

# DISSCO makes 'music' for Argonne, UIUC researchers

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A mathematician and a musician have teamed up to create a new computer program that both composes music and creates the instrumentation to play it. The software is available for free from SourceForge.net.

The mathematician – Hans G. Kaper of the U.S. Department of Energy's Argonne National Laboratory – and the musician – Sever Tipei of the Computer Music Project at the University of Illinois at Urbana-Champaign – have worked together for several years on the project, called DISSCO for Digital Instrument for Sound Synthesis and Composition. A key feature of DISSCO is that it integrates composition and sound synthesis in one seamless process, delivering a finished product that needs no further processing.

"The idea is to use the computer as an assistant in composing a piece of music," Kaper said. "The computer takes a general idea and develops sheet music or recorded sound." Kaper knows the concept from both sides; in addition to his position at Argonne, he is also adjunct professor of music in the Computer Music Project.

"It's like writing a symphony and at the same time building the instruments to play it," Tipei added.

The resulting sounds are not Mozart, or Thelonious Monk, or even Moby, but an interesting amalgam of notes. A sample of computer-composed music is at [ems.music.uiuc.edu/cmp/manyWorlds.wav](http://ems.music.uiuc.edu/cmp/manyWorlds.wav) , and a

sample of computer-composed and sound-generated music is at [ems.music.uiuc.edu/ANL-folds3.wav](https://ems.music.uiuc.edu/ANL-folds3.wav) . Included in that second sample is a series Kaper and Tipei call the "Argonne chime" – a series of notes created by the computer program that spell the word Argonne – the notes A, Re, G, Sol, two computer-selected sounds to represent the letter "n," and E.

The program serves two major purposes: The ability to create and hear sounds allows students to understand the interplay between structure and randomness in music composition; and the ability to produce sounds from computer data offers scientists a new way to discover the patterns and aberrations in data – "data sonification" instead of "data visualization."

Tipei appreciates showing his students how structure and randomness can blend to enhance the creative process. "The idea is to develop a manifold composition, which is one musical structure which includes some degree of randomness. The end product is a composition that changes every time it is played," Tipei said. DISSCO permits variable degrees of indeterminacy at all levels while producing a fully completed musical product. Parallels are established between the way sounds are grouped in various structural units and the way partial sounds and notes contribute to the makeup of a sound, which leads to the use of similar tools to manage events that occur at different time scales.

DISSCO uses additive sound synthesis to build sounds from sine waves. It allows precise control over each parameter of each sine wave, as well as over the overall qualities of the resulting sound. "Scientists can use this instrument to explore scientific data by rendering them in a sound file," Kaper said. "The data are used to define the characteristics of the sound wave, such as the way it is tuned, its loudness, its spatial distribution and the amount of reverberation. In all there are more than a dozen useful degrees of freedom that we can build into a sound – more

than enough for most physical or computational experiments."

DISSCO is available at [dissco.sourceforge.net](https://dissco.sourceforge.net) , and is free software distributed under the terms of the GNU General License.

Source: [DOE/Argonne National Laboratory](#)

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