

# Fugue No. 9

E Major

*Well-Tempered Clavier Book I*

Johann Sebastian Bach

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To read this essay in its hypermedia format, go to the Shockwave movie at <http://www2.nau.edu/tas3/wtc/i09.html>.

The image shows a musical score for Fugue No. 9 in E major, BWV 99, from the Well-Tempered Clavier, Book I. The score is written for a grand piano, with a treble clef on the upper staff and a bass clef on the lower staff. The key signature is E major (three sharps) and the time signature is common time (C). The subject is the first melodic line, and the countersubject is the second melodic line. Below the score, there are labels 'A', 'T', 'C', 'G', 'C', 'C', 'C' with arrows indicating their positions. A bracket labeled 'Subject' spans from the beginning to the end of the first line, and a bracket labeled 'Countersubject' spans from the beginning to the end of the second line.

**Subject:** Fugue No. 9, *Well-Tempered Clavier*, Book I

Until the end of the 19th century humans could not explain why a child looked and acted like his parents. But well before that time Bach understood how motives in the subject would replicate themselves in the fugue. In this analysis we'll consider how:

- a fugue is like DNA
- fugues employ an alphabet of motives
- recombinant motives are prized
- motivic mutation is not uncommon
- the fugue is generative

## A Fugue Is Like DNA

Johann Sebastian Bach was born in 1685. He came from a long line of Bachs, renowned musicians in Thuringia for over a hundred years. This has led some to speculate that Bach's genius was attributable as much to his genes as to his training and hard work.

In 1865, one hundred and eighty years later, an Augustinian monk named Gregor Mendel discovered why traits of the parent are passed on to the child.

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Mendel's work led to the discovery of genes and eventually of DNA, the genetic code present in every life form. Scientists have recently completed one of the greatest sleuthing achievements in history, the mapping of the human genome. Their findings identify the molecular composition of DNA corresponding to each of the 46 chromosomes in our bodies.

A Bach fugue is like DNA in three respects. First, whatever "genetic" traits are present in its subject are passed to the fugue. The subject has a defining set of motives, like genes, that contain the material for the rest of the fugue. Bach's sons used to tell a story about their father. Upon hearing the subject of a fugue he would predict the contrapuntal techniques that would be used to develop it. When those techniques were heard he would nudge his neighbor as if to say, "I told you so."<sup>2</sup>

Second, Bach's fugues are like DNA in the countless variations they produce with only a few simple musical ideas. Like the nucleotides of sugar, phosphate, and nitrogen bases that comprise a strand of DNA, passing note, neighbor note and consonant skip figures underlie every Bach fugue. Out of these simple particles Bach has generated a splendid array of subjects with their attendant moods and inherent potential for development.

A third way that Bach's fugues are like DNA is in the common elements that unite them. All living beings share many of the same genes, each made of the same molecules. Under certain natural (and artificial) conditions genes will even transfer themselves from one species to the next. Similarly the fugues in the *Well-Tempered Clavier* utilize elemental patterns to create a variety of subjects and unique works of art. The shared chemistry and genetic coding in DNA suggests that all living things have a common origin. Whether we be worms or wombats, peacocks or people, we share many of the same designs. Too, the shared motives in Bach's fugues confirm their source, the fertile mind of an extraordinarily gifted composer.

### **Fugues Employ an Alphabet of Motives**

DNA looks like a spiral staircase. Its double helix handrails are made of deoxyribose sugar and phosphate molecules. These join to form long polymers that could be likened to the free counterpoint gluing the parts of a fugue together. I have designated these free counterpoint portions within the dotted lines of the timeline.

The rungs of the DNA ladder contain its genetic code; they are what give the zebra stripes and an elephant its big ears. These rungs are comprised of four nitrogen bases: adenine (A), thymine (T), cytosine (C), and guanine (G). A-T always pair with each other as do C-G. These four represent the genetic alphabet from which all physical traits are derived; they exist in the same proportions in every life form. They are like the musical alphabet from which melodic figures, motives, subjects, preludes and fugues, are made.

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<sup>2</sup> Carl Philipp Emanuel would tell, of his father: "When he listened to a rich and many-voiced fugue, he would soon say, after the first entries of the subjects, what contrapuntal devices it would be possible to apply, and on such occasions, when I was standing next to him, and he had voiced his surmises to me he would joyfully nudge me when his expectations were fulfilled."

Continuing the biochemical analogy, I have labeled the motives in this fugue A, T, C, and G. They have been marked on the timeline and on the score. When strung together the motives ATCG comprise the fugue's subject. If you click on the timeline the ATCG "gene group" will also activate within the DNA strand to the right.

The most primal idea, the attention getter, is figure A. It is a rising second from *do* to *re*. Its other defining characteristic is a crisply articulated short-long. The second idea (particle T) is a rising tetrachord that has "figured" prominently in many other fugues of this study. The third idea (figure C) features the lower and upper neighbors to the main note E. The fourth idea (figure G) outlines a consonant skip of a third with a passing note between.

### **Recombinant Motives Are Prized**

Fugue is the most highly developed of contrapuntal forms. Counterpoint is the art of combining melodic strands with each other. Sometimes this involves slicing and splicing portions of a subject in different orders. There is no better example of recombinant motives than in this fugue.

The subject of this fugue is any contiguous statement of ATCG in that order. On the timeline these have been represented in grey. The first pair of motives (A-T) is represented in hot colors, while the second pair (C-G) is represented in cool. This is because the cool motives also comprise the countersubject. So the countersubject is a continuation of motives in the subject.

This fugue is unique in that its countersubject undergoes considerable mutation. I define the countersubject of this fugue as any string of cool colors immediately following the subject in the same voice, or sounding at the same time as the subject in another voice. I have enclosed the qualifying combinations within solid lines. Possible countersubject strings are: CCCG (mm. 2, 5, 17); CCCC (mm. 4, 9); CGCC (mm. 11-12).

### **Motivic Mutation Is Not Uncommon**

Yes *mutation* is a word that we use in musical analysis. It is most often applied to the statement of a motive in a different mode. For example, nine of the ten statements of the subject are in major. The subject statement in m. 16 is in minor. It is therefore said to have *mutated* to the relative minor.

Another type of mutation involves motivic transformation by rhythmic augmentation, melodic inversion, retrogradation, or any combination of the foregoing. Let us start with particle T, the rising tetrachord. Portions of the 2nd episode are punctuated by falling tetrachords prominently displayed in the high voice. These are represented on the timeline as upside-down versions of T. The bass voice of m. 7 contains an augmented version of mutant T.

The developmental episodes of this fugue are classic studies in recombinant mutation. The episode beginning in m. 13 is especially involved. It presents a C-G strand in the high voice with aggregates of A and mutant C-G particles in the middle and low. This section is of such importance that I have identified each particle in this portion of the score.

What looks like a large letter e in the bass voice of m. 13 is not a new motive. It is really an upside-down and rhythmically augmented figure G. And those backward C's in mm. 14-15 are actually augmented retrograde-inversions of figure C.

Yet a third type of mutation results in the illusion of motive created by the combination of different voices. The three statements of figure A in mm. 13-15 are produced by an amalgam of pitches in the two lower voices. Yet the effect is that of figure A. This is called an *aggregate*.

### **The Fugue is Generative**

The greatest contribution of genetics since Gregor Mendel has been to reaffirm the principle that all life is generated from pre-existing life. While a fugue is not biologically alive, it lives in the imagination of those who hear it. We might say that the fugue is alive with motive.

That this creative principle extends from the first parent through each generation of Bachs, through Johann Sebastian, to the preludes and fugues of his *Well-Tempered Clavier*, suggests that art participates in the principle that life begets life.

To those who know how to listen to a fugue it can be heard as a tonal allegory for the generative process. Not every motive has sufficient "life" to generate new life. Bach's genius can be seen at the molecular level--in his choices of motives in the subject.

There is evidence, from Bach's *Inventionen and Sinfonien* (Two and Three-Part Inventions) that he conceived of the initial phase in composition as one of taking a pre-existing subject and transforming it to produce a new one. As in biology, where the myth of spontaneous generation was discarded one hundred years ago, we now have reason to believe that the elemental material of Bach's fugues were not reinvented but recycled from prior ideas continually swirling in his head.

After the subject has been devised there must be a process for multiplying it into a mature fugue. That process is called, in living things, *mitosis*--a cell divides into two daughter cells sharing the same DNA. In polyphonic music that process is called *counterpoint*--one melody generates another or is used to accompany itself.

A Bach fugue is *organic*; the whole cannot be understood without reference to its parts and the parts cannot be appreciated without an understanding of the whole. That nearly every measure contains the DNA code of its subject contributes to the fugue's unity, without which the fugue would wander into a wilderness of disconnected ideas. But the recombinant techniques of counterpoint contribute to a fugue's variety, without which it would die of pathological sameness.