CHAPTER 3

THE GRID

A Life Principle

STRUCTURE AND FLOW

What do hopscotch, American football, and Arnold Schoenberg have in common?
Two words explain everything: The Grid.

From birth to death, every day all day long, our existence depends on an organizing principle composed of interlocking lines and numbers. The lines, straight or curved, may be visible like grooves on a sidewalk or invisible like the meridians of Chinese medicine. The numbers may be overt like the twelve tones of Schoenberg’s method of composition, or deeply hidden like the forty-six chromosomes in the nucleus of a human cell. Together, the lines and numbers constitute a grid—the crucial framework behind every human activity and endeavor.

Hopscotch, football, and twelve-tone music wouldn’t exist without their underlying grids. Fundamental as it may be, however, the grid alone doesn’t amount to much more than an abstraction. The grid becomes a life principle when energy flows through it and in opposition to it.

The word grid means different things depending on context. Overlaid on a map, a grid is a system of evenly spaced lines that cross one another at right angles, forming squares or rectangles. The lines are numbered or lettered, making it possible to create an index of locations on the map according to their coordinates. The grid increases the amount of information you can draw from the map. Thanks to it you can read the map better, and eventually navigate the world that the map represents.

A grid is also a network of power stations, towers, cables, and pipes that distributes electrical power over a territory. Without the grid, electricity wouldn’t be able to travel around the city and give it light and heat. Without electricity, the grid would be inert. In other words, the grid alone is useless, just as electricity alone is useless. It’s their meeting and opposing each other that makes them useful.
The system of parallel lines painted on a field for playing American football is called the grid or gridiron. Football itself is informally called the gridiron—an indication of how important the grid is to the game! The starting position of cars on a racecourse is also called the grid.

The map, the system of cables and power stations, the lines on the football field, and the positions of cars at the start of a race are dictionary definitions of the word grid. As I see it, all these grids are manifestations of a larger concept that we might call the Grid, with a capital G.

The Grid is the structure underpinning any system—a relatively rigid framework built of simple geometrical and mathematical elements that interact with one another as numbers, lines, curves, and angles, delineating space and time. It may be visible or invisible, audible or inaudible, tangible or intangible. The Grid is organized and predictable, but the energies that oppose it are fluid and unpredictable. Thanks to opposition, the Grid condenses and multiplies the energies that flow through it.

**GRIDS IN DAILY LIFE**

A set of bookshelves is a grid. In a library, a whole wall may be given over to a collection of identically shaped books, in which case there is a sort of coincidence between the grid and what occupies it. But elsewhere—in your home, for instance—you might organize your books against the grid, counterpointing the grid's predictability with a jagged mini-skyline of books of different sizes, shapes, and colors.

The three-act structure of many plays and films is a grid. A 110-page screenplay that is the blueprint for a conventional Hollywood action movie has recognizable dividers: on page 10, the *inciting incident, a* dramatic event that pulls the hero into the action; on page 30, the *first-act turning point, in* which the story kicks into high gear; and so on throughout the screenplay, the *midpoint* at page 60, the *second-act turning point* at page 90, the *crisis, climax, and resolution* in the last few pages.

The grid creates expectations: The moviegoing public expects the hero to behave in a certain way after the inciting incident, and in a different way after the crisis and climax. The job of the filmmaker is to manipulate expectations and then thwart them, or perhaps fulfill them in original ways. Character arcs, plots and subplots, and the rise and fall of dramatic tension all play with the grid or against it. The movie, then, is an interplay between expectations and realities, formulas and surprises, conventions and inventions. The dynamic pull between these forces makes or breaks the movie.

Children delight in the grid of the sidewalk. You can step exclusively on the squares, avoiding the lines and grooves that separate the squares; or you can step on the lines quite on purpose. But if you decide to avoid stepping on the lines and your foot lands on one by accident, your whole destiny might change, up to your wedding day and beyond!

The human body is a series of interlocking grids including the skeleton, the muscle system, the nervous system, and the meridians of Chinese medicine, among others. Life is a play against the grid—the opposition between the inescapable limits of biological grids and our desire to overcome these innate limitations. The capillary system connecting arteries and veins, for instance, is a grid. Without this particular grid, there can be no life; but without the flow of blood pushing against the grid, there can be no life either!
A chessboard is a two-colored grid of sixty-four squares: eight times eight, or two to the power of six. There's so much latent mathematics in the chessboard that you could spend a lifetime just pondering the possible relationships and operations within it. The chess pieces' hierarchy is a function of how much power they have to move against the grid. Rooks move up and down, bishops diagonally, the queen both ways. The queen, then, is worth as much as a rock and a bishop. The entire game is completely dependent on the grid and the pieces' capacity to move against it.

The urban street grid has existed for as long as there have been cities. In antiquity the Romans, the Greeks, and the Chinese all built cities using grids. Some of the grid's modern manifestations are particularly interesting—New York City, for instance, or Chicago or Los Angeles. The street grid organizes aspects of urban life such as traffic flow, garbage collection, and mail delivery. Most city grids combine strict geometrical patterns with not-so-strict corners, diagonals, and dead ends—partly on account of a city's geographical features, partly because the human element in city planning is inevitably unpredictable. In a great American city like New York, the highly organized grid is the background for an unpredictable, asymmetrical skyline—buildings of many shapes and sizes, sometimes at right angles to the grid, sometimes not. The variety of buildings plays against the predictable grid, and the end result is endlessly stimulating. In a not-so-great American city, the grid itself lacks interest, being much too even, and the buildings and parks within the grid don't create enough opposition to the grid. Everyone is too well behaved, the grid as well as the stuff in it.

The calendar is a grid of days, weeks, and months. The numbers seven (days in a week) and twelve (months in a year) are pregnant with meaning. So are the numbers thirteen (full moons in a year), fifty-two (weeks in a year), and sixty (seconds to the minute, minutes to the hour). Behind the calendar's mathematical arrangement there lie the cycles of the sun and moon, astronomic events that carry tremendous physical and metaphysical power.

We grow up having internalized the calendar-as-grid. We follow the days and weeks intuitively, and we keep track of certain obligations and events without thinking about them. But we also externalize the calendar-as-grid through the use of watches and clocks, calendars, agendas, and lists. It's impossible to have a wholly internalized calendar, amounting to an absolutely reliable inner feeling for the passage of time in all its dimensions. And it's undesirable to have a wholly externalized calendar, becoming overly dependent on lists and clocks to organize your daily life.

POETIC GRIDS

Written and spoken languages all have their grids. The alphabet itself is a grid of sorts; so is the conjugation of verbs with its interplay of rules and exceptions. Poetry being “enhanced language,” logically enough it has “enhanced grids,” or poetic forms. These are of interest to musicians since they share many similarities with musical forms. I propose to cover three grids: the haiku, the limerick, and the sonnet. My main intention is to show you that grids themselves play a role in meaning and emotion.
1. THE HAiku

Our daily life is suffused with mathematics (numbers) and numerology (the often ungraspable psychological and even mystical meaning of numbers). We could say that number alone is a kind of energy. We feel that three is sacred, as in the Holy Trinity; seven is lucky, thirteen unlucky. Musicians are so used to playing sonatas and symphonies in three or four movements that a piece in two movements, or five, carries the interest and energy of its being an exception to the norm. When it comes to time signatures, average musicians know their twos, threes, and fours, but five and seven are a different matter. Two, three, four, and six are “friendly.” Five and seven raise the red flag!

The haiku is a spare poetic form originating in Japan, comprised of three lines of five, seven, and five syllables. A haiku would be a completely different form if it had four lines rather than three; or if the syllable count was the same on every line; or if the syllable count were six, eight, and six syllables rather than five, seven, and five. (Truth be told, Japanese poets vary the syllable count a little bit if the poem justifies it.)

Traditionally, a haiku makes a metaphorical reference to an aspect of nature and the seasons in order to address timeless human behaviors and foibles. This is how William Packard explains it:

Every traditional haiku uses a kigo, or season word, to specify whether the poem is of winter, spring, summer, or autumn mood. Traditional haiku will also be characterized by renso, or loose association of disparate images, and contain an elliptical leap from the second to the third line which simulates sudden Zen satori or enlightenment, illumination of the true nature of reality.

The first line makes a statement; the second line seems to make an unrelated statement; the third line says something surprising and unexpected, showing that the previous lines were in fact closely related. A proper haiku, then, is a rather dynamic and complex form. Its mathematical components are restrictive, imposing limits and obligations: You must fit all your words and everything you want to say into this unyielding vessel. While the grid is fixed, the poem’s words are fluid, speaking of the seasons, the sun and the moon, wind and rain, lakes, rivers, trees, falling leaves . . . all with a metaphorical and psychological dimension.

According to this broader definition of a haiku, the following poem can’t be considered a haiku even though it has the required number of syllables:

Terrible headache
Whenever she comes to town.
Yep. Mother-in-law.

This one, though, might pass muster:

Season of the witch.
I love my wife, but—oh, doom.
Here comes her mother.
2. THE LIMERICK

Arising from folk tradition, a limerick has five lines of varied and jagged lengths. Lines 1, 2, and 5 have seven to ten syllables and rhyme with one another; lines 3 and 4 have five to seven syllables and rhyme with each other. Many of the syllables in a limerick form into anapestic feet: ta-ta-DUM. Sequences of anapests in English contain a rollicking energy difficult to restrain; anapests carry humor and wit by their very nature. A limerick's rhyme scheme is AABBA, with unexpected or even forced rhymes. Traditionally, the first line makes a reference to a person or a locale. Table 3.1, "The Limerick Grid," shows an abstract limerick.

In construction, sound, and meaning, the limerick is coarse by definition. Traditional limericks are obscene, or at the very least full of double entendres. Hearing a limerick, a child might not understand it altogether and yet laugh at its sounds, while an adult might blush at what it hints at. The passage of time has lessened the tradition of obscenity, and today there exist limericks as pure as the driven snow. Limericks are poetic jokes, told out loud. For this reason they circulate widely, and it's easy to lose track of a limerick's authorship. Table 3.2, "The Limerick against the Grid," illustrates a limerick side by side with its abstract grid. Most feet in the example are anapestic. Can you spot the exceptions?

Asymmetry, tortured rhymes, the deliberate distortion of the stresses and grammar of everyday language, words and lines repeated at unexpected times: many formal aspects of the limerick might be called "perverted prosody," and for that very reason the poetic form lends itself to expressing provocative or obscene thoughts. It'd be difficult to use it to express exalted sentiments, to speak of God, love, or mourning.

Form is meaning. Compare one of Anton Webern's epigrammatic pieces lasting thirty seconds or less, with Richard Wagner's eighteen-hour Ring cycle. Can they really convey

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<tr>
<th>TABLE 3.1 The Limerick Grid</th>
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<tbody>
<tr>
<td>Line #</td>
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<tr>
<td>1</td>
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<td>2</td>
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<td>3</td>
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<td>4</td>
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<td>5</td>
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<table>
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<tr>
<th>TABLE 3.2 The Limerick against the Grid</th>
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<tbody>
<tr>
<td>Line #</td>
</tr>
<tr>
<td>1</td>
</tr>
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<td>4</td>
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<td>5</td>
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</tbody>
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similarmessages? Once you embrace the principle that form is meaning, you can collaborate with the form and allow it to work for you. If you inhabit the form, you don't need to strain, to fight, to huff and puff, to emote. Instead, the energies in your performance will come from the opposition between the fixed grid and the fluid forces that run against the grid.

3. THE SONNET

The sonnet is a rich poetic form that arose in Italy in the 1200s and that now exists in multiple variations across languages and cultures. The Italian poet Petrarch (1304–1374) developed an enduring structure of fourteen lines subdivided into an octave (two quatrains or stanzas of four lines) and a sestet (another quatrain, followed by a couplet), with the rhyme scheme ABAB CDCD EFEF GG. In the Petrarchan form, the octave stated some sort of metaphysical or emotional problem, and the sestet proposed a solution. The subject matter tended to be courtly love, with the poet using the first person (“I love her, but she doesn't love me”). This tradition lasted centuries, but in time the form came to embrace many other subjects.

Shakespeare’s sonnets use a slightly different form. Instead of an octave and a sestet, they employ four quatrains and finish with a couplet that offers some sort of conclusion or moral for the poem. You can visualize the grids of Petrarchan and Shakespearean sonnets in this way:

<table>
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<tr>
<th></th>
<th>Petrarch</th>
<th>Shakespeare</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(4 + 4) (3 + 3)</td>
<td>(4 + 4 + 4) (2)</td>
</tr>
</tbody>
</table>

In English, poets write their traditional sonnets in iambic pentameter: five iambic feet per line, for a total of ten syllables per line. Poets give themselves the freedom to amputate a syllable from the count or add one; as long as five stresses remain, lines with nine syllables (one unstressed syllable amputated) or eleven syllables (one unstressed syllable added) don't break the game's rules.

A sonnet's grid is so different from a haiku's or a limerick's that its contents must also be different. Form is meaning—there's no escaping this truth! Readers and listeners expect that every foot in a sonnet written within the English tradition will be iambic. A good sonnet, however, follows the grid to some degree and deviates from it to another degree. Precisely because the grid creates expectations, deviations generate a kind of friction that increases the poem's interest. The poet might sprinkle a few trochaic feet (“TUM-da”) here and there, or an anapest (“ta-ta-DUM”). Great poets are masters of expectation and deception, carefully setting up expectations better to deceive and delight their readers.

Table 3.3, “The Sonnet against the Grid,” shows Shakespeare’s Sonnet 18 side by side with its abstract grid. See if you can catch where Shakespeare chose rhythms that push against the grid, and where he submitted his pen to the grid's tyranny— for instance, by compressing a word (“oft”) better to fit the grid.
### Table 3.3 A Shakespeare Sonnet against the Grid

<table>
<thead>
<tr>
<th>Line #</th>
<th>Abstract Iambic Pentameter</th>
<th>Rhyme</th>
<th>Sonnet 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ta-DUM ta-DUM ta-DUM ta-DUM ta-DUM</td>
<td>A</td>
<td>Shall I compare thee to a Summer's day?</td>
</tr>
<tr>
<td>2</td>
<td>ta-DUM ta-DUM ta-DUM ta-DUM ta-DUM</td>
<td>B</td>
<td>Thou art more lovely and more temperate:</td>
</tr>
<tr>
<td>3</td>
<td>ta-DUM ta-DUM ta-DUM ta-DUM ta-DUM</td>
<td>A</td>
<td>Rough winds do shake the darling buds of May, And Summer's lease hath all too short a date:</td>
</tr>
<tr>
<td>4</td>
<td>ta-DUM ta-DUM ta-DUM ta-DUM ta-DUM</td>
<td>B</td>
<td>Sometimes too hot the eye of heav'n shines, And oft is his gold complexion dimm'd; And every fair from fair sometime declines, By chance or nature's changing course untrimm'd.</td>
</tr>
<tr>
<td>5</td>
<td>ta-DUM ta-DUM ta-DUM ta-DUM ta-DUM</td>
<td>C</td>
<td>But thy eternal Summer shall not fade Nor lose possession of that fair thou owest; Nor shall Death brag thou wanderest in his shade, When in eternal lines to time thou growest:</td>
</tr>
<tr>
<td>6</td>
<td>ta-DUM ta-DUM ta-DUM ta-DUM ta-DUM</td>
<td>D</td>
<td>So long as men can breathe, or eyes can see, So long lives this, and this gives life to thee.</td>
</tr>
</tbody>
</table>
GRIDS IN MUSIC

The musical cosmos abounds with grids. The piano keyboard is a grid, set in a pattern laden with numerical implications. For each octave, there are seven white keys and five black ones. The octave is divided into two symmetrical tetrachords: C-D-E-F, G-A-B-C; tone-tone-semitone, tone-tone-semitone. Let’s agree that the thumb is different from the other fingers; the pianist’s ten fingers, then, are organized (from the left little finger to the right little finger) as \((4 + 1)(1 + 4)\). In the vast majority of passages ever played at the piano, the hands’ mathematics don’t coincide with the keyboard’s—and that’s a good thing, since it creates a dynamic opposition between the keyboard’s implacable grid and the hands’ capacity for variety and invention.

In twelve-tone music, a complex grid is built from a simple row. Like all grids, it contains multiple mathematical elements: the twelve tones of the row itself, the four variants of a row that are permitted in the system (the prime, the inversion, the retrograde, and the retrograde-inversion), the twelve possible transpositions of each row and its variants, and so on. And, like all grids, it carries its own meaning, its own emotional charge: Anything you compose inside the twelve-tone grid will be inevitably different from anything you compose inside the tonal grid.

The chords of tonal music form a complex grid based on the interval of the third. Each third can be major, minor, diminished, augmented, doubly diminished, or doubly augmented. Take a major third, stack a minor third above it, and you have a major triad. Three thirds stacked together create a seventh chord; four thirds create a ninth chord. (If you like puzzles, look at the Forlane from Maurice Ravel’s “Le Tombeau de Couperin” and try to figure out all the seventh and ninth chords he uses!) The key of C major uses a subset of the total grid. In a tune in C major, which arises out of the C-major grid, an F-sharp is in opposition to the grid. But in a tune in G major, it’s an F-natural that opposes the grid.

The thirds play important roles in music, but the foundational grid of tonal music is the circle of fifths. It consists of twelve fifths arrayed in a circle like the hours on a clock, moving up clockwise and down counterclockwise. Starting on C, the fifths go up to G, D, A, and so on, until we arrive back at C; or down to F, B-flat, E-flat, and so on, until we again arrive back at the starting point. The basic elements couldn’t be simpler, and yet the circle of fifths gives rise to the entirety of tonal music, organizing consonance, dissonance, structural relationships, and so on. Beethoven is different from Vivaldi because he opposes the grid of the circle of fifths in a different way. As tonal music developed, composers explored ever more complex oppositions to the grid until the oppositions overcame the grid and gave rise to atonality.

THE METRIC GRID

In this book we’ll make an in-depth study of the metric grid. Subsequently you can use the insights and tools you’ll learn from it to explore the grids of twelve-tone music, counterpoint, modal music, tonal music, bebop, and so on.
Let's define the metric grid as "a pulse, plus a time signature, plus a certain number of measures." An example is the pulse of a quarter note per second (that is, the metronome set at 60), with the time signature of \( \frac{2}{4} \), over thirty-two measures subdivided in eight four-bar phrases.

The metric grid is ubiquitous throughout tonal music, but also in atonal, polytonal, modal, twelve-tone, serial, folk, jazz, and world music. In truth, all of human life is deeply touched by the metric grid. Primeval activities such as breathing, circulation, lovemaking, and dancing follow rhythmical patterns that can be easily inserted into a metric grid—as do lesser activities such as brushing teeth, ironing, and beating eggs.

Before we turn our attention to the metric grid, let's summarize the main characteristics of the Grid as a life principle, since they'll guide us in the chapters that follow.

1. There exists a life principle called the Grid, with capital G.

The Grid functions as a relatively rigid construction against which fluid energies push and flow. It underpins all human endeavors and, more broadly, the workings of the universe. The Grid is the archetypal model for all grids, an entity that the metaphysically inclined might liken to a deity. You can attune yourself to the Grid, sense and understand it, and organize your life in opposition to it. For the sake of argument, suppose you disagree with me about the very existence of the Grid. You'd still learn a lot of useful, practical things from studying grids without a capital G.

2. Grids have multiple dimensions.

A grid contains any or all of these components: visual, auditory, mathematical, geographical, historical, geometrical, topographical, hierarchical, aesthetic, emotional, and biological. This list isn’t exhaustive.

3. All grids are built from simple components such as numbers and lines.

The chessboard is simple. Each chess piece is simple. The rules of the game are simple. Together, these elements are complex. You can deal better with complexity when you understand the simplicity that underpins it. When you practice and study, keep going back to the fundamentals—the numbers and lines that create the grid. They’ll help you “play the game” better.

4. Every grid carries its own meaning and emotion.

Consciously or unconsciously, we respond to abstract mathematical relationships and to numbers themselves. We consider a thirteen-line grid to be different from a twelve-line one, a square grid to be different from a round one, and a symmetrical grid to be different from an asymmetrical one. Perfect symmetry charges the grid with certain emotions and meanings; asymmetry charges the grid with different emotions and meanings. Either way, each grid has a "personality."
5. A grid becomes dynamic when human life flows against it.

Grids capture and enhance natural forces. From early childhood onward, we all think about grids, observe them, live in them, and use our inner resources to push against the grids' pull. Knowledge of the grid increases the pleasure of opposing it.

6. We combine intellect and intuition when we learn and use any grid.

Your knowledge of the multiplication table, which is a mathematical grid, allows you to conduct quick operations mentally. You reckon "three times three" effortlessly, by acquired reflex. To acquire it, you used analysis, memory, intuition, and imagination. If you try to study the metric grid with analytical processes only, you'll find the grid boring and threatening. Bring your creativity to the party and you'll not only have more fun, you'll learn the materials more quickly and more deeply.

7. We can and must internalize each grid to some degree.

Most of us have internalized a large number of grids over the years: the calendar, our neighborhoods' street grid, the multiplication table. Internalized grids make your life easier and healthier, while overly externalized grids make your life complicated and unhealthy. When it comes to the metric grid, externalizing it costs you a lot of energy, interfering with your ability to create oppositions with the grid.

In the next chapter we'll study the metric grid in depth. Following it we'll practice two prosodic skills that make it easier for you to learn and internalize the metric grid: the exercises of Coincidence (chapter 5) and Rhythmic Solfege (chapter 6). Then we'll look at metronomic precision and rubato (chapter 7), two opposing rhythmic forces that charge the metric grid with different kinds of energy. We'll look at practice strategies for studying the superbar structure, or the "measures of measures" that give the metric grid its largest dimension (chapter 8). Finally, we'll look at a number of musical excerpts to see how composers handle the grid: Johannes Brahms (chapter 9) and J. S. Bach (chapter 10). Part II, "Coordination," might at first appear unrelated to the Grid, but in fact coordination itself is a matter of opposing lively energies to relatively rigid grids. Part III, "Sound," will relate indirectly to the Grid because the harmonic series (the subject of chapters 16 and 17) will show us that the circle of fifths—the foundational grid of tonal music—is borne of the vibrations of a single note!