

# An Exquisite Corpse of Musical Cryptograms via BCMI

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## Abstract

What if you could notate a complete work of music in real time just by thinking about it? In this abstract, we present the concept of using music cryptograms and neurotechnology to advance the art of composition and music therapy. This is a herculean task that involves developing neurovascular bioelectronics, AI composition methods, and AI/ML-enabled Brain Computer Interfaces (BCI) to allow not only abled composers but also disabled, paralyzed, and quadriplegic people—whether from war tours, vehicular accidents, old age, disease, or birth anomalies, i.a.—to create sheet music that can be performed by live musicians, just by internalizing melodies and harmony.

## Musical Cryptography as Sound Art

Musical Cryptography, in its simplest form, is a method of mapping musical notes onto letters of a romanized alphabet to encode secret messages. Ahmadeus Beaux-Arts has devised a proprietary 26-letter system using solfège nomenclature in multiple languages and systems to create a wide variety of musical scores across various styles and genres that appeal to listeners worldwide.

In 2020, Ahmadeus Beaux-Arts launched two Sound Art projects, *CRYPTOGRAMS* and *SPIKED TINSEL*, that have been successful in demonstrating the viability of its 26-letter system of musical cryptography as a method of melody-forming and as a means of connecting with people to show their names, lives, and legacies matter. While *CRYPTOGRAMS* demonstrates various aural and visual encoding methods—e.g. direct pitch translation, spectral embedding, and rhythmic voice mapping—*SPIKED TINSEL* goes a step further in using regular expressions (i.e. X-grams) to process

large amounts of text to use as enhanced reference inputs, called “influences,” for comparing human compositions against trainable AI music generators such as AIVA (the Artificial Intelligence Virtual Artist). The first trial of these works in *CRYPTOGRAMS* resulted in a Shakespearean rendering of the canonized Hamlet monologue “To be or not to be. . .” (titled *Cryptospeare*), while in *SPIKED TINSEL*, 3.5 hours of musical output—called *101 Ghosts*; subsequently used as an AIVA influence track—resulted in a Christmas Carol (titled *Ebonitë Screwidge*). The difference between *Cryptospeare* and *Ebonitë Screwidge* is that, with current AI processing at platforms like AIVA, the encryption—albeit musical—is unidirectional and non-decodable. *Cryptospeare*, on the other hand, is written as a decodable music canon that can be described as prancing around the ear like a large candy cane, twisting and convoluting in formation at a candy factory.

In relationship to future projects, we hope to apply these methods to more rapidly build a COVID 19 Music Memorial honoring the names of hundreds of thousands of those who died during the pandemic. We also hope to develop an AI-based system that operates like a Cryptospearean composer, creating melodies, countermelodies, and accompaniments that are musically convincing and preserve the audio and bidirectionality of the encryption.

## Music Neurotechnology and BCI

Applying Neurotechnology and Brain Computer Interfaces to music scoring is a relatively new and challenging topic in the world of music technology. Ahmadeus Beaux-Arts, a business dedicated to creating neurotech for the musical mind, is currently based at New Lab, LLC, a high-tech research and

development facility in Brooklyn that applies transformative technology to things that matter.

Music matters to us; and, in general, music notation is difficult and time consuming. It can often take up to a full working day (8 hours) for a single composer to conceive of, notate, and engrave 15 seconds worth of substantial polyphonic music (8 to 10 instruments across 40+ voices). This output can increase 700% to 2 minutes per day when reduced to a single-instrument like piano when conceptualized using music cryptograms.

Music composition, however, is nothing more than the ability to *write* music. Nonetheless, music literacy is not necessary to communicate musically or for the mind to develop concepts from pitched utterances often communicated in vocal music, such as Inuit throat-singing. We do know, in any case, that music resides in myelinated minds (Coyle 2009, 30-53) and are researching ways to interpret the electrical signals that fire in the brain when it manifests so that it may be documented in written form. In this vain, Ahmadeus Beaux-Arts wants to build music notation software that simplifies inputs through reading and interpreting brainwaves, enhanced by muscle memory triggers. In other words, we propose developing a system that outputs sheet music in real time as one thinks of the melody.

In 2005, a landmark study toward a brainwave controlled musical interface (BCMI) was uninterested in a system that plays naturally conceived melodies (Miranda et al). The next landmark study was presented in 2011 by two Georgia Tech graduate students who created a BCMI for real-time composition (Chew et al). In 2018, a groundbreaking neurovascular bioelectronics technology was proposed for controlling basic computer inputs (Oxley et al). Ahmadeus Beaux-Arts believes that a marriage between existing EEG technologies and music scoring software will enable people of all backgrounds and abilities to interact with a system to produce sheet music in real time, just by thinking about music, without the need for expensive instruments or other input devices such as a midi-keyboard and mouse.

## References

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- Oxley TJ, et al. *Journal of NeuroInterventional Surgery* 2020;0:1–7. <https://doi:10.1136/neurintsurg-2020-016862>.

## Biography

**Ahmadeus Beaux-Arts, Inc.**, founded in 2017 by Bryan A. Crumpler, leverages the intellectual capital of arts organizations to effect social change at the intersection of music, film, language, art, science and technology. Our mission is to elevate the conscience of global society through the creation of public art-music projects and bridging groundbreaking technologies with music applications. We believe operating at the intersection of neurotechnology (mind-reading devices), AI, and music technology will heighten the human brain's capacity for music creation. Crumpler has received numerous prestigious awards from the Morehead-Cain Foundation, Tandy Technology Foundation, Elks National Foundation, United States Artists, Musicians Foundation, Ministry of the Flemish Community, Bank of America, a Research Education Support Fellowship from the NIH, plus nearly a dozen international music prizes for music performance, as well as a 2015 bid from the Atlanta Music Project for the Pulitzer Prize for Music Composition.