

there are more important issues, so don't hold anybody's feet to the fire just on abortion. That's a misuse of the consistent ethic, and I deplore it.

Though we cannot judge people's consciences, we can judge external situations to determine whether they are manifestly gravely sinful and whether the person exhibits obstinate persistence. Likewise, the reception of Holy Communion is an external, public act. Nevertheless, the question of the proper disposition of the soul while receiving Holy Communion is eminently pastoral. It has long standing in the Church, going back to the early centuries.

The Bible clearly teaches about the proper disposition to receive Holy Communion. In the First Letter to the Corinthians, St. Paul writes:

Whoever . . . eats the bread or drinks the cup of the Lord in an unworthy manner will be guilty of profaning the Body and Blood of the Lord. Let a man examine himself, and so eat of the bread and drink of the cup. For anyone who eats and drinks without discerning the body eats and drinks judgment upon himself. (1 Cor. 11:27–29)

This biblical teaching is reflected in Canons 915–16 of the Catholic Church's Code of Canon Law. Canon 915 addresses the minister of Holy Communion, who is not to admit individual persons to the Sacrament under the circumstances clearly defined in that canon. Canon 916 is addressed to the person who is "conscious of grave sin." Thus, whereas Canon 915 puts the burden of discernment on the minister of Holy

Communion, Canon 916 places responsibility for self-discernment on the person who desires to receive the Sacrament. These principles for the proper disposition for being admitted to Holy Communion are in keeping with the maxim that "law follows theology"—that is, that the laws of the Church are not created in a vacuum but are practical applications of biblical and theological truths in actual situations.

In seeking Eucharistic coherence in an incoherent era, we must remember that our goal is conversion and readmission to Communion, not exclusion and permanent expulsion from the community of faith. Even when a difficult decision must be made not to admit someone to Holy Communion until there has been repentance and reconciliation, such discipline does not contradict the love by which it is motivated. ■

Bach and Pythagoras

by Dan Moller

Anyone who begins playing Bach as an adult will notice two things: that he should have started earlier, ideally by studying the piano as a child instead of chasing a leathery orb around some field; and that there is something of the divine in Bach. Philosophers have always drawn a connection between music and the cosmos and its creator. And after butchering our way through various preludes and fugues, most of us will see a connection, too, even if it isn't quite the one the philosophers propose.

Superficially, we could cite the religious content of Bach's music, or his biography. Mozart and Beethoven wrote glorious Masses, and the former at least seems to have had some enthusiasm for the words. But listening to Bach's *St. Matthew Passion* is another thing entirely. It isn't just the lyrics. It's the three-hour length (half an opera, Wagner would say), the interpolation of Lutheran hymns, and Bach's personal obsession with this work. Despite the mix of indifference and hostility that greeted it, his calligraphic score from 1736 was an elaborate red-letter edition, with carefully glued

repairs. And then there are all the other passions and Masses, hundreds of cantatas, and chorale preludes for the organ.

Cynics will say that Bach was just going through the motions—another cantata, another day at the office. Albert Schweitzer even proposed that art was Bach's true religion. Such interpretations are hard to square with the outward features of Bach's life—the dozens of religious volumes in his library, the exacting exams on his way to becoming cantor at Leipzig. (Quick: How many chapters are there in the Gospel of Luke? Which Gospel contains the phrase, "This is life eternal"? Reply in Latin, please.)

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And then there is the symbolic dimension of the music itself. The fugue in C-sharp minor from Book I of the *Well-Tempered Clavier* begins with a theme that seems to outline a cross in the score. The *St. Matthew Passion* begins in E minor because that is the traditional key of the cross, its solitary sharp denoted *Kreuz* in German. Bach was fond of writing musical puzzles, one of which he captioned *Symbolum: Christus Coronabit Crucigeros* (“Motto: Christ will Crown the Crossbearers”). It contains a piercing lament that the musicologist Timothy Smith has described as musical stigmata, in light of a dissonant sequence of five tones, which the piece emphasizes. All this, surely, is overkill for a day at the office.

There is nothing amiss, then, in noting Bach’s religious enthusiasms when accounting for the feeling one gets from playing him at the piano. Still, it may seem a bit trite. After all, as you stumble through the *Well-Tempered Clavier*, which offers a prelude and fugue for every key twice around, the pieces don’t all have the portentous qualities of the C-sharp minor, and there are no words to cling to. Yet that sense of the numinous remains.

Philosophers of a certain stripe suggest another approach. The Pythagoreans, who saw number as a guide to reality, noticed that music could be described in mathematical terms, since the intervals between notes correspond to the ratios between strings. (The perfect fifth interval, which opens the *Star Wars* theme, is formed by strings at a ratio of 3:2.) It was a short leap to the idea that reality itself could be described in musical terms corresponding to numbers and proportions, and then to the conceit of the “harmony of the spheres,” which associated the heavenly bodies with music. This thought shows up in the cosmology of Plato, who was a Pythagorean at heart. The sign over his Academy bearing the motto

“Let no one ignorant of geometry enter” is apocryphal but apt, and he suggests in the *Timaeus* that the cosmos has a structure associated with a musical scale defined mathematically. (By contrast, Aristotle rejected the harmony of the spheres on the plausible if prosaic ground that even when you listen really carefully, you can’t hear anything.)

An aside is in order, lest we begin snickering at the quackery of the ancients. Writers such as Plato and Aristotle may seem to have had no scientific grasp of reality, lost in philosophical speculation. Some of their contemporaries certainly saw it this way—Aristophanes’s *Clouds* is famous for its fart jokes and for its portrayal of Socrates as a bumbling cosmologist. Why didn’t they look around more, instead of mumbling about ideal forms and final causes? “*Virtus dormitiva!*” we chortle with Molière.

But this is to misunderstand the Greek preoccupation with number and harmony. Plato’s *Timaeus*, with its goofy-sounding cosmology and musical proportions, reflects cutting-edge work in both mathematical theory and empirical observation. Plato proposes that matter is composed of tiny particles we cannot observe directly, but whose mathematical structure we might be able to infer using the latest techniques. Further, we must try to discover a *model* to account for anomalous observations, such as the retrograde motion of the planets across the sky. For his part, Aristotle was busy investigating the human metabolism and the functions of the organs, including by dissection.

The experimental method had to wait for the Islamic Golden Age, and later Francis Bacon. But the ancients proposed mathematical models to fit their observations, which they had the good sense to take seriously. They were wrong about a great deal—Aristotle says the brain functions to cool the blood—but these errors will

seem trivial to any thoughtful student of history. The tragedy lies not in the mistakes of these intrepid explorers but in the timidity of their successors. It’s not Aristotle’s fault that his epigones mindlessly repeated his claims instead of taking them in the spirit he intended: as proposals and conjectures to be tested and improved on.

Ancients aside, after a gap of two thousand years, we encounter another Pythagorean in Johannes Kepler. In his third law of planetary motion, Kepler found Pythagorean harmony in the speeds of the planets, which move faster as they approach perihelion, the point closest to the sun, and slower farther away, as they approach aphelion. The ratio between these two speeds, fastest and slowest, was the basis of the cosmic harmony Kepler sought, and eventually he developed a kind of cosmic orchestra comprising the planets.

This, too, is apt to strike us as quaint and misguided, and we may feel tempted to throw over the Pythagoreans altogether. And yet they uncovered an important truth, for the Pythagoreans were fundamentally right about number as a guide to reality. Their mistake was to suppose that the order was out there in the world and not a rational construction of our making, an interior cosmos. Of course, there was always going to be some degree of order in the world—some whole number of suns and planets, various regularities to observe and codify. But the original hope was for perfect spheres and simple congruences. Some final theory of everything may vindicate the original hopes of the Pythagoreans, but it looks doubtful. Laws such as that of gravity are full of random-seeming constants, and Kepler’s cosmic harmonies were a fraud, requiring him to dredge his data until he found something vaguely musical by chance. It turns out that reality is messy and disorganized, but mathematics is useful for describing the mess.

In fact, the Pythagorean dream was wrong about mathematics itself. The Pythagoreans imagined mathematics to be perfectly rational, always expressible in terms of integers and the ratios between them. It is said that those who knew the truth were sworn to secrecy or drowned—as when it emerged that pi is an irrational number, since the circumference of a circle and its diameter are incommensurable (*alogos*). Forbidden math, like forbidden love, can surprise or even shock us, it would seem.

This Pythagorean tragedy governs *The Well-Tempered Clavier*, a work dedicated to the mess of incommensurability. When you tune your keyboard by the standards of perfection, using Pythagorean fifths to move from note to note, things seem fine at first. If you start with C and move to G (a fifth interval higher), and then to D, and so on, eventually you will arrive back at C, several octaves higher. But *this* C turns out not to be the same C you started with. That is, if you tune up by octaves, and make sure that each C sounds twice as high as the last (double the frequency), you will come out someplace slightly different than you would if you had tuned up by fifths. The gap between the two Cs is called the Pythagorean Comma, and one imagines all the secrets and drownings it must have occasioned over the years.

The Pythagorean Comma makes it impossible to play in perfect tune in every key without fudging the tuning a bit so that things are slightly off, but not quite enough to sound wrong. The well-tempered keyboard is one that's been tuned so that you can freely whip from key to key within and between pieces without retuning. Bach is saying that the world doesn't live up to our Pythagorean dreams, but that the solution is to use our skill—art,

Kunst, technē—to make up for it, and so to tame unruly nature.

The common ways of seeing divinity in Bach disappoint us because they are either too ambitious or not ambitious enough. It would have been satisfying to hear the demiurge at the piano, but that was never in the cards, not while pi remains *alogos*. And simply noting the religious content of the passions feels rather pat.

But playing Bach is a lesson in transformation. I think it is this that one senses late at night, listening to that fugue in C-sharp minor, with its cross and, later on, a waterfall of tears. Of course, a great deal of music is about transformation. Theme-and-variation is common enough; Beethoven's melodies are sometimes pedestrian (ba-ba-ba-*baaa*), but they are developed in ways that astonish us. Still, in Bach the imperative to transform seems especially insistent. Themes are stretched out by augmentation or compressed by diminution; they are flipped upside-down or played backwards; the *Art of the Fugue* is dedicated to mutating a single theme over and over; and the Goldberg ground is ceaselessly altered, a single face with thirty masks.

And in Bach's work, secular music is transformed into religious material, in what is known as *contrafactum*. The *St. Matthew Passion* has a through-line in the recurring hymn, "O sacred head, now wounded," sometimes described as a Greek chorus in the form of a Lutheran chorale. But it was adapted from the decidedly secular song "My Heart is Troubled by a Tender Maiden," whose content will be familiar to anyone who knows Van Halen or The Kinks. Perhaps we shouldn't read too much into repurposing pop music, but plenty of

artists *have* been self-conscious about this sort of thing. The Blind Boys of Alabama perform the tune "House of the Rising Sun" with the lyrics to "Amazing Grace," in a clearly intentional juxtaposition, and Luther himself once quipped, "Why should the Devil have all the good tunes?"

Given Bach's penchant for such transformations, it's hard not to see a deeper significance. It isn't just the alchemy of turning doggerel into passion music; it's the transformation *we* undergo at Bach's hand at the keyboard, and the conversion of the heart that his many musical alterations hint at. Bach's music traverses the entire spectrum of difficulty, from the very easiest to the nearly impossible. As soon as they can read some music, those inclined can join the other little Bachs at their lessons from *Anna Magdalena's Notebook*, then proceed to the *Well-Tempered Clavier*, and finally attempt the *Art of the Fugue*, parts of which are more or less unplayable. At the end of this process, there is a palpable sense that Bach has transformed you into someone a little less unworthy of his music, and every so often, you begin to wonder whether it isn't in fact Bach who is playing you.

Bach's conversion of the heart remains after we have left behind all those Pythagorean schemes. The schemes point outward, toward a cosmos that is supposed to match the order of the music, when what we should be considering are the transformations and conversions required within ourselves. Music involves an "unconscious arithmetic of the soul," Leibniz says, but the quantities and ratios embody no cosmic perfections and are, as we have seen, quite imperfect themselves. They pertain, rather, to perfections of the heart and the will, of what we want and value, contemplating Bach's miracles at the keyboard. ■

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