What does testosterone sound like?
Track 13
Structural and Aesthetic Choices in Sonication

The idea of using the subunits of DNA, called nucleotides, as the basis of music is not new. There are many versions of music based on this idea on the Web. However, because there are only 4 nucleotides in DNA, such music is rather monotonous. If one bases music, not on nucleotides, but on other elements of DNA structure or the elements of protein for which DNA provides instruction, greater structural complexity is possible.

The function of DNA in cells can be described according to the sequence described below:

DNA----------RNA----------Protein

The information stored in DNA is used to generate a complementary strand of RNA. The nucleotides in RNA are grouped into "codons" (groups of 3 nucleotides). Each condon specifies a particular amino acid in the protein that will ultimately be produced. Thus, when the time comes for the information stored in DNA to be translated into a protein, several additional options for sonication of the original DNA are opened up.
For instance, each since there are 4 RNA nucleotides and each group of 3 nucleotides makes a codon, there is a total of 4^3 or 64 codons. Thus, if one were to use codons as the basis for music, one would have 64 commands to work with leading to the possibility of using different codons to specify pitch, rhythm, dynamics etc.

In this work, composer Jim Croson of the OSU School of music used the gene for testosterone as the basis for music. Musical instructions were generated by identifying which amino acid each codon calls for. The genetic code is considered degenerate, meaning that there is more than one codon per amino acid (although only a single amino acid is assigned to each codon). Pitches were assigned to each of 20 amino acids to create the music. As a tribute to the 3 dimensional structure of DNA, the composer used a filter to place an accent on every 10^{th} base which approximates the periodicity of the DNA double helix.

Additional biological details were also included in this work by the composer. For instance, the individual nucleotides are represented by two note chords. These are used as background structure against which the amino acid-determined pitches are played. The composer represented complementary 5' and 3' stands of DNA by playing complementary chords in the musical underpinning of the piece.

The piece was put together using a computer to translate DNA nucleotides into a series of pitches and chords according to the sonication instructions. Thus, we now know literally what testosterone sounds like.