

和弦语言；李晓虹；DOI: 10.13140/RG.2.2.25415.65440/3；ISBN:9781370273348；ASIN: B0919JJ3R7

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CHORD LANGUAGE

(First name: Equal Temperament Logic and Equal Temperament Painting)

和弦语言

(首发名：平均律逻辑与平均律绘画)

(English and Chinese version)

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Overview Of Chord Language | 和弦语言综述

25 届世界哲学大会论文 | Papers of the XXV World Congress of Philosophy

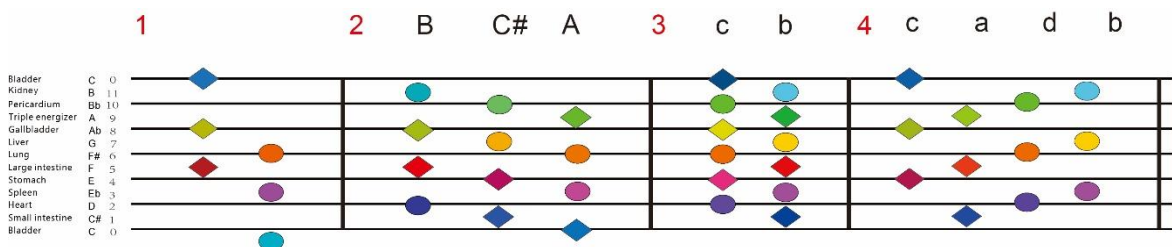
引言 | Introduction

和弦语言基于量子化频谱，其核心包括：弦（开弦、闭弦、膜弦）；和弦数学（代数结构、群作用）；生成：时间（音乐）、空间（绘画）、生命（经络系统）等；表现为和弦场——量子化的时空分布。

和弦是自然的基础结构与统一框架。

The chord language is based on the quantized spectrum, and its core includes: strings (open strings, closed strings, membrane strings); chord mathematics (algebraic structure, group action); generation: time (music), space (painting), life (meridian system), etc.; it is manifested as chord field - quantized space-time distribution.

Chords are the fundamental structure and unifying framework of nature.



基本和弦表：1-1、大三和弦（闭弦），1-2、小三和弦（开弦）、2、减七和弦（膜弦）、3、全音阶和弦（膜弦），4、增三和弦（膜弦）

和弦频谱公式： N^*F , H^{N^*F} ($H=1.059463$, $N \in \mathbb{Z}$)

符号：◆=+音符，●=-音符，音符色=色荷

本文使用 MOD12 记谱法

BASIC CHORD TABLE: 1-1, MAJOR TRIAD (CLOSED STRING), 1-2, MINOR TRIAD (OPEN STRING), 2, DIMINISHED 7TH (MEMBRANE STRING), 3, DIATONIC CHORD (MEMBRANE STRING), 4, AUGMENTED TRIADS (MEMBRANE STRINGS)

CHORD SPECTRUM FORMULA: N^*F , H^{N^*F} ($H=1.059463$, $N \in \mathbb{Z}$)

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SYMBOL: ◆ = + NOTE, ● = - NOTE, NOTE COLOR = COLOR CHARGE

THIS ARTICLE USES MOD12 NOTATION

关键词 | Keywords: 和弦场、量子化、弦理论、音乐、绘画、生命、经络

Chord field, quantization, string theory, music, painting, life, meridian

Chord Space And Painting|和弦空间与绘画

和弦语言生成音乐（时间域）与绘画（空间域），二者构成量子化的时空结构，其频率-维度关系为： nf , H^{nf} , $H=1.059463$, $n \in \mathbb{Z}$ 。音乐与绘画在三和弦上的映射可由集合 $\{-7, -4, 0, 4, 7\} \bmod 12$ 表达，两者镜像对称，可数学转换。

The chord language generates music (time domain) and painting (space domain), which constitute a quantized space-time structure with a frequency-dimensional relationship of: nf , H^{nf} , $H=1.059463$, $n \in \mathbb{Z}$. The mapping of music and painting on triads can be expressed by the set $\{-7, -4, 0, 4, 7\} \bmod 12$, which are mirror-symmetric and can be mathematically converted.

和弦空间由弦（开、闭、膜）表达，绘画是其观察与应用领域，这是本书的主要内容。

The chord space is expressed by strings (open, closed, membrane), and painting is its field of observation and application, which is the main content of this book.

“弦”是“和弦”的几何语义，“和弦”是“弦”的特征频谱。不同的和弦类型对应不同的几何语义：

大三和弦 $(-7, -4, 0) \bmod 12 \leftrightarrow$ 闭弦（轮廓线）

小三和弦 $(-7, -3, 0) \bmod 12 \leftrightarrow$ 开弦（分面线）

等比和弦：减七和弦 $(0, 3, 6, 9) \bmod 12$ ，全音阶和弦 $(0, 2, 4, 6, 8, 10) \bmod 12$ ，增三和弦 $(0, 4, 8) \bmod 12$
 \leftrightarrow 膜弦（非线性空间）

这三种和弦类型共同构成空间场，定义所有可能的空间状态及其相互作用。

"String" is the geometric semantics of "chord", and "chord" is the characteristic spectrum of "string". Different chord types correspond to different geometric semantics:

Major triad $(-7, -4, 0) \bmod 12 \leftrightarrow$ closed string (contour line)

Minor triad $(-7, -3, 0) \bmod 12 \leftrightarrow$ open string (fecet line)

Geometric chords: diminished seventh chord $(0, 3, 6, 9) \bmod 12$, diatonic chord $(0, 2, 4, 6, 8, 10) \bmod 12$,

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augmented triad (0,4,8) mod 12 \leftrightarrow membrane chord (nonlinear space)

These three chord types together constitute a spatial field, defining all possible spatial states and their interactions.

和弦绘画中可以观察到开弦，闭弦，膜弦，是基于观察、实验的空间模型。

Open strings, closed strings, and membrane strings can be observed in chord painting, which is a spatial model based on observation and experiment.

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Chord Spacetime|和弦时空

自然依托于时空框架，现存两种时空体系：

和弦时空——基于和弦（量子化频谱），构成和弦场，常用于音乐、绘画等，描述内在结构与自组织关系；非和弦时空——屏蔽和弦，依赖外部参考系（时钟、尺子、参照物），常用于经典物理学，构建相对性经验与概念。

和弦时空基于内在频谱的共振结构，非和弦时空则基于测度与坐标系统。

Nature depends on the space-time framework, there are two space-time systems:

Chord space-time - based on the chord (quantized spectrum), constitute the chord field, often used in music, painting, etc., to describe the internal structure and self-organization relationship;
Nonchord spacetime - shielded chords, dependent on external reference frames (clocks, rulers, referents), often used in classical physics to construct relativistic experiences and concepts.

The chord space-time is based on the resonance structure of the intrinsic spectrum, while the non-chord space-time is based on the measure and coordinate system.

和弦时空由和弦表达，取值公式： $n.f$, $H^{n.f}$ ($H=1.059463$, $n=$)。 ($n.f$) h ($h=6.626 \times 10^{-34}$)
得到普朗克量子假设，其中 f_1 - f_6 形成大三和弦， f_1 - f_7 形成属 7 和弦， f_1 - f_9 形成属 9 和弦，“量子化”与和弦相关。

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Chord spacetime is expressed by chords, and the value formula is: $n.f, H^{n.f}$ ($n=1,2,3,\dots$, $H=1.059463$). $(n.f)h$ ($h=6.626\times 10^{-34}$) gives Planck's quantum hypothesis, where f_1 - f_6 forms a major triad, f_1 - f_7 forms a dominant 7th chord, and f_1 - f_9 forms a dominant 9th chord. "Quantization" is related to chords.

和弦时间与和弦空间镜像对称: $\{-7, -4, 0, 4, 7\} \bmod 12$ (互为反和弦, 反调), 可数学转换, 空间具有定域性, 时间具有非定域性, 表现为时空二相性 (波粒二相性)。

Chord time and chord space are mirror-symmetric: $\{-7, -4, 0, 4, 7\} \bmod 12$ (mutually anti-chords and anti-tuning), which can be mathematically converted. Space is local and time is non-local, which manifests as the duality of space and time (wave-particle duality).

和弦具有几何语义 (开弦, 闭弦, 膜弦), 表达空间的状态与作用, 并产生空间场。

Chords have geometric semantics (open string, closed string, membrane string), express the state and action of space, and generate spatial fields.

音符具有 \pm 属性, 这是频率的物理属性, 应涉及所有波动、频率相关现象, 如: 电磁场, 量子场。

Notes have \pm properties, which are the physical properties of frequency and should be involved in all wave and frequency-related phenomena, such as electromagnetic fields and quantum fields.

和弦是一量子化的时空框架。

Chord is a quantized space-time frame.

Chord Biology|和弦生命

人类观察到两种生命形式: 和弦场与生物体, 分别来自和弦观察者 (自观察者) 与非和弦观察者 (外观察者), 生命的存在是这两种观察方式的叠加, 构成双层结构, 即: 生命=和弦场+生物体。

Human beings observe two life forms: the chord field and the organism, from the chord observer (self-observer) and the non-chord observer (external observer) respectively, and the existence of life is the superposition of these two ways of observing, forming a two-layer structure, namely: life = chord field + organism.

和弦在人体内表现为经络 (脉轮) 系统, 对应于和弦观察者的内在体验: 十二经络具有受激反应特征频谱, 分布为: 十二平均律 (H^{n*f} , $H=1.059463$, $n\in\mathbb{Z}$), 这表明音乐 (时间域)、绘画 (空间域)、经络系统共享相同的数学结构 (量子化频谱), 构成和弦场的不同表现形式。

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Chords manifest themselves in the human body as a meridian (chakra) system, corresponding to the inner experience of the chord observer; the twelve meridians have a characteristic spectrum of stimulated response, distributed as: twelve equal temperament ($H^n \cdot f$, $H=1.059463$, $n \in \mathbb{Z}$), which shows that music (time domain), painting (space domain), and meridian systems share the same mathematical structure (quantized spectrum) and constitute different manifestations of the chord field.

和弦场是生命（自我）的物理与数学形式，超越生物体的形态与化学层面，是更基础的存在形式。

The chord field is the physical and mathematical form of life (self), which transcends the morphological and chemical level of the organism and is a more fundamental form of existence.

Natural Spirit|自然精神

精神涉及两套语言系统：符号语言与和弦语言；前者是人工信息系统，基于符号，如：自然语言；后者是自然信息系统，基于和弦（量子化频谱，弦），如：音乐、绘画，经络；精神是符号与和弦二层存有。

Spirit involves two sets of language systems: sign language and chord language; The former is artificial information system, based on symbols, such as: natural language; The latter is a natural information system based on chords (quantized spectrum, strings) such as: music, painting, meridians; Spirit is a two-layer being of symbols and chords.

人的认识来自两种观察者：和弦观察者与非和弦观察者，前者产生了音乐、绘画、经络、宗教等；后者产生了科学，哲学等，两种观察者产生了两种世界观。

Human cognition comes from two types of observers: chord observers and non-chord observers. The former produced music, painting, meridians, religion, etc.; the latter produced science, philosophy, etc. The two types of observers produced two worldviews.

和弦语言以频率为编码元素，和弦为编码，对应特定的时空，生命语义，是自然精神的形式。

Chord language takes frequency as coding element, chord as coding, corresponding to specific space-time, life semantics, is the form of natural spirit.

*本文内容来自对音乐，绘画，经络等和弦现象的观察，实验。

* THE CONTENT OF THIS ARTICLE COMES FROM THE OBSERVATION AND EXPERIMENT OF MUSIC, PAINTING,

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MERIDIANS AND OTHER CHORD PHENOMENA.

*和弦语言出版物有：《和弦语言》与《和弦绘画》，前者介绍和弦语言的语法、语义规则及数学模型，侧重和弦空间语言；后者是和弦绘画（和弦空间）的实验图例与教材。

*THE CHORD LANGUAGE PUBLICATIONS ARE: "CHORD LANGUAGE" AND "CHORD PAINTING", THE FORMER INTRODUCES THE GRAMMAR, SEMANTIC RULES AND MATHEMATICAL MODELS OF CHORD LANGUAGE, FOCUSING ON THE LANGUAGE OF CHORD SPACE; THE LATTER IS THE EXPERIMENTAL ILLUSTRATION AND TEACHING MATERIAL OF CHORD PAINTING (CHORD SPACE).

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Catalogue | 目录

OVERVIEW OF CHORD LANGUAGE | 和弦语言综述

CHORD SPACE AND PAINTING | 和弦空间与绘画

CHORD SPACETIME | 和弦时空

CHORD BIOLOGY | 和弦生命

NATURAL SPIRIT | 自然精神

CATALOGUE | 目录

1. CHORD MATHEMATICS-1 | 和弦数学-1

1-1. TEMPERAMENT SYSTEMS | 律制

1-2. SYMMETRICAL AND ASYMMETRICAL CHORDS | 对称与非对称和弦

1-3. MOD12 NOTATION | MOD12 记谱法

1-4. EQUAL TEMPERAMENT CHROMATOGRAPHY | 平均律色谱

1-5. \pm NOTES | \pm 音符

REFERENCE | 参考

2. CHORD MATHEMATICS-2 | 和弦数学-2

2-2. \pm NOTE DISTRIBUTION IN TRIADS | 三和弦中的 \pm 音符分布

2-3. \pm NOTE DISTRIBUTION IN GEOMETRIC CHORDS | 等比和弦中的 \pm 音符分布

REFERENCE; 参考

3. CHORD (STRING) GEOMETRY | 和弦（弦）几何

3-1. GEOMETRIC SEMANTICS OF CHORD | 和弦的几何语义

3-2. LINE AND MEMBRANE CHORDS | 线和弦与膜和弦

3-3. CLOSED AND OPEN CHORDS | 闭和弦与开和弦

3-4. COINCIDENT CHORDS | 重合和弦

CHORD LANGUAGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3, ISBN:9781370273348, ASIN: B0919JJ3R7

3-5、TIME CHORD | 时间和弦

4. CHORD PACKAGES|和弦包

4-1.CHORD SPACE PACKET | 和弦空间包

4-2. CHORD TIME PACKET | 和弦时间包

4-3.SCALE SYSTEM | 音阶系统

REFERENCE, PROMPT | 参考、提示

5.HEPTACHORD |七声音阶

5-1. FIGURE-GROUND RELATION | 图-底关系

5-2. SAME ROOT MAJOR MINOR | 同根大-小调

5-3、SOLUTION | 解决

6.HEPTACHORD T-D-S TRIAD |七声音阶 T-D-S 三和弦

REFERENCE |参考

7. SPECIAL CHORDS IN THE HEPTACHORD |七声音阶中的特殊和弦

7-1.COINCIDENT CHORD |重合和弦

7-2.OMIT CHORD |省略和弦

8.GESTALT|完形性

8-1.GESTALT LEVEL | 完形级别

8-2.THE GESTALT LEVEL OF T-D-S |T-D-S 的完形级别

8-3.MAIN PART | 主体

REFERENCE | 参考

9. JAZZ SCALE|爵士音阶

9-1. FIGURE-GROUND RELATION |图底关系

9-2、SAME ROOT MAJOR MINOR | 同根大-小调

9-3. AUGMENTED TRIAD | 增三和弦

9-4、COINCIDENT CHORD |重合和弦

CHORD LANGUAGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3,ISBN:9781370273348, ASIN:
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Email: lixiaohonggg@outlook.com; <https://orcid.org/0000-0001-6461-1239>

9-5、SOLUTION | 解决

9-5 . NEUTRAL COLOUR | 无彩色

10. ATONAL SYSTEM |无调性系统

REFERENCE |参考

11.MELODY OF COLOR|色彩旋律

11-1.M-L MELODY | M-L 旋律

11-2.FACET MELODY |分面旋律

11-3、POINT MELODY |点旋律

11-4、PARALLEL MELODY |并行旋律

12.NON-CHORD TONE|和弦外色

12-1.FREQUENCY OFFSET |频率偏移

12-2.SPACE REGION OFFSET | 空间区域偏移

13.MULTI-LAYERED TUNING AND COSMIC MODELS|多层调群与宇宙模型

13-1.B-C#-A KEY GROUP |B-C#-A 调群

13-1.1、THE REVERSE RESOLVED OF B-C#-A KEY GROUP |B-C#-A 调群的反常解决

13-2.T-D-S KEY GROUP |T-D-S 调群

REFERENCES

14、CHORD SPACETIME|和弦时空

14-1.THE STRUCTURE OF CHORD SPACETIME |和弦时空的结构

14-2.CHORD PACKET |和弦包

14-3. SPACE-TIME DUALITY |时-空二相性

4. SPATIAL INTERACTION |空间相互作用

14-5.CHORD SPACE-TIME MEASUREMENT |和弦时空测量

REFERENCE;参考

15.CHORD BIOLOGY|和弦生命

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Email: lixiaohonggg@outlook.com; <https://orcid.org/0000-0001-6461-1239>

5-1.QUALITATIVE AND DIMENSIONAL |定性与量纲

15-2.CHORD DISTRIBUTION ON THE HUMAN BODY |人体上的和弦分布

15-3.CHORD LIFE PACKET | 和弦生命包

15-4.CORRESPONDENCE BETWEEN HUMAN AND UNIVERSE | 天人相应

15-5. GESTALISM | 完型性

15-6.LIFE AND DEATH | 生-死

15-7.CHORD MEDICINE |和弦医学

APPENDIX | 附录

REFERENCE |参考

16.NATURAL SPIRIT |自然精神

16-1.TWO LANGUAGE | 两种语言

16-2.COMPILE |编译

16-3.OBSERVER | 观察者

REFERENCE;参考

BRIEF SUMMARY；小结

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1. Chord Mathematics-1 | 和弦数学-1

和弦数学是波动与频率的自然法则映射，依赖和弦的物理属性。它涵盖音乐数学，并扩展至和弦绘画（和弦空间）与和弦生命（经络）领域的观察结果。作为一种理论框架，和弦数学应适用于所有涉及波动与频率的现象和事件。

Chord mathematics is a mapping of natural laws of wave motion and frequency, relying on the physical properties of chords. It encompasses the mathematics of music and extends to observations in the fields of chord painting (chord space) and chord life (meridians). As a theoretical framework, chord mathematics should apply to all phenomena and events involving wave motion and frequency.

关键词：和弦，波动，频率，色谱，±音符，镜像对称

Keywords: chord, wave, frequency, color spectrum, ± note, Mirror Symmetry

1-1.Temperament Systems |律制

和弦由特定离散频谱构成，和弦数学具有离散数学结构，其取值的数学方法称为：律制（Temperament systems），如：五度相生律（Circle-of-fifths system），纯律（Just intonation），十二平均律（Equal Temperament）等。

Chords are composed of specific discrete spectra, and chord mathematics has a discrete mathematical structure. The mathematical method of determining their values is called a Temperament system, such as Circle-of-fifths system, Just intonation, Equal Temperament, etc.

所有律制（Temperament systems）基于两个数列集合：泛音数列 $\{n^*f, n=1,2,3,\dots\}$ （等差数列）与平均律数列 $\{H^n, H=1.059463, n \in \mathbb{Z}\}$ （等比数列），{大三和弦}与{等比数列（Geometric sequence）和弦} 分别是两者的子集。

All temperament systems are based on two sets of number series: the overtone series $\{n^*f, n=1,2,3,\dots\}$ (arithmetic series) and the equal-temperament series $\{H^n, H=1.059463, n \in \mathbb{Z}\}$ (geometric series). {Major triad} and {Geometric chords} are subsets of the two.

倍频数列 $\{2^n, n=\text{序数}\}$ 是 {泛音} 与 {平均律} 的交集，这是和弦语言保持统一的基础。

The octave series $\{2^n, n=\text{ordinal}\}$ is the intersection of {overtone} and {equal temperament}, which is the basis for chord language to remain unified.

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Overtone Sequence|泛音数列

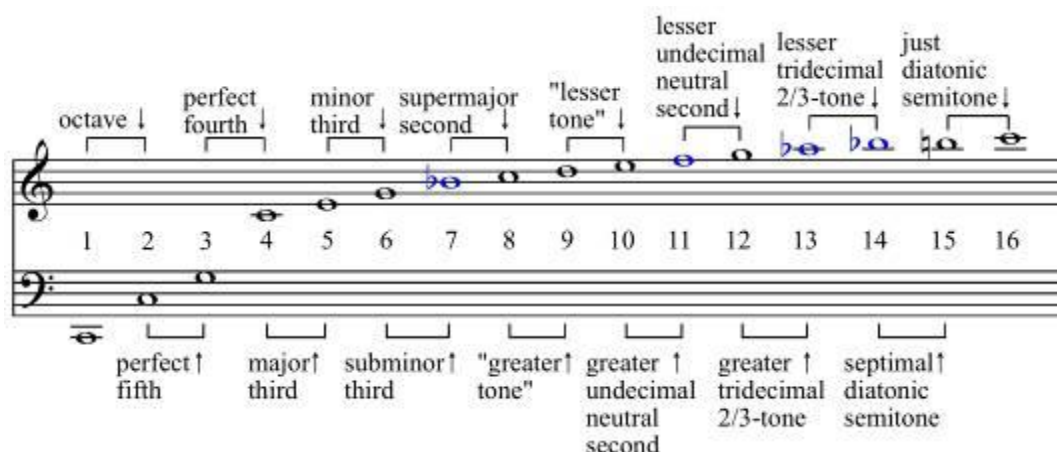


图 1-1.1、泛音频谱

Figure 1-1.1 Overtone spectrum

泛音频谱公式: $n \cdot f$, $n=1,2,3,\dots$, 正整数, f =频率

Overtone spectrum formula: $n \cdot f$, $n=1,2,3,\dots$, f = frequency

泛音频谱中的 f_1 - f_6 形成大三和弦, f_1 - f_7 形成属 7 和弦, f_1 - f_9 形成属 9 和弦, 这表明和弦的自然属性。

The f_1 - f_6 in the overtone spectrum forms a major triad, f_1 - f_7 forms a dominant 7th chord, and f_1 - f_9 forms a dominant 9th chord, which shows the natural properties of the chords.

普朗克量子假设 ($n \cdot h \cdot f$, $h=6.626 \times 10^{-34} \text{J} \cdot \text{s}$) = $(n \cdot f) h$, 其中 f_1 - f_6 形成大三和弦, f_1 - f_7 形成属 7 和弦, f_1 - f_9 形成属 9 和弦——其离散特征与和弦相关。

Planck's quantum hypothesis ($n \cdot h \cdot f$, $h=6.626 \times 10^{-34} \text{J} \cdot \text{s}$) = $(n \cdot f) h$, where f_1 - f_6 forms a major triad, f_1 - f_7 forms a dominant 7 chord, and f_1 - f_9 forms a dominant 9 chord - whose discrete features are related to the chord.

泛音频谱生成的和弦 (大三和弦, 属七和弦, 属九和弦, 属十一和弦) 都是非对称和弦, 不能自然生成对称和弦。

"Chords generated from overtone spectra (major triads, dominant seventh chords, dominant ninth chords, dominant eleventh chords) are all asymmetrical chords and cannot naturally produce symmetrical chords."

泛音频谱 (如谐波序列) 的核心特性是频率为基频的整数倍, 这种特性在一维振动模型中成立, 但在高维空间中不再适用。原因如下:

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频率关系不同：高维振动频率由多个模式数决定，通常不是基频的简单整数倍。

频谱分布复杂：高维频谱通常是非线性的，且分布取决于几何形状。

模式耦合：高维振动中，不同方向的模式会耦合，导致频谱行为更加复杂。

通过比较一维和高维振动模型的频谱特性，可以证明泛音频谱（基频整数倍的谐波序列）仅适用于一维空间，而不适用于高维空间。高维振动模型的频谱行为更加复杂，且不满足泛音频谱的简单线性关系。

The core characteristic of the harmonic spectrum (such as the harmonic series) is that the frequencies are integer multiples of the fundamental frequency. This property holds true in one-dimensional vibration models but is no longer applicable in higher-dimensional spaces. The reasons are as follows:

Frequency Relationships Differ: In higher-dimensional vibrations, frequencies are determined by multiple mode numbers and are generally not simple integer multiples of the fundamental frequency.

Complex Spectral Distribution: The spectrum in higher dimensions is typically nonlinear, and its distribution depends on the geometric shape.

Mode Coupling: In higher-dimensional vibrations, modes in different directions couple with each other, leading to more complex spectral behavior.

By comparing the spectral characteristics of one-dimensional and higher-dimensional vibration models, it can be demonstrated that the harmonic spectrum (a harmonic series with integer multiples of the fundamental frequency) is only applicable in one-dimensional space and does not extend to higher-dimensional spaces. The spectral behavior of higher-dimensional vibration models is more complex and does not satisfy the simple linear relationship of the harmonic spectrum.

Equal Temperament Sequence|平均律数列

公式： $H^n \cdot f$ （ $H = \text{half-step} = 12 \sqrt[12]{2} = 1.059463$ ， $n = \text{序数}$ ， $f = \text{频率}$ ）

Formula: $H^n \cdot f$ ($H = \text{half-step} = 12 \sqrt[12]{2} = 1.059463$, $n = \text{ordinal}$, $f = \text{frequency}$)

首项指数 $1-1=0$ ，默认首项指数=0，可用： $H^n \cdot f$

将平均律数列的指数放入集合： $\{-11, -10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\} \bmod 12$ ，可以显示其数学结构并进行群运算。

By putting the exponentials of the average law series into the set $\{-11, -10, -9, -8, -7, -6, -5, -4, -3,$

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$\{-2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\} \bmod 12$, its mathematical structure can be displayed and group operations performed.

十二平均律的音高分布是严格的等比数列： $f_n = f_0 \cdot 2^{n/12}$ 。

其中，三种等比和弦（减七和弦、全音阶和弦、增三和弦）构成其核心生成基础：

减七和弦（小三度等距，公比= $H^3 \approx 1.189207$ ）

全音阶和弦（大二度等距，公比= $H^2 \approx 1.122462$ ）

增三和弦（大三度等距，公比= $H^4 \approx 1.259921$ ）

这三种和弦的几何语义是膜空间，是和弦空间（绘画）的生成基础。

因此，十二平均律不仅是人为构造的调律系统，它可能有更深的几何与物理基础。

The pitch distribution in the 12-tone equal temperament is a strict geometric sequence: $f_n = f_0 \cdot 2^{n/12}$, which possesses complete mathematical symmetry.

Among these, three types of Geometric chords (the diminished seventh chord, the whole-tone scale chord, and the augmented triad) form the core generative foundation:

The diminished seventh chord (equally spaced minor thirds, common ratio = $H^3 \approx 1.189207$)

The whole-tone scale chord (equally spaced major seconds, common ratio = $H^2 \approx 1.122462$)

The augmented triad (equally spaced major thirds, common ratio = $H^4 \approx 1.259921$)

The geometric semantics of these three chords are membrane spaces, serving as the generative foundation for chord spaces (in painting). Therefore, the 12-tone equal temperament is not merely an artificially constructed tuning system; it may have deeper geometric and physical foundations.

1-2. Symmetrical and Asymmetrical Chords|对称与非对称和弦

和弦分为对称和弦与非对称和弦，对称和弦基于平均律，如：减七和弦，全音阶和弦，增三和弦；非对称和弦基于泛音频谱，如：大三和弦，整体表现为：对称-破缺。

Chords are divided into symmetrical chords and asymmetric chords, and symmetrical chords are based on the equal temperament, such as: diminished seventh chord, diatonic chord, increased triad; Asymmetrical chords are based on the overtone spectrum, such as the major triad, and the overall

performance is: symmetry-broken.

Geometric chords|等比和弦

等比数列（Geometric sequence）和弦是对称和弦，基于平均律的数学框架（mod12 群），共有三种：

Geometric chords are symmetrical chords based on the mathematical framework of equal temperament (mod12 group). There are three types:

减七和弦、公比= $H^3 \approx 1.189207$ ；小三度数列，{0,3,6,9}；七声音阶（Heptachord）特征和弦。

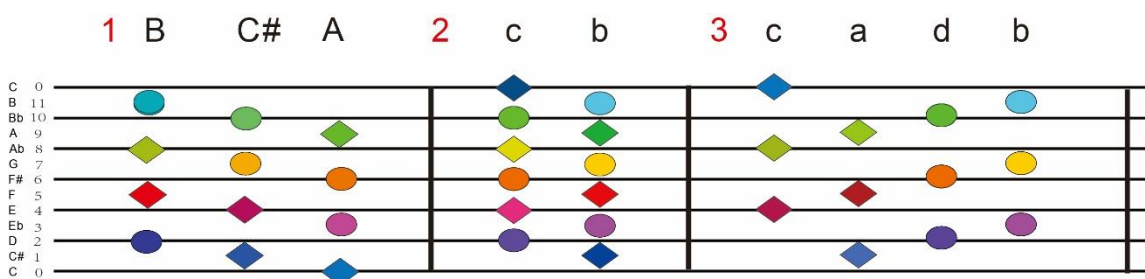
Diminished 7th, common ratio = $H^3 \approx 1.189207$; Minor third series, {0,3,6,9}; Heptachord characteristic chords.

全音阶和弦、公比 = $H^2 \approx 1.122462$ ；全音阶数列，{0,2,4,6,8,10}，爵士音阶特征和弦。

Diatonic chord, common ratio = $H^2 \approx 1.122462$; Diatonic series, {0,2,4,6,8,10}, characteristic chords of the jazz scale.

增三和弦（**augmented triad**）、公比 = $H^4 \approx 1.259921$ ，大三度（Major third）数列，{0, 4, 8}，爵士五声音阶特征和弦。

augmented triad, common ratio = $H^4 \approx 1.259921$, Major third series, {0,4,8}, characteristic chord of the jazz pentatonic scale.



等比和弦表：1、减七和弦（膜弦）、2、全音阶和弦（膜弦），3、增三和弦（膜弦）

*◆=正音符，●=负音符，色彩=色荷

Geometric chords table: 1, diminished 7th chord (membrane chord), 2, diatonic chord (membrane chord), 3, augmented Triads (membrane chord)

*◆=positive note, ●=negative note, color=color charge

三种等比和弦（Geometric chords）是三种音阶：七声音阶，爵士音阶，爵士五声音阶的构成基础。

The three Geometric chords are the basis of three scales: the heptatonic scale, the jazz scale, and

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the jazz pentatonic scale.

Triad|三和弦

三和弦是非对称和弦，包含纯五度，大三度或小三度。纯五度是其特征音程（不存在于等比和弦中）。

Triads are asymmetrical chords that contain a perfect fifth, a major third, or a minor third. The perfect fifth is their characteristic interval (not present in geometric progression chords).

大三和弦是泛音频谱的 f1-f6，两者存在自然联系。

The major triad is f1-f6 of the overtone spectrum, and there is a natural connection between the two.

大三和弦（Major triad），{0,4,7}。

Major triad , {0,4,7}.

小三和弦（Minor triad），{0,3,7}

Minor triad , {0,3,7}

三和弦+等比和弦组成音阶，调，在后面部分有更多介绍。

Triads + Geometric chords make up the scale, key, more on this later section.

三和弦重叠等比和弦，或三和弦重叠三和弦还可产生众多的重叠和弦，它们是基本和弦的衍生形式，放在后面的章节介绍。

Triad overlap Geometric chords or triad overlap Triads can also produce numerous overlapping chords, which are derivative forms of the basic chords and are described in later sections.

Mirror Symmetry|镜像对称

三和弦（Triad）有升序与降序两种组织方式，音乐（时间域）采用升序方式，绘画（空间域）采用降序方式形式，数学形式为镜像对称（互为反和弦-反调）。

Triads can be organized in two ways: ascending and descending. Music (time domain) uses ascending order, and painting (space domain) uses descending order. The mathematical form is mirror symmetry (antichords - anti-tones).

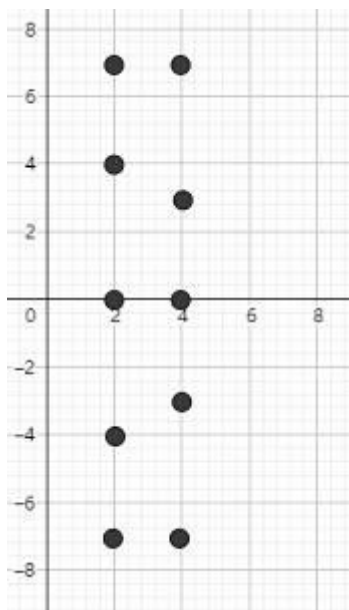


图 1-3、大三和弦-小三和弦的升序，降序，镜像对称形式。Y=平均律数列的指数

Figure 1-3, Major triad - minor triad ascending, descending, mirror-symmetric form. Y= exponents of the equal temperament series.

大三和弦，升序：{0, 4, 7}，大三和弦，降序：{-7, -4, 0} (mod 12)

Major triad, ascending: {0,4,7}, Major triad, descending: {-7, -4, 0} (mod 12)

小三和弦，升序：{0, 3, 7}，大三和弦，降序：{-7, -3, 0} (mod 12)

Minor triad, ascending: {0,3,7}, Major triad, descending: {-7, -3, 0} (mod 12)

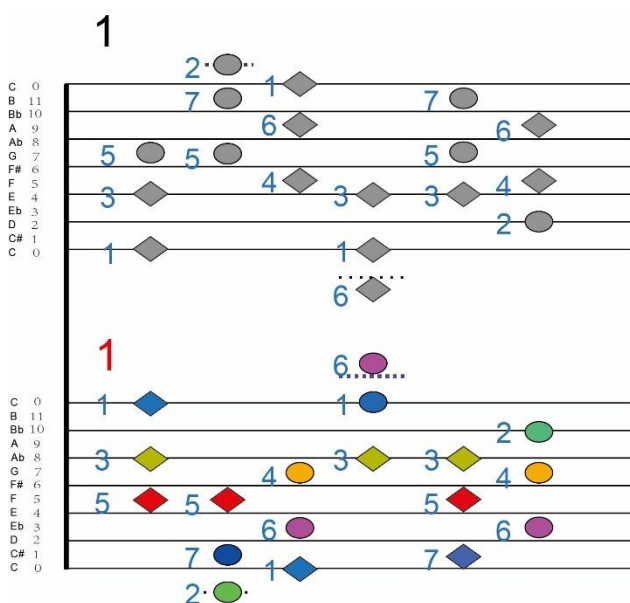


图 1-3.2、大三和弦-小三和弦的升序，降序，镜像对称形式。七声音阶（Heptachord），C 大调，

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B0919JJ3R7

关系小调。

Figure 1-3.2. Ascending, descending, mirror-symmetric forms of Major - minor triads. Heptachord, C major, relation minor.

Formula; 公式:

C 大三和弦（升序）= $H^0, 4, 7.C$

C major chord, (ascending)= $H^0, 4, 7.C$

a 小三和弦（升序）= $H^0, 3, 7.a$

a minor triad (ascending)= $H^0, 3, 7.a$

C 大三和弦（降序）= $H^0, -4, -7.C$

C major chord(descending)= $H^0, -4, -7.C$

Eb 小三和弦（降序）= $H^0, -3, -7.Eb$

Eb minor triad (descending)= $H^0, -3, -7.Eb$

镜像对称产生了反和弦，反调，这是和弦数学的重要概念。

Mirror symmetry produces the antichord, the antikey, which is an important concept in chord mathematics.

1-3. mod12 notation | mod12 记谱法

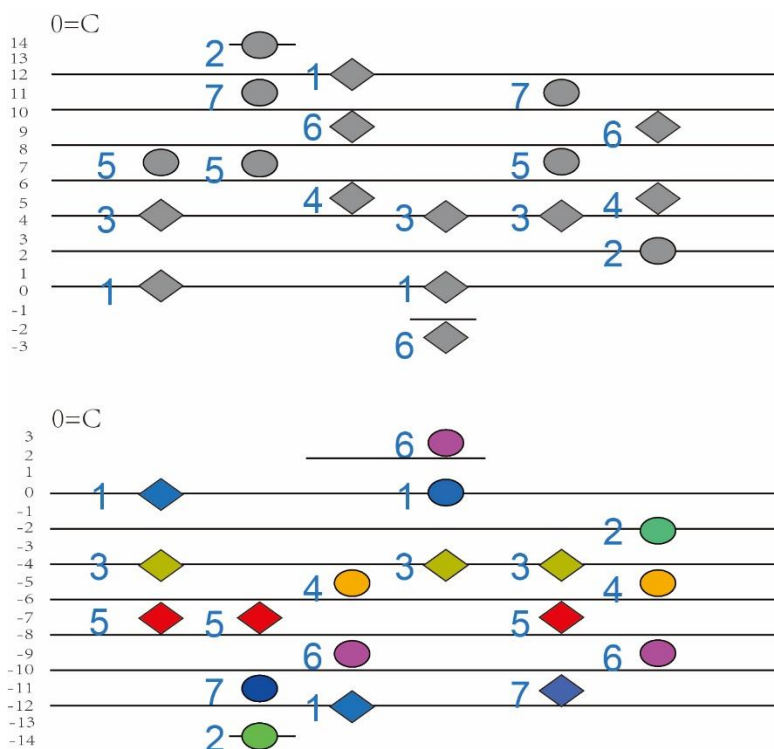


图 1-3、mod12 记谱与 mod12 群，上下表为镜像反转。

Figure 1-3, mod12 notation and mod12 group, the upper and lower tables are mirror inversion.

1. 结构概述

在绘画（空间域）中，和弦结构是音乐（时间域）的镜像反转。然而，传统五线谱难以完整表达这一结构。

Mod 12 记谱法以半音（小二度）为基本单位，构建对称、可计算的音高系统，并支持 mod 12 变换运算，提供更精准的和弦分析和调式变换工具。

1. Structure Overview

In painting (spatial domain), chord structure is the mirror inversion of music (temporal domain). However, traditional musical notation struggles to fully express this structure.

Mod 12 notation uses the semitone (minor second) as the basic unit, constructing a symmetrical, calculable pitch system. It supports mod 12 transformation operations, providing more precise tools for chord analysis and modal transformation.

2. 记谱方式

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音高表示

音高以整数表示 (mod 12)，即：

$(-6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, \dots) \bmod 12$

0 代表 C（或可定义其他调性起点），作为锚点，上下可自由加线扩展音域。

整数映射到音高：每个音高以 mod 12 进行归约，使音程关系计算更为直观。

谱表设计

均匀分布的音程体系：

相邻的线与空格均为小二度（半音）关系，确保音程分布均匀且对称完整。

示例：

线：0, 2, 4, 6, 8, 10, 0, 2, 4, 6, 8, 10

空格：1, 3, 5, 7, 9, 11, 1, 3, 5, 7, 9, 11

数学统一性：适用于和弦分析、调式变换、T/I 群变换等数学运算，使得音乐理论可以直接映射到数学结构中。

2. Notation Method

Pitch Representation

Pitches are represented by integers (mod 12), as follows:

$(-6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, \dots) \bmod 12$

0 represents C (or another defined tonal starting point), serving as an anchor point. Lines can be freely added above and below to extend the range.

Integer Mapping to Pitches: Each pitch is reduced by mod 12, making the calculation of interval relationships more intuitive.

Staff Design

Evenly Distributed Intervals:

Adjacent lines and spaces are all in a minor second (semitone) relationship, ensuring that the intervals are evenly distributed and symmetrically complete.

Example:

Lines: 0, 2, 4, 6, 8, 10

Spaces: 1, 3, 5, 7, 9, 11

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Mathematical Unity: Suitable for mathematical operations such as chord analysis, modal transformation, and T/I group transformation, allowing music theory to be directly mapped into mathematical structures.

3. 兼容五线谱

保留传统五线谱的节奏、力度、连线、指法等符号，确保音乐家能够快速适应。

兼容现有音乐软件与 MIDI 处理，支持计算机辅助作曲和 AI 生成音乐。

3. Compatibility with Traditional Notation

Retains traditional symbols for rhythm, dynamics, slurs, fingering, etc., ensuring that musicians can adapt quickly.

Compatible with existing music software and MIDI processing, supporting computer-aided composition and AI-generated music.

4. 主要优势

图形化的 mod 12 群表示 → 能完整呈现音乐与绘画的数学结构。

数学对称性强，支持 mod 12 计算 → 适用于调式变换、对称和弦分析、T/I 群运算。

适用于计算机音乐、AI 作曲、音高变换计算 → 推动音乐科技、电子音乐的发展。

4. Main Advantages

Graphical representation of the mod 12 group → can fully represent the mathematical structure of music and painting.

Strong mathematical symmetry, supports mod 12 calculation → suitable for modal transformation, symmetrical chord analysis, and T/I group operations.

Applicable to computer music, AI composition, and pitch transformation calculation → promotes the development of music technology and electronic music.

总结

Mod 12 记谱法通过均匀的半音分布体系，打破传统五线谱的局限，使和弦、调式和音程变换更加数学化、对称化，并且能更好地与计算机音乐和 AI 结合。这种方法不仅能够提供更清晰的音高关系，还能拓展音乐与绘画的数学连接，为现代音乐理论和科技音乐提供新的工具。

Summary

Mod 12 notation, through its evenly distributed semitone system, breaks the limitations of

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traditional notation. It makes chord, mode, and interval transformations more mathematical and symmetrical, and can be better integrated with computer music and AI. This method not only provides clearer pitch relationships but also expands the mathematical connection between music and painting, providing new tools for modern music theory and technology.

1-4. Equal Temperament Chromatography |平均律色谱

平均律色谱（Equal Temperament Chromatography）包含 12 个色荷，是和弦空间语言与和弦绘画的基本定量，量纲。

Equal Temperament Chromatography contains 12 color charges and is the basic quantitative and dimension of chord space language and chord painting.

可见光的波长与频率对照表

Visible light wavelength and frequency comparison table

色彩名称（Color name），波长（Wavelength: nm），频率（frequency: MHz）

紫光（Purple）、400~435；790-680

蓝光（Blue）、450~480；680-620

青光（Cyan-blue）、480~490；600-620

绿光（Green）、500~560；600-530

黄光（Yellow）、580~595；530-510

橙光（Orange）、595~605；510-480

红光、（Red）605~700；480-405

采用：红 ≈ 410 作为初始值，用平均律（Equal Temperament）公式： $F_n = H^n \cdot F$ （ $H = 1.05946$ ， $n =$ 序数， $F =$ 初始频率）计算，得出平均律（Equal Temperament）色谱。

Using red = 410 as the initial value, using the equal temperament formula: $F_n = H^n \cdot F$ ($H = 1.05946$, $n =$ ordinal number, $F =$ initial frequency) to calculate the equal temperament chromatogram:

红（Red）: 410

朱红（Rot-orange） ≈ 434.3827

橙（Orange） ≈ 460.1094922

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橙-黄 (Orange-yellow) ≈ 487.472106

黄 (Yellow) ≈ 516.4620658

黄-绿 (Yellow-green) ≈ 547.1759951

绿 (Green) ≈ 579.7164508

绿兰 (Green blue) ≈ 614.1921343

兰 (Blue) ≈ 650.7181042

青紫 (Indigo) ≈ 691.5352454

紫 (Violet) ≈ 732.6607983

紫红 (Surplish red) ≈ 776.2320318

将平均律 (Equal Temperament) 色谱记入下表，并与音符，经络的频率关联。

Record the Equal Temperament chromatogram in the table below and associate it with the frequency of the notes and meridians.

音名 [↵] pitch names [↵]	色彩 [↵] Color [↵]	十二经络 [↵] Twelve Meridians [↵]	± [↵]
C [↵]	blue [↵]	足太阳膀胱经-Foot Taiyang Bladder Meridian [↵]	+ [↵]
B [↵]	cyan [↵]	足少阴肾经-Foot Shaoyin Kidney Meridian [↵]	- [↵]
Bb [↵]	Green [↵]	手厥阴心包经 - Hand Jueyin Pericardium Meridian [↵]	- [↵]
A [↵]	Yellowgreen [↵]	手少阳三焦经-Hand Shaoyang Sanjiao (Triple Burner) Meridian [↵]	+ [↵]
Ab [↵]	Yellow [↵]	足少阳胆经 - Foot Shaoyang Gallbladder Meridian [↵]	+ [↵]
G [↵]	yelloworange [↵]	手厥阴肝经 - Hand Jueyin Liver Meridian [↵]	- [↵]
F# [↵]	orange [↵]	手太阴肺经 - Hand Taiyin Lung Meridian [↵]	- [↵]
F [↵]	Rot-orange [↵]	手阳明大肠经 - Hand Yangming Large Intestine Meridian [↵]	+ [↵]
E [↵]	Red [↵]	足阳明胃经 - Foot Yangming Stomach Meridian [↵]	+ [↵]
Eb [↵]	purplishred [↵]	足太阴脾经 - Foot Taiyin Spleen Meridian [↵]	- [↵]
D [↵]	purplishred [↵]	手少阴心经 - Hand Shaoyin Heart Meridian [↵]	- [↵]
C# [↵]	indigo [↵]	手太阳小肠经 - Hand Taiyang Small Intestine Meridian [↵]	+ [↵]

平均律 (Equal Temperament) 元素对应表

Equal Temperament element correspondence table

1 列：音名 (pitch names)。

Line 3: Pitch names.

2 列：色荷

Column 4: Color Charge

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3 列：受激-反应经络及阴-阳属性。

3 columns: stimulus-response meridians and yin-yang properties.

1-5. ±Notes | ±音符

和弦语言基于一系列频率值，定量单位为“音符”，这里需要扩充定义：在本书中，音符=频符 (Frequency note)，包括声-光等所有频率。

Chord language is based on a series of frequency values, and the unit of quantification is "notes". Here we need to expand the definition: in this book, note = frequency note, including all frequencies such as sound and light.

和弦语言中，所有音符都具有正-负属性，它是频率的物理属性，不是数学中的正-负数。

In the chord language, all notes have a positive-negative attribute, which is a physical attribute of frequency, not a positive-negative number in mathematics.

音符的正-负属性继承自经络的阴-阳属性，由中医经典记载。（参见：和弦数学-2）。

The positive-negative properties of musical notes are inherited from the Yin-Yang properties of meridians, as documented in the classics of Chinese medicine (see: Chord Mathematics-2).

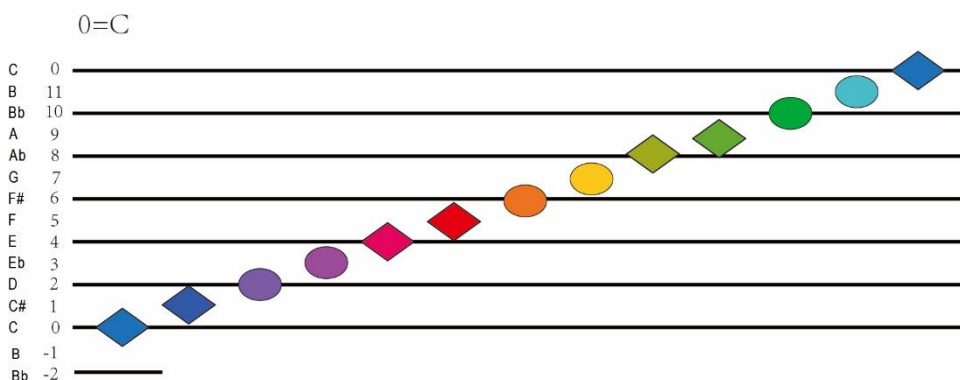


图 1-5、± 音符表：椭圆=负音符，菱形=正音符。

Figure 1-5, ± note table: oval = negative note, diamond = positive note.

音符（频率）的正、负是重要的物理属性与和弦编码元素，涉及的内容比较多，放在后面章节（和弦数学-2）专门介绍。

The positive and negative values of notes (frequencies) are important physical properties and chord encoding elements. There is a lot of content involved, so it will be introduced in the following

chapter (Chord Mathematics-2).

Reference |参考

Basic music theory; 基础音乐理论

Harmony; 和声学

Chord Painting; 和弦绘画

General Physics Textbooks: 普通物理学教材

Textbook of Meridian Studies; 经络学教材

12-ary cyclic group (mod 12); 12 元循环群 (mod 12 群)

Common Formula|常用公式

Chord= $H^{n_1, n_2, n_3, n_x \cdot f_0}$; ($H=1.05946$, n =序数)

Chord = $H^{n_1, n_2, n_3, n_x \cdot f_0}$; ($H=1.05946$, n = ordinal)

大三和弦 (Major Chord) = $H^{0, 4, 7 \cdot f_0}$

小三和弦 (Minor chord) = $H^{0, 3, 7 \cdot f_0}$

大三和弦 (降序) = $H^{0, -4, -7 \cdot f_0}$

major chord(descending) = $H^{0, -4, -7 \cdot f_0}$

小三和弦 (降序) = $H^{0, -3, -7 \cdot f_0}$

minor triad (descending) = $H^{0, -3, -7 \cdot f_0}$

减七和弦 (Diminished 7th) = $H^{0, 3, 6, 9 \cdot f_0}$ (Geometric sequence; 等比数列)

增三和弦 (Augmented triads) = $H^{0, 4, 8 \cdot f_0}$ (Geometric sequence; 等比数列)

全音阶和弦 (Diatonic chord) = $H^{0, 2, 4, 6, 8, 10, 12 \cdot f_0}$ (Geometric sequence; 等比数列)

半音阶 (Chromatic chord) = $H^{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 \cdot f_0}$ (Geometric sequence; 等比数列)

2. Chord Mathematics-2 | 和弦数学-2

和弦数学是波动与频率的自然法则映射，依赖和弦的物理属性。它涵盖音乐数学，并扩展至和弦绘画（和弦空间）与和弦生命（经络）领域的观察结果。作为一种理论框架，和弦数学应适用于所有涉及波动与频率的现象和事件。

Chord mathematics is a mapping of natural laws of wave motion and frequency, relying on the physical properties of chords. It encompasses the mathematics of music and extends to observations in the fields of chord painting (chord space) and chord life (meridians). As a theoretical framework, chord mathematics should apply to all phenomena and events involving wave motion and frequency.

关键词：和弦，波动，频率，色谱，±音符，镜像对称

Keywords: chord, wave, frequency, color spectrum, ± note, Mirror Symmetry

和弦由三个以上的特定离散频率构成，基本分类为三和弦与等比和弦（Geometric chords），两者的结合产生和弦语句，表达和弦语义。

Chords are composed of three or more specific discrete frequencies, and are basically classified into triads and Geometric chords. The combination of the two produces chord statements and expresses chord semantics.

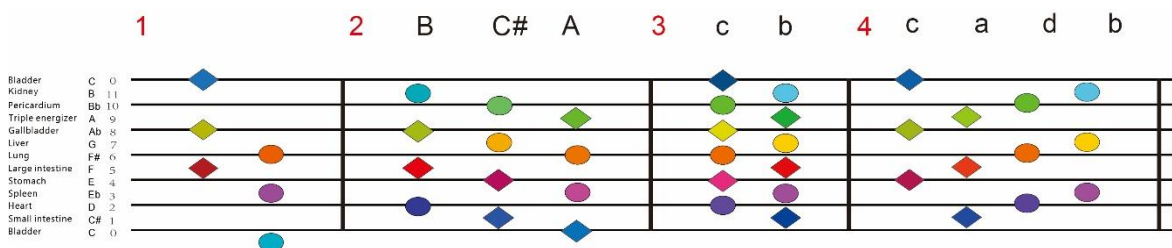
平均律数列（Equal temperament series）是和弦的常用取值范围，其中的每个音符都具有频率值与正-负值，两者是和弦的基本编码元素，前者构成离散频率值分布，后者构成正、负值分布，所有和弦都包含这两种分布，并由此决定和弦的时空语义以及其它属性。

The Equal temperament series is a commonly used range of values for chords. Each note in the series has a frequency value and a positive-negative value. These two are the basic encoding elements of chords. The former constitutes a discrete frequency value distribution, and the latter constitutes a positive-negative value distribution. All chords contain these two distributions, which determine the spatiotemporal semantics and other properties of the chord.

和弦的频率值分布在前面已经介绍（1、和弦数学-1），本章主要介绍和弦的正-负值分布及编码、语义规则，涉及和弦，调，调群的构成规则。

The frequency value distribution of chords has been introduced before (1. Chord Mathematics-1).

This chapter mainly introduces the positive-negative value distribution, encoding and semantic rules of chords, involving the composition rules of chords, keys and key groups.



基本和弦表：1-1、大三和弦（闭弦），1-2、小三和弦（开弦）、2、减七和弦（膜弦）、3、全音阶和弦（膜弦），4、增三和弦（膜弦）

*和弦频谱公式： $n \cdot f$, $H^n \cdot f$ ($H=1.059463$, $n \in \mathbb{Z}$)

*符号：◆=+ 音符，●=- 音符，音符色=色荷

*本文使用 mod12 记谱法

Basic chord table: 1-1, major triad (closed string), 1-2, minor triad (open string), 2, diminished 7th (membrane string), 3, diatonic chord (membrane string), 4, augmented Triads (membrane strings)

* Chord spectrum formula: $n \cdot f$, $H^n \cdot f$ ($H=1.059463$, $n \in \mathbb{Z}$)

* Symbol: ◆=+ note, ●=- note, note color = color charge

** This article uses mod12 notation

± 音符是频率的物理属性，继承自经络学，这里有未知的自然法则，我们只能通过观察它在和弦语言中的作用及数学规律，确定其真实性。（参见：15.和弦生命）

± notes are the physical properties of frequency, inherited from meridians. There are unknown natural laws here. We can only determine its authenticity by observing its role in chord language and mathematical laws. (See: 15. Chord life)

音名↵ pitch names↵	色彩↵ Color↵	十二经络 ↵ Twelve Meridians↵	±↵
C↵	blue↵	足太阳膀胱经-Foot Taiyang Bladder Meridian↵	+↵
B↵	cyan↵	足少阴肾经-Foot Shaoyin Kidney Meridian↵	-↵
Bb↵	Green↵	手厥阴心包经 - Hand Jueyin Pericardium Meridian↵	-↵
A↵	Yellowgreen↵	手少阳三焦经-Hand Shaoyang Sanjiao (Triple Burner) Meridian↵	+↵
Ab↵	Yellow↵	足少阳胆经 - Foot Shaoyang Gallbladder Meridian ↵	+↵
G↵	yelloworange↵	手厥阴肝经 - Hand Jueyin Liver Meridian↵	-↵
F#↵	orange↵	手太阴肺经 - Hand Taiyin Lung Meridian↵	-↵
F↵	Rot-orange↵	手阳明大肠经 - Hand Yangming Large Intestine Meridian↵	+↵
E↵	Red↵	足阳明胃经 - Foot Yangming Stomach Meridian↵	+↵
Eb↵	purplishred↵	足太阴脾经 - Foot Taiyin Spleen Meridian↵	-↵
D↵	purplishred↵	手少阴心经 - Hand Shaoyin Heart Meridian↵	-↵
C#↵	indigo↵	手太阳小肠经 - Hand Taiyang Small Intestine Meridian↵	+↵

平均律（Equal Temperament）元素对应表

Equal Temperament element correspondence table

1 列：音名（pitch names）。

Line 1: Pitch names.

2 列：色荷

Column 2: Color Charge

3 列：受激-反应经络及阴-阳（±）属性。

3 columns: stimulus-response meridians and yin-yang(±) properties.

*注：经络具有正、负（阴-阳）属性，并会传递给同一行中的声、光频率，这是频率的物理属性；也是最重要的和弦编码元素，涉及后面的所有章节。

*Note: Meridians have positive and negative (yin-yang) properties and will be transmitted to the sound and light frequencies in the same line. This is the physical property of frequency; it is also the most important chord coding element, involving all subsequent chapters.

上面表中的对应关系基于经络的受激反应特征频率，在本书第 15 章还有专门的介绍。（15.Chord Biology;和弦生命）

The corresponding relationship in the above table is based on the characteristic frequency of the stimulated response of the meridian, which is specifically introduced in Chapter 15 of this book.

(15.Chord Biology;和弦生命)

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2-2.± Note Distribution In Triads | 三和弦中的±音符分布

三和弦（triad）由三个离散频率值组成，在音乐中分别称为：根音（Root），三度（Third），五度（Fifth）本文仍沿用音乐中的术语。

A triad is composed of three discrete frequency values, which are called the root, third, and fifth in music. This article still uses the terminology in music.

三和弦又可分为大三和弦（Major triad）和小三和弦（Minor triad），这两种和弦的区别取决于它们的根色与三度（Third）的音程，大三度（major third）为大三和弦，小三度（minor third）为小三和弦，两种和弦在几何语义上有着重要的区别，在后面章节有详细的介绍。

Triads can be divided into major triads and minor triads. The difference between these two chords depends on their root color and the interval of the third. The major third is the major triad, and the minor third is the minor triad. The two chords have important differences in geometric semantics, which will be introduced in detail in the following chapters.

分别以 12 个色做根色（Root color），构成 24 个三和弦，12 个大三和弦，12 个小三和弦，包含了所有三和弦的±音符分布形式。

Use 12 colors as the root color, respectively, to form 24 triads, 12 major triads, and 12 minor triads, including the ± note distribution of all triads.

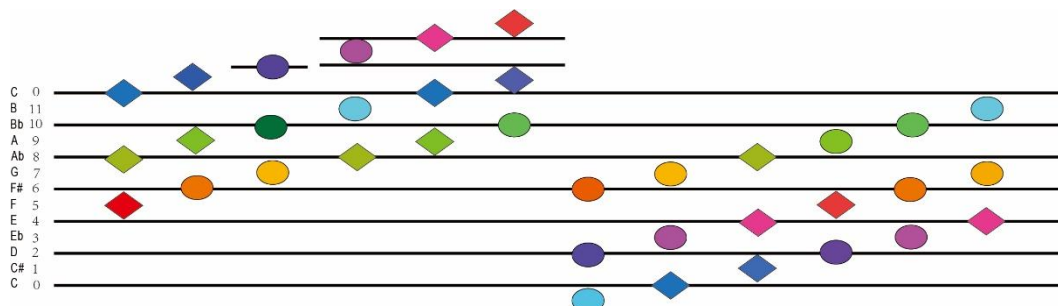


图 2-4.1：大三和弦表（菱形=+音符，圆形=-音符）

Figure 2-4.1: Major chord table(Diamond=+note, circle=-note)

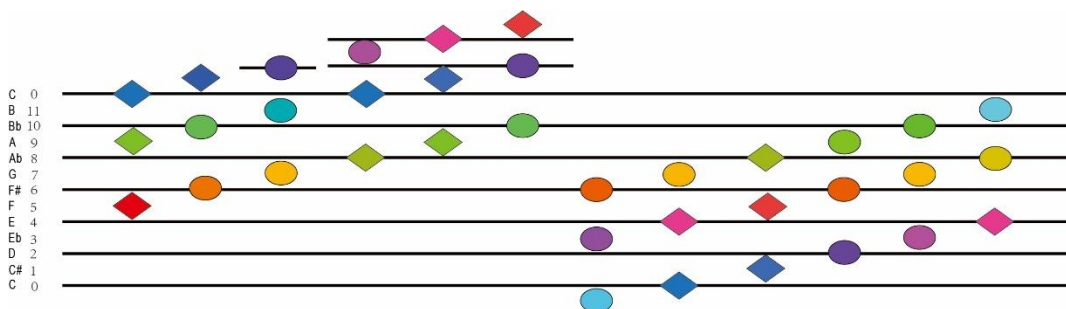


图 2-4.2：小三和弦表（菱形=+音符，圆形=-音符）

Figure 2-4.2: Minor chord table(Diamond=+note, circle=-note)

忽略表中的频率分布，保留正-负值分布，共有六种组合：

Ignoring the frequency distribution in the table and retaining the positive-negative value distribution, there are six combinations:

(+, +, +), (-, -, -), (-, -, +), (+, +, -), (-, +, +), (+, -, -)

六种组合在和弦语义上有重要的区别，涉及：开弦，闭弦，正-负电荷等。

The six combinations have important differences in chord semantics, involving: open strings, closed strings, positive-negative charges, etc.

六种组合可以是大小三和弦，这里涉及以下规则：

The six combinations can be major-minor triads, where the following rules are involved:

(1)、+根三和弦 (+, x, x) 倾向生成大三和弦，-根三和弦 (-, x, x) 倾向生成小三和弦。

(1) + root triads (+, x, x) tend to generate major triads, while - root triads (-, x, x) tend to generate minor triads.

(2)、标准三和弦 (Standard triads)：+根大三和弦 (+, x, x) 与 -根小三和弦 (-, x, x) 可充当调系统中的主和弦。

(2) The positive root major triad (+, ±, ±) and the negative root minor triad (-, ±, ±) act as the main chords in the tuning system.

(3)、非标准三和弦 (Non-standard triads)：+根小三和弦 (+, x, x) 与 -根大三和弦 (-, x, x)，不能充当调系统中的主和弦。

(3) Non-standard triads: + minor triad (+, x, x) and - major triad (-, x, x) cannot serve as the main chords in the key system.

标准三和弦又可分为两种：

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There are two types of standard triads:

纯三和弦 (pure triad), 如: 纯大三和弦 (+, +, +), 纯小三和弦 (-, -, -)。

pure triad, such as pure major triad (+,+,+), pure minor triad (-, -, -).

混合三和弦 (Mixed triad): 混合大三和弦 (+, x, -); 混合小三和弦 (-, x, +)。

Mixed triad: Mixed major triad (+, x, x); Mixed minor triads (-, x, x).

两种标准三和弦在调集团中涉及以下规则:

The two standard triads involve the following rules in key groups:

纯三和弦 (pure triad) 在调集团中充当主调的主和弦

A pure triad acts as the main chord of the main key in a key group

混合三和弦 (Mixed triad) 在调集团中充当副调的主和弦。

Mixed triad are tonic chords that act as secondary keys in a key group.

上面规则适用于七声音阶系统, 在爵士音阶系统中有一些区别, 在后面相关章节分别介绍。

The above rules apply to the heptachord scale system, and there are some differences in the jazz scale system, which are described in the relevant sections later.

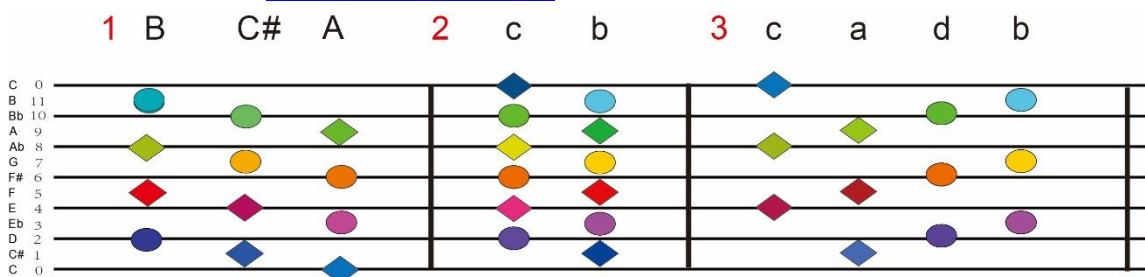
2-3. ±Note Distribution In Geometric chords;等比和弦中的±音符分布

等比和弦 (Geometric chords) 的离散频率分布为等比数列 (Geometric sequence), 这类和弦在音乐中称作: 不协和弦 (Dissonant chords), 等比和弦有: 减七和弦, 全音阶和弦, 增三和弦, 分别是不同音阶系统的特征和弦, 在前面的章节已有介绍。(参见: 1.Chord Mathematical;和弦数学)。

The discrete frequency distribution of Geometric chords is a geometric sequence. This type of chord is called dissonant chords in music. Geometric chords include diminished seventh chords, diatonic chords, and augmented triads, which are characteristic chords of different scale systems and have been introduced in the previous chapters. (See: 1. Chord Mathematical).

下图是等比和弦表, 请注意各和弦中的±音符比例。

The figure below is a Geometric chords table, please pay attention to the proportion of ± notes in each chord.



等比和弦表：1、减七和弦（膜弦）、2、全音阶和弦（膜弦），3、增三和弦（膜弦）

*◆=正音符，●=负音符，色彩=色荷

Geometric chords table: 1, diminished 7th chord (membrane chord), 2, diatonic chord (membrane chord), 3, augmented Triads (membrane chord)

*◆=positive note, ●=negative note, color=color charge

Figure 2-2. Geometric chords table: 1, Diminished 7th, 2, Diatonic chord, 3, Augmented triad, (◆=positive note, ●=negative note)

忽略表中频率分布，只保留正-负值分布，可以记为以下组合：

Ignoring the frequency distribution in the table, only keeping the positive-negative value distribution, it can be recorded as the following combination:

(+, +, -, -), (+, -, +, -, +, -), (+, +, +), (-, -, -)

其中包括：对称形式与非对称形式，其中，减七和弦（diminished 7sh）与全音阶和弦为对称形式，增三和弦（augmented Triads）为非对称形式。

These include: symmetric and asymmetric forms, where the diminished 7sh and diatonic chords are symmetric forms, and the augmented Triads are asymmetric forms.

两种形式在和弦语义上有重要的区别，涉及：调群，磁场，磁荷，膜弦等。

The two forms have important differences in chord semantics involving: tone groups, magnetic fields, magnetic charges, membrane strings, etc.

Reference; 参考

三和弦的正-负音符分布与中国古代易经中的八卦图有些相似，但是我无法证明它们是或不是同一对象，放在下面仅供参考。

The distribution of the positive and negative notes of the triad is somewhat similar to the Eight

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和弦语言：李晓虹；DOI: 10.13140/RG.2.2.25415.65440/3；ISBN:9781370273348；ASIN: B0919JJ3R7

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diagrams in the ancient Chinese Book of Changes, but I cannot prove that they are or are not the same object, which is placed below for reference only.

(+, +, +), (-, -, -), (-, -, +), (+, +, -), (-, +, +), (+, -, -)

乾 (☰)、坎 (☵)、艮 (☶)、震 (☳)、巽 (☴)、离 (☲)、坤 (☷)、兑 (☱)

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B0919JJ3R7

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3. Chord(String)Geometry | 和弦（弦）几何

和弦语言是时空语言，其空间表达生成“和弦空间”。和弦绘画是和弦空间的主要观察基础与应用领域，也是本书的核心内容。

在音乐中，基本频率单位是“音符”（机械波）。然而，和弦绘画的定量基础基于色彩频率（光，电磁波）。因此，我们需要扩充定义：

音符 = 频符（Frequency Note）：包含所有频率的广义概念。其中，色彩频率可特称为色荷（Chromatic Charge）。

本文涉及两个关键术语：“和弦”与“弦”。

和弦：由三个以上离散频率构成的和弦编码，具有量子化频谱的特性。

弦：和弦编码中包含的几何语义（如线、膜等），类似于弦理论中的开弦、闭弦或膜。

关系：和弦是弦的编码形式，弦是和弦的几何语义。两者是同一事物的两面，分别从数学编码和几何语义的角度进行描述。

和弦空间的研究采用代数、模 12 群（Mod 12）等数学工具，并通过绘画表达其几何语义。和弦空间与弦理论的几何框架有相似之处，但其独特之处在于以和弦绘画的观察为基础，以视觉实验为主要研究方法。和弦绘画不仅揭示了和弦编码的几何语义，也为科学与艺术的交叉研究提供了全新的视角。

Chord language is a spatiotemporal language, and its spatial expression generates "chord space." Chord painting serves as the primary observational foundation and application domain of chord space, as well as the core content of this book.

In music, the fundamental unit of frequency is the "note" (mechanical wave). However, the quantification of chord painting is based on color frequencies (light, electromagnetic waves).

Therefore, we need to expand the definition:

Note = Frequency Note: A generalized concept encompassing all frequencies. Among these, color frequencies can be specifically referred to as Chromatic Charge.

This text involves two key terms: "chord" and "string."

Chord: A chord encoding composed of three or more discrete frequencies, characterized by a

quantized spectrum.

String: The geometric semantics (such as lines, membranes, etc.) contained within chord encoding, analogous to open strings, closed strings, or membranes in string theory.

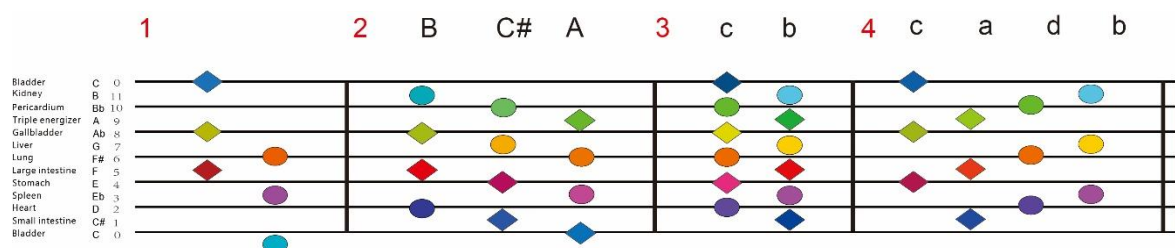
Relationship: A chord is the encoded form of a string, while a string is the geometric semantics of a chord. The two are two sides of the same entity, described from the perspectives of mathematical encoding and geometric semantics, respectively.

The study of chord space employs mathematical tools such as algebra and modulo 12 groups (Mod 12), and expresses its geometric semantics through painting. Chord space shares similarities with the geometric framework of string theory, but its uniqueness lies in its foundation in chord painting observations and its primary research method of visual experimentation. Chord painting not only reveals the geometric semantics of chord encoding but also provides a new perspective for interdisciplinary research in science and art.

3-1.Geometric semantics Of Chord | 和弦的几何语义

和弦以量子化频谱为编码形式，包含两个基本类型：对称和弦与非对称和弦，整体表现为对称-破缺结构。

The chords are encoded in the quantized spectrum and contain two basic types: symmetric chords and asymmetric chords, and the overall performance is symmetry-broken structure.



基本和弦表：1-1、大三和弦（闭弦），1-2、小三和弦（开弦）、2、减七和弦（膜弦）、3、全音阶和弦（膜弦），4、增三和弦（膜弦）

*和弦频谱公式： $n \cdot f$, $H^n \cdot f$, ($H=1.059463$, $n \in \mathbb{Z}$)

*符号：◆=+ 音符，●=- 音符，音符色=色荷

*本文使用 mod12 记谱法

Basic chord table: 1-1, major triad (closed string), 1-2, minor triad (open string), 2, diminished 7th

CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3, ISBN:9781370273348, ASIN:

B0919JJ3R7

(membrane string), 3, diatonic chord (membrane string), 4, augmented Triads (membrane strings)

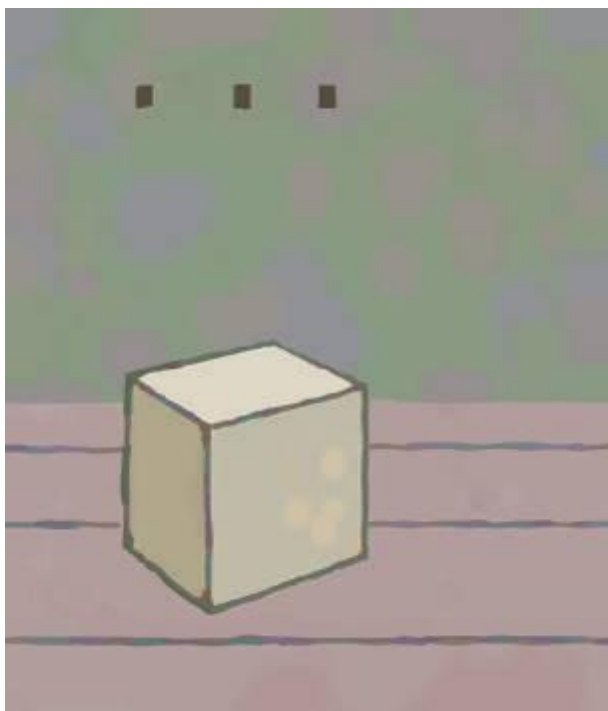
* Chord spectrum formula: $n \cdot f, H^n \cdot f$ ($H=1.059463, n \in \mathbb{Z}$)

* Symbol: $\blacklozenge = +$ note, $\bullet = -$ note, note color = color charge

** This article uses mod12 notation

基本和弦表中的和弦按照几何语义可分为：1、线和弦与膜和弦；2、开和弦与闭和弦。

The chords in the basic chord table can be divided into: 1. line chords and membrane chords; 2. open chords and closed chords.



图：3.1：和弦几何语义图例，开和弦，闭和弦，膜和弦，点空间（线图）

Figure: 3.2: Semantic legend of chord space, open chord, closed chord, membrane chord, point space

说明：上面几何图形中的线有几种作用：1、用于构成图形边界（轮廓线），产生图形-背景关系；2、用于分面，如：分面线（绘画中称为：明暗交界线），4、点空间。

The line in the above geometric figure has several functions: 1. It is used to form the figure boundary (contour line) and produce the figure-ground relationship; 2, used for faceted, such as: facet line (painting called: light and dark facet line), 4, point space.



图：3.2：和弦几何语义图例，开和弦，闭和弦，膜和弦，点空间（详细图例）

Figure: 3.2: Semantic legend of chord space, open chord, closed chord, membrane chord, point space (detailed legend)

上图中出现的和弦及几何语义：

The chords and geometric semantics that appear in the picture above:

闭和弦具有闭合（完形）倾向，用于构成图形空间的轮廓线，产生图-底关系（Figure-ground relation）。

Closed chords have a tendency to close (Gestalt) and are used to form the contours of the figure space, resulting in a figure-ground relation.

2、开和弦没有闭合（完形）倾向，用于非轮廓线，如：分面线，线状空间等。

2, open chord has no closing (gestalt) tendency, used for non-contour lines, such as: faceted lines, linear Spaces, etc.

3、点空间：点空间包括端点，角点，独立点空间，用线和弦中的音符表达，它是线和弦的特殊形式。

3. Point space: Point space includes end points, corner points, and independent point space, expressed by the notes in the line chord, which is a special form of the line chord.

4、膜和弦充满所有非线（点）空间。

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4. Membrane chords fill all non-linear (point) spaces.

3-2.Line And Membrane Chords | 线和弦与膜和弦

和弦按几何语义分为两类：线和弦与膜和弦，分别表达两种空间状态“线”与“非线膜”；非线膜没有边限定，无法用“维”进行描述，它是和弦空间特有的空间状态。

Chord are divided into two categories according to geometric semantics: line chords and membrane chords, which express two spatial states "line" and "non-line membrane" respectively; non-line membrane has no boundary limit and cannot be described by "dimensions", it is a chord space unique spatial state.

三和弦（大三和弦，小三和弦）的几何语义是“线”，表达“线空间”，称作：线和弦。见图 3-1。

The geometric semantics of triads (major triads, minor triads) is "line", which expresses "line space" and is called: line chord,. See Figure 3-1.

等比和弦（减七和弦、全音阶和弦，增三和弦）的几何语义为：非线膜，称作“膜和弦”。

The geometric semantics of Geometric chords (diminished 7th, diatonic chords, augmented triads,) are: non-linear membrane, called "membrane chord".

见图 3-1、和弦空间图例：膜和弦充满所有非线空间，线和弦（轮廓线、分面线）之外的空间都由膜和弦占据。

See Figure 3-1, chord space legend: membrane chords fill all non-linear spaces, and the space outside of linear chords (contours, Fecet line) is occupied by membrane chords.

非线膜和弦只有在被线和弦限定边界后，才能形成二维，三维空间；膜和弦与线和弦相互依赖，孤立的线和弦与膜和弦都处于不稳定状态。

The Membrane chords can form a two-dimensional and three-dimensional space only after it is defined by the line chords; the Membrane chords and the line chords are interdependent, and the isolated L and Membrane chords are in an unstable state.

和弦空间由线和弦+膜和弦构成：线和弦定义膜和弦，产生轮廓线与分面线，形成二维面与三维体积，和弦空间是线和弦定义膜和弦的结果，未经定义的膜和弦处于任意维度。

The chord space is composed of line chords + membrane chords: line chords define membrane chords, generate contour lines and Fecet line, and form two-dimensional surfaces and three-

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dimensional volumes. Chord space is the result of line chords defining membrane chords, undefined membrane chords are in arbitrary dimensions.

3-3.Closed And Open Chords | 闭和弦与开和弦

线和弦分为两种：大三和弦与小三和弦，其几何语义分别为：闭和弦（闭弦）与开和弦（开弦），（见图 3.1）。

line chords are divided into two types: major triads and minor triads. Their Geometric semantics are: closed chords (closed strings) and open chords (opened strings), (see Figure 3.1).

大三和弦具有闭合性（完形性），几何语义是闭弦，表达图形与背景交界处的轮廓线，产生图-底关系（Figure-ground relation）。

The major triad has closure (gestalt), and the geometric meaning is a closed string, which expresses the contour line at the junction of the Figure and the background, and generates a figure-ground relation.

小三和弦没有闭合性（完形性），几何语义是开弦，表达开放的线空间，常用于三维体上的分面线。

Minor triads do not have closure (gestalt), and the geometric meaning is open string, expressing fecet line space, often used for faceted lines on a three-dimensional body.

两者的基本区别是：闭和弦（闭弦）表达轮廓线，开和弦（开弦）表达分面线。

The basic difference between the two is: closed chords (closed string) express contour lines, and open chords (open string) express Fecet line.

Positive-Negative Closed And Open Strings | 正-负闭弦与开弦

大三和弦（闭弦）构成轮廓线，小三和弦（开弦）构成分面线，两种和弦分别包含正-负两种形式：

正大三和弦 {+, x, x}

负大三和弦 {-, x, x}

正大三和弦在图底关系（figure-ground relation）中构成背景侧的轮廓线，负大三和弦在图底关系（figure-ground relation）中构成图形侧的轮廓线。

负小三和弦 {-,x,x}

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正小三和弦 {+,x,x}

负小三和弦构成凸分面线，正小三和弦构成凹分面线。

正大三和弦构成背景轮廓线，负大三和弦生成图形轮廓线；负小三和弦生成凸分面线，正小三和弦生成凹分面线。

Major Triads (Closed Chords) form contour lines, while minor triads (open chords) form facet lines.

Both types of chords include positive and negative forms:

Positive Major Triad: {+, x, x}

Negative Major Triad: {-, x, x}

In a figure-ground relation, positive major triads create contour lines on the background side, and negative major triads create contour lines on the figure side.

Negative Minor Triad: {-, x, x}

Positive Minor Triad: {+, x, x}

Negative minor triads form convex facet lines, and positive minor triads form concave facet lines.

Positive major triads form background contour lines, negative major triads form figure contour lines; negative minor triads form convex facet lines, and positive minor triads form concave facet lines.



图 3.3.正-负、大-小三和弦

Figure 3.3. Positive - negative, major - minor triad

Omitted Triads | 省略三和弦

大三和弦与小三和弦都有确定的几何语义：闭弦-轮廓线，开弦-分面线，但三和弦在省略 1-2 音符后，确定性降低，空间语义也会相应的发生变化。

Both major and minor triads possess definitive geometric semantics: closed strings represent contour lines, while open strings correspond to facet lines. However, when a triad omits 1-2 notes, its determinacy diminishes, and the spatial semantics undergo corresponding transformations.

点空间：

所有音符都可以知觉为点空间，但是有图形意义的点空间是三和弦（线和弦）的省略、收缩形式。

将三和弦省略，只剩下一色，三和弦的线空间（1 维）便会收缩为“点空间”（0 维），点空间是线和弦的省略引起线空间收缩的结果。见图 3.1，图 3.2

在图例中、墙上的挂钩为点状空间，使用小三和弦（开弦）的根色；正方体的分面线为小三和弦，根色出现在各个转角的点上。

Point Space:

"All notes can be perceived as point spaces, but point spaces with graphical significance are abbreviated and contracted forms of triads (line chords).

By omitting the notes of a triad, leaving only one color, the line space (1-dimensional) of the triad contracts into a 'point space' (0-dimensional). The point space is the result of the line space contracting due to the omission of the line chord. See Figure 3.1 and Figure 3.2.

In the illustrations, the wall hooks serve as point spaces, using the root color of a minor triad (open chord); the facet lines of the cube are minor triads, with the root color appearing at the points of each corner."

不确定线：

开和弦（开弦）与闭和弦（闭弦）的区别在和弦的三度（大三度与小三度），如果省略和弦三度，两者的区别便消失，产生不确定的线空间。

Uncertainty line:

The difference between an open chord (open string) and a closed chord (closed string) is in the third of the chord (major and minor third), and if the chord third is omitted, the difference between the two disappears, creating an uncertain line space.

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3-4、Coincident Chords | 重合和弦

重合和弦由同调中的不同和弦重合构成，最常见形式是：三和弦叠加等比和弦（Geometric chords），也可以是三和弦叠加三和弦。

Overlapping chords are formed by overlapping different chords in the same key. The most common form is: triad superimposed on Geometric chords, or triad superimposed on triad.

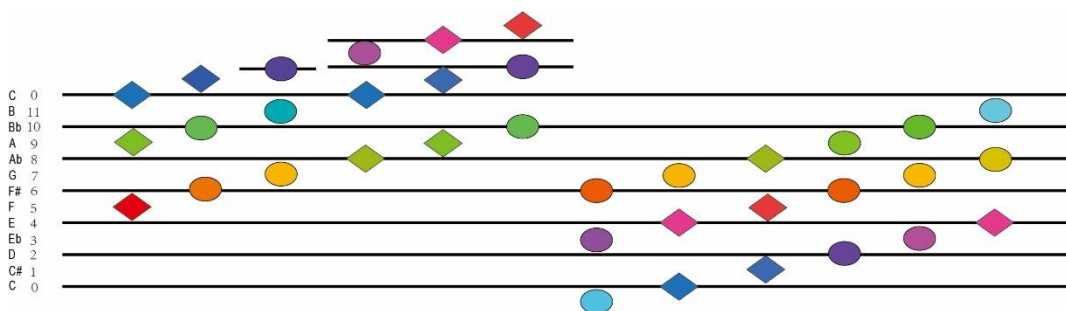


图 3-5、常见重合和弦：Csus2, Csus4, C6, Cadd9, G7, G9, F7, F9, bEmsus4, bEmsus2, bAm7, bBm7

Figure 2-3. Common Coincident chord: Csus2, Csus4, C6, Cadd9, G7, G9, F7, F9, bEmsus4, bEmsus2, bAm7, bBm7

重合和弦通常是基于三和弦，但也能表达非线性空间，具有膜和弦的语义特征。

Coincident chords are usually based on triads, but can also express non-linear spaces and have the semantic characteristics of membrane chords.

重合和弦变化形式很多，这里只介绍其构成原理与语义特征，在本书后面的内容中还有更多介绍。

There are many variations of overlapping chords. Here we only introduce their composition principles and semantic characteristics. There will be more introductions in the later contents of this book.

3-5、Time Chord | 时间和弦

时间和弦与空间和弦互为反和弦，两者在数学形式上表现为：镜像对称——这表明两者相互依存，联系。（参见：1-5. Mirror Symmetry；镜像对称）

Time chord and space chord are opposite to each other. The two are shown in mathematical form:

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mirror symmetry-which shows that the two are interdependent and connected. (Refer to: 1-5. Mirror Symmetry)

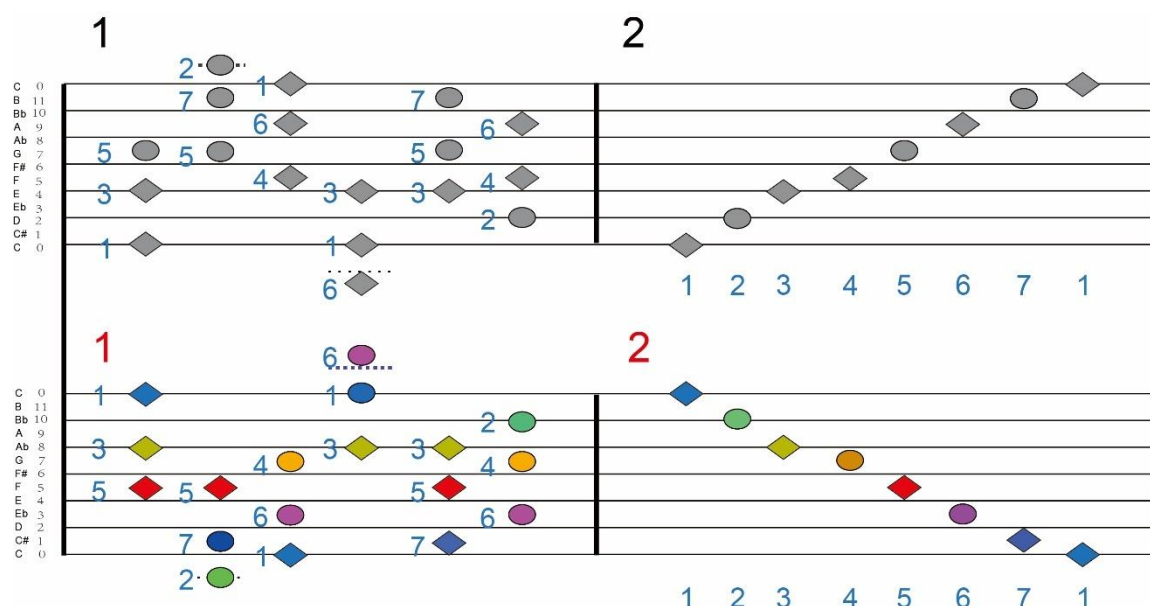


图 3-6、平均律镜像坐标，七声音阶（Heptachord），C 大调的三和弦与音阶

Figure 3-6, the equal temperament mirror coordinates, Heptachord, C major triad and scale

和弦时间用频率与振幅等能量变化产生时间表达。

Chord time is expressed in terms of time generated by energy changes such as frequency and amplitude.

和弦时间包的基本单元是“时段”，主和弦构成时段边界，等比和弦填充主和弦之外的时间。

The basic unit of the chord time Packet is the "period", the tonic forms the boundary of the period, and the Geometric chords fills the time outside the tonic.

时间与空间的边界都需要由三和弦定义，没有三和弦定义的膜和弦没有确定的时-空状态。

The boundaries of time and space need to be defined by triads, and membrane chords without triads have no definite space-time state.

时间和弦不含几何语义，没有空间状态，可以处于任意空间位置的叠加态（非定域性）；反之，空间和弦不含时间语义，没有时间状态，只能表达静止的空间（定域性）；定域性与非定域性产生了“时空二相性”（波粒二相性）。

Time chord does not contain geometric semantics, no space state, can be in any space position superposition state (non-locality); On the contrary, spatial chord has no time meaning, no time state,

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和弦语言；李晓虹；DOI: 10.13140/RG.2.2.25415.65440/3；ISBN:9781370273348；ASIN: B0919JJ3R7

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can only express the static space (locality); Locality and non-locality produce "space-time duality"
(wave-particle duality).

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4. Chord Packages | 和弦包

在和弦时空中，孤立的三和弦（非对称和弦）与等比和弦（对称和弦）均无法独立构成完整的时空表达。只有通过将三和弦（非对称和弦）与等比和弦（对称和弦）组合为“和弦包”，并形成对称-破缺（Symmetry Breaking）结构，才能完整地表达时空。

和弦包分为和弦时间包与和弦空间包。两者的核心三和弦（triad）满足镜像对称关系：

$$\{-7, -4, 0\} \leftrightarrow \{0, 4, 7\} \bmod 12$$

分别表征和弦时间与和弦空间的几何对偶性。这一镜像对称关系（Mirror Symmetry）表明，时间和空间在和弦语言中可以通过几何结构相互映射。（参见：1-3.1.镜像对称）

在一个和弦包中：

三和弦作为边界算子，生成时空边界：

时间维度：定义时段边界（起始点、终止点）。

空间维度：定义空间边界（轮廓线、分面线）。

等比和弦作为场填充（Field Filling）：

通过等比频率分布（减七和弦，全音阶和弦，增三和弦）渗透边界内外的时空连续体，其作用类似于经典物理中的以太场（Ether Field）或量子场论中的背景场（Background Field）。

和弦包（Chordal Package）可形式化定义为：

和弦包 = 三和弦（边界） + 等比和弦（场填充）

其中，“+”表示对称-破缺耦合，最终生成稳定的和弦时空流形。

和弦语言中，和弦包又称为：调——包括大调，小调，及七声音阶，爵士音阶等，分别表达不同的时空含义，在后面章节将会逐步介绍。

In chordal spacetime, isolated triads (asymmetric chords) and Geometric chords (symmetric chords) cannot independently constitute a complete expression of spacetime. Only by combining triads (asymmetric chords) with Geometric chords (symmetric chords) to form a "chordal package," and establishing a symmetry-breaking structure, can spacetime be fully expressed.

Chordal packages are divided into chordal time packages and chordal space packages. The core

triads (triads) of the two satisfy a mirror symmetry relationship:

$$\{-7, -4, 0\} \leftrightarrow \{0, 4, 7\} \bmod 12$$

These respectively represent the geometric duality of chordal time and chordal space. This mirror symmetry relationship indicates that time and space can be mutually mapped through geometric structures in the language of chords. (See: 1-3.1. Mirror Symmetry)

Within a chordal package:

Triads act as boundary operators, generating spacetime boundaries:

Time dimension: Define temporal boundaries (starting point, ending point).

Space dimension: Define spatial boundaries (contour lines, facet lines).

Geometric chords act as field filling:

Through geometric frequency distributions (diminished seventh chords, whole-tone chords, augmented triads), they permeate the spacetime continuum inside and outside the boundaries, functioning similarly to the ether field in classical physics or the background field in quantum field theory.

The chordal package (Chordal Package) can be formally defined as:

Chordal Package=Triads (Boundary)+Geometric

chords (Field Filling)Chordal Package=Triads (Boundary)+Geometric chords (Field Filling)

Here, "+" denotes symmetry-breaking coupling, ultimately generating a stable chordal spacetime manifold.

In the language of chords, chordal packages are also referred to as "keys"—including major keys, minor keys, diatonic scales, jazz scales, etc.—each expressing different spacetime meanings, which will be gradually introduced in later chapters.

4-1.Chord Space Packet | 和弦空间包

一个和弦空间包必须包含两种和弦：线和弦（三和弦）与等比和弦（膜和弦），和弦空间包=线和弦+导音膜和弦，线和弦构成轮廓线、分面线，产生空间定义（图-底关系等），膜和弦充满所有非线空间，类似“以太”，和弦空间包是和弦空间的基本单元。

A chord space packet must contain two kinds of chords: line chords (triads) and Geometric chords

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(membrane chords), chord space packet = line chords + membrane chords, line chords form contour lines, Fecet line, and produce space definitions (Figure-ground relationship, etc.), membrane chords fill all non-linear spaces, similar to "ether", chord space packet is the basic unit of chord space.

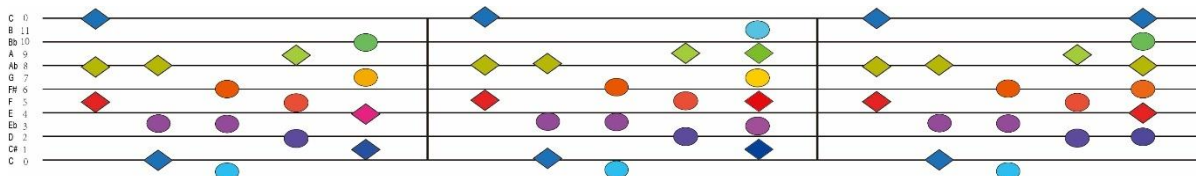


图 4.1、1、七声音阶和弦空间包；2-3、爵士音阶和弦空间包

Figure 4.1, 1. Heptachord scale chord space packet; 2-3. Jazz scale chord space packet

三和弦的几何语义是：线（开弦，闭弦），等比和弦（Geometric chords）的几何语义是：非线膜，线和弦对膜和弦作边界定义（轮廓线，分面线），产生和弦空间包。

The geometric semantics of triads are: lines (open string, closed string), and the geometric semantics of Geometric chords are: non-linear membranes, line chords define boundaries (contours, Fecet line) to membrane chords, resulting in Chord Space Packet.

一个完整的和弦空间包只含一个膜和弦，但通常需要两个线和弦：大三和弦（闭弦）与小三和弦（开弦），分别构成轮廓线与分面（分形）线。

A complete chord space packet contains only one membrane chord, but usually requires two line chords: a major triad (closed string) and a minor triad (open string), which form the contour line and the facet (fractal) line respectively.



图 4.2、七声音阶 C 大调-升 f 小调，大三和弦生成图形轮廓线，小三和弦生成分面线，减七和弦填充所有 M 维空间。

Figure 4.2. heptachord C major f-sharp, major triads generate figure contour lines, minor triads generate Fecet line lines, and diminished 7th fill all M-dimensional spaces.

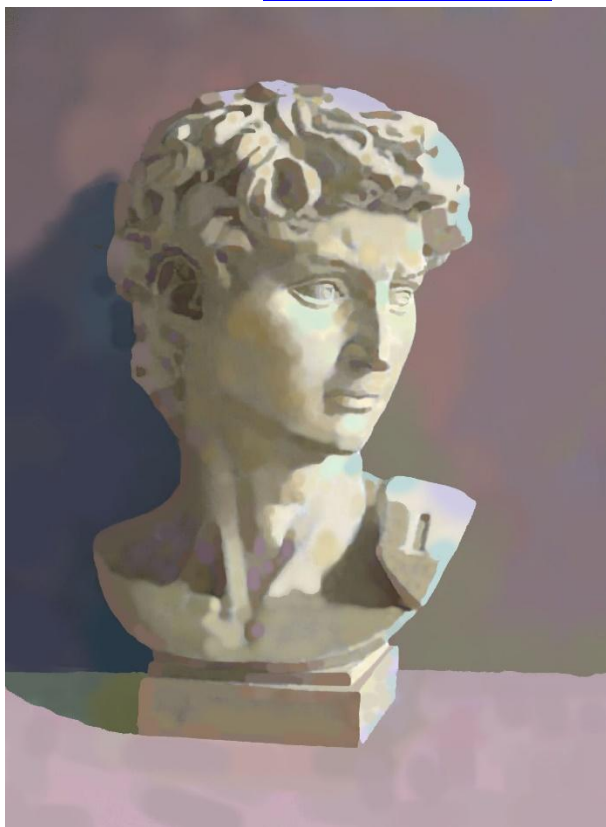


图 4.3、爵士音阶，升 f 小调，大三和弦生成图形轮廓线，小三和弦生成成分面线，全音阶和弦填充所有非线空间。

Figure 4.3. Jazz scale f-sharp minor, major triads generate figure outlines, minor triads generate Fecet line line, and diatonic chords fill all non-linear spaces.

4-1.2. Figure-Ground Relation | 图-底关系

图-底关系（figure-ground relation）是空间知觉的基本模式，“背景空间”与“图形空间”是产生空间知觉的必要条件；两种空间都与音符-和弦的正-负属性相关，正音符-和弦具有背景（远）倾向，负音符-和弦具有图形（近）倾向，图-底关系与“景深”相关。

The figure-ground relation is the basic mode of spatial perception, and "background space" and "figure space" are necessary conditions for spatial perception; both spaces are related to the positive-negative properties of note-chords, and the positive Note-chords have background (far) tendencies, negative note-chords have figure (near) tendencies, and the figure-ground relationship is related to "depth of field".

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图 4-2、七声音阶，升 f 小调-C 大调图-底关系

Figure 4-2. Heptachord scale f-sharp minor,C major figure-ground relationship

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图-底关系包括：三和弦图-底关系与等比和弦图-底关系。

The figure-ground relationship includes: triad figure-ground relationship and geometric chord figure-ground relationship.

三和弦图-底关系：图-底关系与三和弦相关，表现为：小调的图形（近）倾向，大调的背景（远）倾向，（参见：2-4、和弦中的±音符规则；3-3、正-负闭弦与开弦）。

Figure-ground relationship of triads: The figure-ground relationship is related to triads, which is manifested as: figure (near) tendency in minor keys, background (far) tendency in major keys (see: 2-4, ± note rule in chords; 3-3, positive-negative closed and open strings).

等比和弦图-底关系：等比和弦中的负音符具有图形（近）倾向，正音符具有背景（远）倾向。

Figure-ground relationship of geometric chords: The negative notes in a geometric chord have a figure (near) tendency, and the positive notes have a background (far) tendency.

下面例图中包含两种图-底关系。

The following example diagram contains two figure-ground relationships.

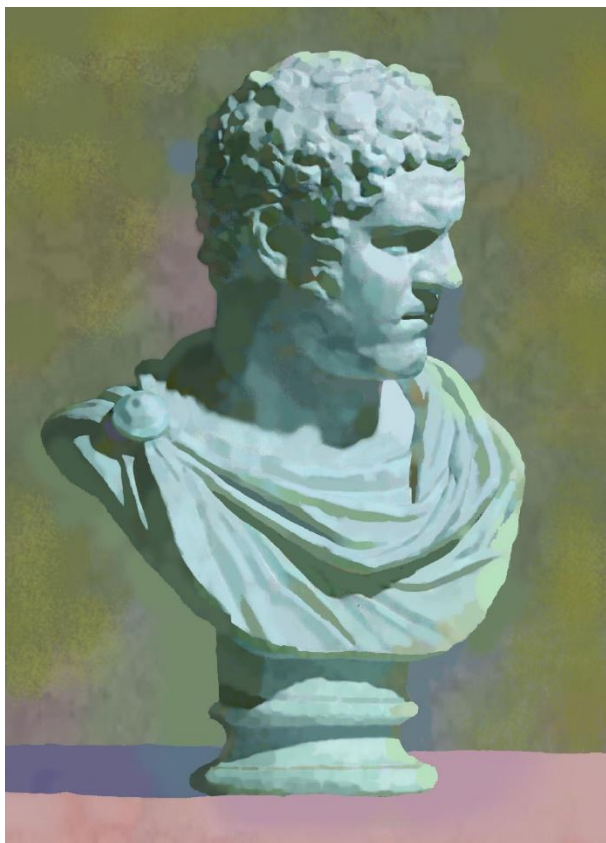


图 4-2.2、七声音阶 E 大调，降 b 小调

Figure 4-2.2, Heptachord scale E major, b-flat minor

4-2. Chord Time Packet | 和弦时间包

和弦时间包与和弦空间包的区别在于其中的三和弦，两者互为反和弦（镜像对称）。（参见：1-5.Mirror Symmetry；镜像对称）

The difference between the chord time packet and the chord space packet is the triads in them, which are antichords (mirror-symmetrical) of each other. (See: 1-5.Mirror Symmetry)

和弦时间的进行由音符-和弦及强度（振幅）的变化产生，和弦时间的基本单位是时间包。

The progression of chord time is produced by changes in note-chord and intensity (amplitude), and the basic unit of chord time is the time packet.

和弦时间包构成“时段”，主和弦构成时段边界（开始与结束），等比和弦充满边界之外的时间。

The chord time packets make up the "periods", the tonic chords form the period boundaries (start and end), and the Geometric chords fill the time outside the boundaries.

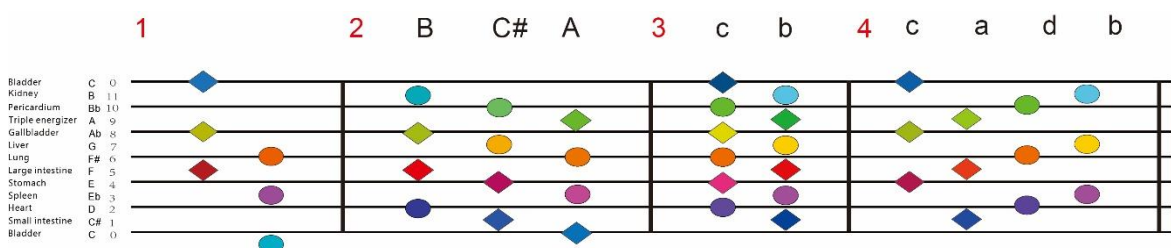
人类对时间的观察比对空间的观察少很多，和弦时间（音乐）是一个还需要更多关注的部分。

Humans observe a lot less of time than space, and chord time (music) is an area that needs more attention.

4-3.Scale System | 音阶系统

和弦语言中有三种基本的等比和弦：减七和弦，全音阶和弦，增三和弦，等比和弦是不同音阶系统的特征和弦。

There are four basic geometric progression chords in the chord language: diminished seventh chords, diatonic chords, augmented triads, and diatonic chords. Geometric progression chords are the characteristic chords of different scale systems.



基本和弦表：1-1、大三和弦（闭弦），1-2、小三和弦（开弦）、2-、减七和弦（膜弦）、3-、全音阶

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和弦（膜弦），4、增三和弦（膜弦）

*和弦频谱公式： $n \cdot f$, $H^n \cdot f$, ($H=1.059463$, $n \in \mathbb{Z}$)

*符号：◆=+ 音符，●=-音符，音符色=色荷

*本文使用 mod12 记谱法

Basic chord table: 1-1, major triad (closed string), 1-2, minor triad (open string), 2, diminished 7th (membrane string), 3, diatonic chord (membrane string), 4, augmented Triads (membrane strings)

* Chord spectrum formula: $n \cdot f$, $H^n \cdot f$ ($H=1.059463$, $n \in \mathbb{Z}$)

* Symbol: ◆=+ note, ●=- note, note color = color charge

** This article uses mod12 notation

减七和弦向三和弦解决，产生七声音阶（heptachord）；全音阶和弦与增三和弦向三和弦解决，产生爵士音阶，不同音阶系统有着重要的和弦语义差别，也是后面章节的主要内容。

The diminished seventh resolves to the triad, producing heptachord; Diatonic chords and augmented triads solve to triads, producing jazz scales. Different scale systems have important chord semantic differences, which are also the main content of the following chapters.

Reference, Prompt | 参考、提示

*本书的 1-4 章是和弦语言的基础部分，请在完全熟悉之后再进入后面的内容。

*Tip: Chapters 1-4 of this book are the basic part of the chord language. Please enter the following content after you are fully familiar with it.

Bibliography; 参考书目

Basic Theory Of Music; 音乐基础理论

Harmony; 和声学

Chord Painting; 和弦绘画

General Physics; 普通物理学

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triad, 3, f-sharp minor triad, 4, A major triad, 5, Leading note diminished 7th.

图 6.1 中，1、2、3、4 是主和弦（线和弦），用于定义减七和弦（膜弦）。

In the figure, 1, 2, 3, 4 are the tonics (line chords), used to define the Diminished 7th (membrane chords).

减七和弦中的四个色分别充当导音，可产生四个调，称为：同导音减七和弦调群（same leading note diminished 7th keys group），四个调具有相同的完型性。（参见：8、完型性）

Each of the four colors in the diminished 7th chord acts as a leading note, resulting in four tones, known as the same leading note diminished 7th keys group, all of which have the same gestalt. (See: 8, Gestalt)

只有纯大调（主和弦为纯大三和弦），纯小调（主和弦为纯小三和弦）才能充当七声音阶系统的主调。参见：2-4、和弦中的±音符规则。

Only pure major (the tonic is a pure major triad) and pure minor (the tonic is a pure minor triad) can act as the tonic of the heptachord system. See: 2-4, ±note rule in chords.

七声音阶服从和弦中的±音符规则。参见：2-4、和弦中的±音符规则。

The heptachord obeys the ± note rule of the chord, see: 2-4, The ± Note Rule In Chord.

5-1. Figure-Ground Relation | 图-底关系

图-底关系由图形与背景构成，是空间知觉的基本元素。

The figure-ground relation is composed of figure and background, which is the basic element of spatial perception.

图-底关系（figure-ground relation）包括两种类型：绝对图-底关系与相对图-底关系；前者的图形与背景均具有确定性，绝对性；后者的图形与背景具有相对性。

There are two types of figure-ground relation: absolute figure-ground relation and relative figure-ground relation. In the former, both the figure and the ground are definite and absolute; in the latter, the figure and the ground are relative.

下面例图中，石膏模型是绝对图形，墙面是绝对背景，两者构成绝对图-底关系。

In the example picture below, the plaster model is the absolute figure and the wall is the absolute background, and the two form an absolute figure-ground relationship.

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图 5-1.绝对图-底关系

Figure 5-1. Absolute Figure – Ground Relationship

下面例图中，部分图形与背景具有相对性，为相对图-底关系。

In the following example figure, some figures and background are relative, which is a relative figure-ground relationship.



图 5-1.2.相对图-底关系

Figure 5-1.2. Relative figure-ground relationship

5-1.1. Augmented Fourth Major-Minor |增四度大-小调

七声音阶（heptachord）中的绝对图-底关系（figure-ground relation）由纯大调与纯小调构成，两调的主音为增四度（Augmented fourth）关系，拥有相同的导音减七和弦（Leading note diminished 7th），纯大调表达绝对背景，纯小调表达绝对图形。（参见：2-2）

The absolute figure-ground relation in heptachord is composed of pure major key and pure minor key, and the tonic of the two keys is an Augmented fourth relation. With the same Leading note diminished 7th, the pure major expresses the absolute background and the pure minor expresses the absolute figure. (See: 2-2)

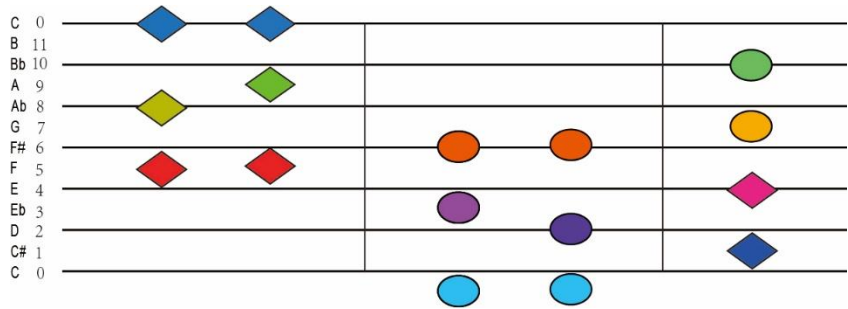


图 5-1.1、七声音阶（Heptachord）中的±纯三和弦（和弦 1、3）构成图-底大小调。

Figure 5-1.1.The ± Pure triads (chords 1, 3) in the Heptachord constitute a figure-ground relational key.

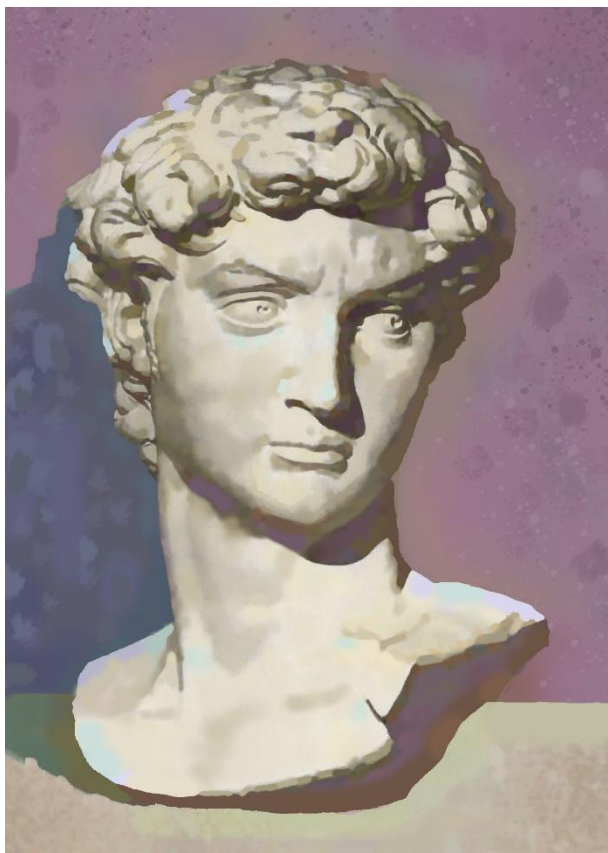


图 5-1.2、七声音阶，增四度大-小调

Figure 5-1.2, Heptatonic scale, Augmented fourth major-minor



图 5-1.2、七声音阶，增四度大-小调

Figure 5-1.2, Heptatonic scale, Augmented fourth major-minor

5-1.2.Parallel Major-Minor |平行大-小调

七声音阶中的平行大-小调（Parallel Major-Minor）用于表达相对图-底关系。

Parallel Major-Minor in the heptachord used to express the relative figure-ground relationship.

平行大小调（Parallel Major-Minor）中的两个调分为：主调（first key）与副调（Second key），主调（First key）的主和弦（Tonic）是纯三和弦，副调（Second key）的主和弦（Tonic）是混合三和弦，两调的主音为小三度关系，拥有相同的导音减七和弦（Leading note diminished 7th）。

The two keys in Parallel Major-Minor are divided into: The first key and the Second key, the Tonic of the First key is a pure triad, the Tonic of the Second key is a mixed triad, and the tonic of the two keys is a minor third. It has the same Leading note diminished 7th.

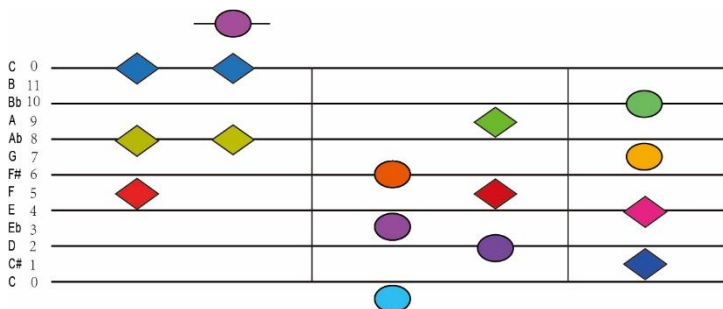


图 5-2.1、上图中，和弦 1、3 为纯三和弦；和弦 2、4 为混合三和弦。（菱形=+音符，圆形=-音
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B0919JJ3R7

符)

In Figure 5-2.1 and above, chords 1 and 3 are pure triads; Chords 2 and 4 are mixed triads.

(Diamond = + note, circle = -note)

下图中的部分图-底关系具有相对性，采用平行大-小调。

Some of the figure-ground relationships in the figure below are relative, using parallel major-minor scale.



图 5-2.2、七声音阶，平行大小调；C 大调，降 e 小调。

Figure 5-2.2, heptachore scale, parallel major and minor keys: C major, E flat minor.



图 5-2.3、七声音阶，平行大小调；A 大调，升 f 小调。

Figure 5-2.2, heptachore scale, parallel major and minor keys: A major, f-sharp minor.

平行大小调具有一些爵士音阶兼容性，参见：9、爵士音阶。

Parallel major-minor keys have some jazz scale compatibility. See also: 9. Jazz Scales

绝对图底关系（figure-ground relation）可以包含相对图底关系（figure-ground relation），共同构成空间系统：纯大调与纯小调构成绝对图底关系，纯大调与其关系小调，纯小调与其关系大调分别在图形-背景上构成相对图-底关系。

The absolute figure-ground relationship can encompass relative figure-ground relationships, collectively forming a spatial system: The pure major and pure minor scales establish an absolute figure-ground relationship, while the pure major and its relative minor, as well as the pure minor and its relative major, respectively form relative figure-ground relationships within the figure-ground framework.

5-2. Same Root Major Minor | 同根大-小调

根音符相同的大-小三和弦构成同根大-小调（Same Root Major Minor），同根大-小调只用于在同调

中产生轮廓线与分面线，不产生图-底关系，其中的大三和弦生成轮廓线（闭弦），小三和弦生成分面线（开弦）。

Major-minor triads with the Same Root note form the Same Root Major Minor, which is only used to produce contours and Fecet line in the homology, and does not produce a figrue-ground relationship, where the major triads generate contours (closed strings) and the minor triads generate Fecet line (open strings).

同根大-小调中，主和弦是标准三和弦。

In the same root major-minor key, the main chord is the standard triad.

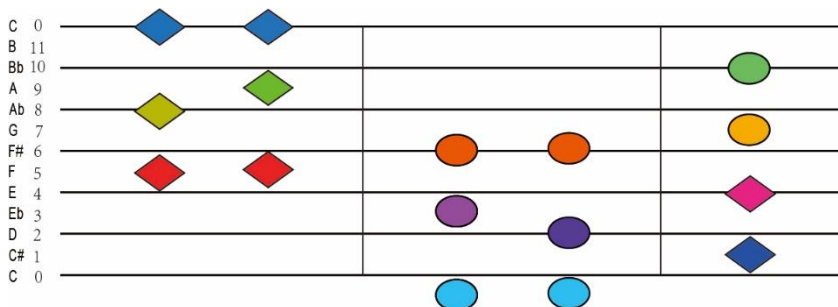


图 9-2.1、同根大-小三和弦，大-小调。

Figure 9-2.1, same root major - minor triad, major - minor.



图 9-2.1、同根音符大-小三和弦，大-小调。

same root major - minor triad, major - minor.



图 9-2.1、同根音符大-小三和弦，大-小调。

Figure 9-2.1, same root major - minor triad, major - minor.

5-3、Solution | 解决

七声音阶中，膜和弦具有寻找线和弦倾向，从而达到稳定，这一属性称作解决（solution）倾向。

In the jazz scale, membrane chords have a tendency to find line chords and thus achieve stability, a property called solution tendency.

膜和弦中各音符具有不同的解决倾向，与主和弦音符为小二度关系的音符具有更强的解决倾向。

Each note in the membrane chord has a different resolution tendency, and the note in the minor second relation with the main chord note has a stronger resolution tendency.

膜和弦中与主音为小二度关系的音符称：导音，具有最强的解决倾向。

The note in the membrane chord that is related to the tonic in the minor second is called the leading note, which has the strongest tendency to resolve.

6. Heptachord T-D-S Triad | 七声音阶 T-D-S 三和弦

前面介绍的七声音阶和弦包（调）只含有主和弦（tonic），在 5 度音符上生成属和弦（dominant chord），4 度音符上生成下属和弦（subordinate chord），系统中便有了三个三和弦，称作：T-D-S 三和弦，音乐理论中称为：正三和弦（Primary triad），用于表达调内不同的图形与分面的亮度关系。

The heptachord chord packet (key) introduced earlier only contains the tonic, the dominant chord is generated on the 5th note, and the subordinate chord is generated on the 4th note. There are three triads in the system, called: T-D-S triads, In music theory, it is called: Primary triad, it is used to express the brightness relationship between different figure and facet in the key.

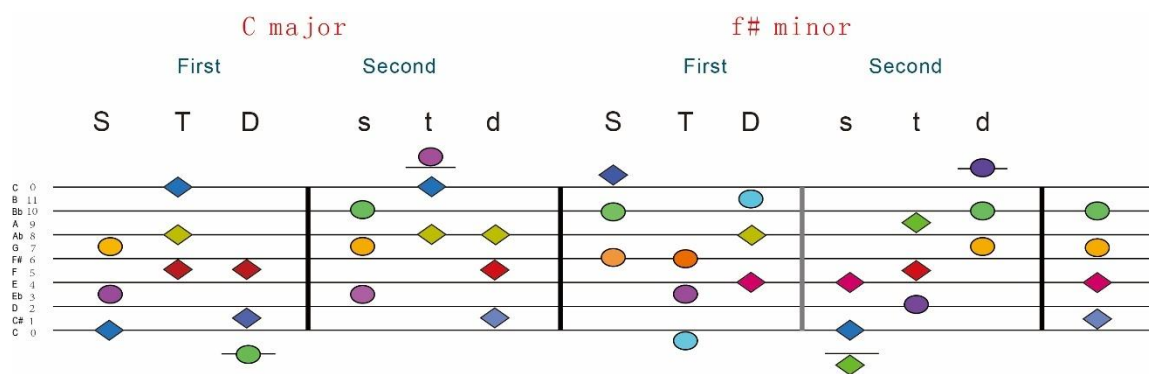


图 6.1、T-D-S 三和弦

Figure 7.1, T-D-S triad

T-D-S 三和弦中，主和弦（Tonic），属和弦，下属和弦具有不同的亮度（亮，暗，中），由此产生 T-D-S 亮度关系，大调，小调具有不同的 T-D-S 亮度关系。

Among the T-D-S triads, the Tonic, the dominant chord, and the subordinate chords have different brightness (bright, dark, medium), resulting in the T-D-S brightness relationship, and the major and minor keys have different T-D-S brightness relationships.

T-D-S 和弦亮度分为：暗，亮，中三级，对应的和弦如下：

The brightness of the T-D-S chord is divided into three levels: dark, light, and medium. The corresponding chords are as follows:

大调 T-D-S 三和弦：属和弦（D）=暗，下属和弦（S）=亮，主和弦（T）=中。

Major T-D-S triad: dominant chord (D) = dark, subordinate chord (S) = bright, tonic (T) = middle.

小调 T-D-S 三和弦：属和弦（D）=亮，下属和弦（S）=暗，主和弦（T）=中。

Minor T-D-S triad: dominant chord (D) = bright, subordinate chord (S) = dark, tonic (T) = middle.

大调的 T-D-S 亮度关系表达不同亮度的图形；小调的 T-D-S 亮度关系表达同一图形上不同亮度的分面。

The T-D-S brightness relationship of major keys expresses figure of different brightness; the T-D-S brightness relationship of minor keys expresses facet of different brightness on the same figure.

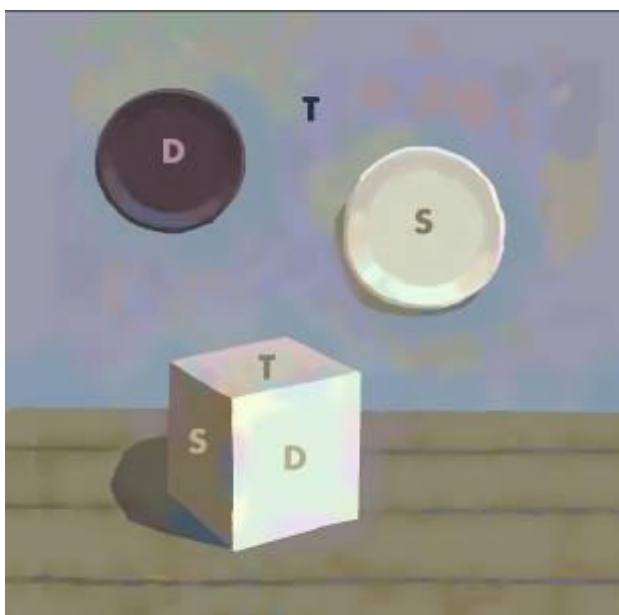


图 6.2、C 大调、#F 小调的 T-D-S 三和弦

Figure 6.2, T-D-S triad in C major, #F minor

C 大调（背景）、暗色挂盘=C 大调属和弦，亮色挂盘=C 大调下属和弦，中间色背景=C 大调主和弦。

C major (background), dark hanging plate = C major dominant chord, bright hanging plate = C major subordinate chord, mid-color background = C major tonic.

纯大调的属和弦与下属和弦可以构成背景上的相对图形。

The dominant and subdominant chords in the pure major scale can form relative figures on the background.

#F 小调（石膏正方体）、正方体上有三个不同亮度的分面，亮面=#F 小调属和弦，暗面=#F 小调下属和弦，中间色=#F 小调主和弦。

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#F minor (plaster squareness), there are three facet of different brightness on the cube, bright side = #F minor dominant chord, dark side = #F minor subdominant chord, middle color = #F minor tonic.

背景上的挂盘与墙面产生调内图-底关系：主和弦构成背景，属和弦，下属和弦构成图形。

The hanging plate on the background and the wall produce an figure-ground relationship within the key: the main chord forms the background, the dominant chord, and the subordinate chord form the figure.

同根音符大-小调转换，可以产生不同图形，不同分面的转换，但服从主调的 T-D-S 亮度级关系。

The same root note major to minor conversion, can produce different figures, different facets of conversion, but obey the main key T-D-S brightness level relationship.

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Chord Painting; 和弦绘画

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7. Special Chords In The Heptachord | 七声音阶中的特殊和弦

七声音阶中的基本和弦是三和弦与减七和弦，在此之外还有一些特殊的和弦，用于一些特殊的用途；如：重合和弦，省略和弦等。

The basic chords in the heptachord are triads and diminished 7th chords, in addition to some special line chords for some special purposes; such as: coincident chords, elliptical line chords, etc.

7-1. Coincident Chord | 重合和弦

七声音阶（heptachord）中存在多种重合和弦，主要特征是：三和弦（线和弦）与调内的导音和弦（膜和弦）有重合的音符，这类和弦线性几何语义不确定，并允许超出三个音符，如：七和弦，九和弦。

There are a variety of overlapping chords in the heptachord scale, and the main characteristics are: the triad (line chord) and the leading note chord (membrane chord) in the key have overlapping notes, such chords have uncertain linear geometric semantics, and allow more than three notes, such as: seventh chord, ninth chord.

七声音阶（heptachord）中的重合和弦不包括主和弦（tonic），但在爵士音阶中，主和弦也是重合和弦。

The heptachord does not include tonic chords, but in the jazz scale, the tonic chords also coincide.

重合和弦可以是：三和弦+三和弦，三和弦+膜和弦，和弦几何语义具有线-膜不确定性。

Coincident chords can be: triad + triad, triad + membrane chord, and chord geometric semantics have line-membrane uncertainty.

最常见的重合和弦是：T-D-S 系统中的属和弦与下属和弦的扩展。

The most common overlapping chords are extensions of dominant and subordinate chords in the T-D-S system.

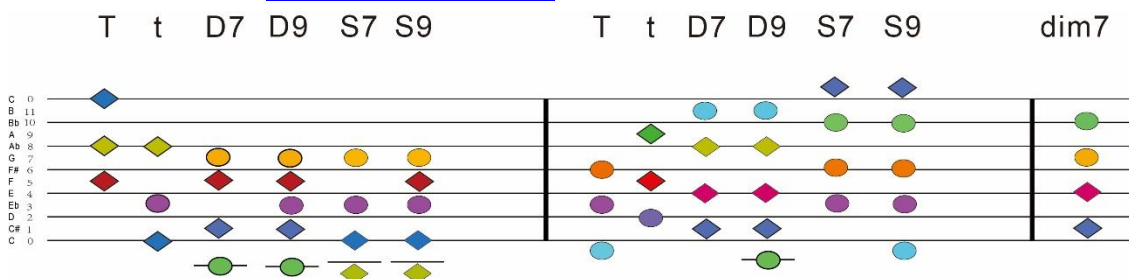


图 7.1、七声音阶 C 大调，#f 小调；属和弦-下属和弦的重合和弦形式。

Figure 7.4, heptachord C major, #f minor; dominant -subordinate Coincident chord form.

属和弦与下属和弦的常见叠加形式有：属七和弦（Dominant Seventh）、下属七和弦

（Subdominant seventh），属九和弦（Dominant ninth），下属九和弦（Subordinate nine chords）等，还有更多可能的形式，无法全部命名。

Common forms of superposition of dominant and subordinate are: Dominant Seventh, Subdominant seventh, Dominant ninth, Subordinate nine , etc. There are more possibilities It's impossible to name all of them.

七声音阶中的重合和弦是膜和弦，同时又具有 T-D-S 亮度关系。

The coincident chords in the heptachord are membrane chords, which at the same time have a T-D-S brightness relationship.



图 7-2、C 大调中的属七和弦：暗色挂盘，下属七和弦：亮色挂盘，#f 小调中的属七和弦：球体亮面

Figure 7.5. The dominant seventh chord in C major: dark hanging plate, subordinate seventh CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3,ISBN:9781370273348, ASIN:

B0919JJ3R7

chord: bright hanging plate, dominant seventh chord in #f minor: bright surface of sphere.

7-2.Omit Chord |省略和弦

省略减七和弦主要用于产生空间景深变化与跨音阶兼容性，常见的省略形式如下：

The omission of diminished 7th is mainly used to generate spatial depth of field changes and trans-scale compatibility. Common omission forms are:

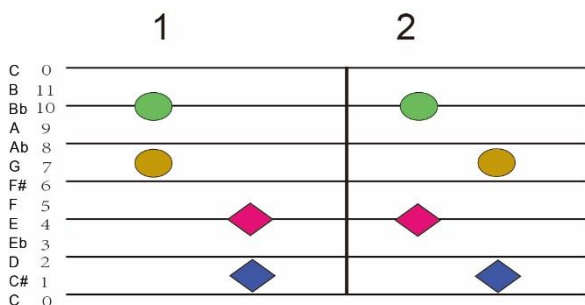


图 7-2，减七和弦的常见省略形式

Figure 7-2, common ellipsis of the diminished 7th

1) 省略正或负音符、减七和弦被省略正或负音符后，空间景深会发生改变——正音符具有背景（远）倾向，负音符具有图形（近）倾向。

1) Positive or negative notes omitted: After a diminished 7th is omitted positive or negative notes, the spatial depth of field changes - positive notes have a background (far) tendency, negative notes have a graphic (near) tendency.

下图中的减七和弦省略了正音符，空间系统系统表现出向前靠近的倾向。

The diminished 7th in the image below omits positive notes, and the spatial system system shows a tendency to approach forward.

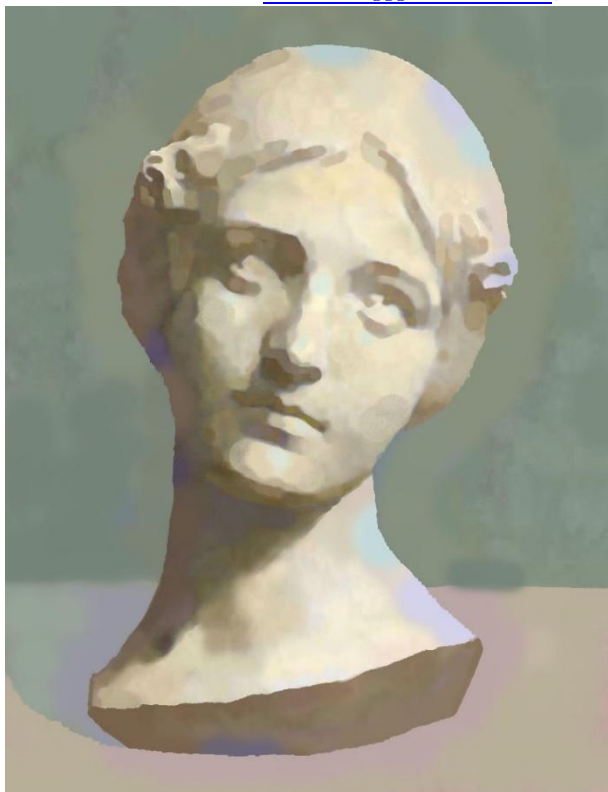


图 7-3、省略了正音符的减七和弦

2) 导音增四度 (leading note augmented fourth) 是减七和弦，全音阶和弦共同省略形式，减七和弦省略为导音增四度 (leading note augmented fourth) 音程时，七声音阶-爵士音阶的膜和弦没有区别。

下图中的减七和弦 (Diminished 7th) 省略为增四度 (augmented fourth) 音程，七声音阶音阶的确定性消失。



图 7-4、减七和弦的省略形式：导音增四度（leading note augmented fourth）

Figure 7-4. The omitted form of the Diminished 7th: leading note augmented fourth

3) 省略三和弦、当七声音阶中的三和弦省略 1-2 音符后，其和弦语义的确定性降低，可以兼容更多的空间状态。

When 1-2 notes are omitted for triads in the heptachord scale, the certainty of the chord semantics is reduced and more spatial states are compatible.

8. Gestalt | 完形性

七声音阶中，和弦空间包具有完形倾向，即：图形轮廓线的闭合性，这种属性主要来自和弦包的导音减七和弦（Leading note diminished 7th）。

In the heptachord, the chord space Packet has a gestalt tendency, that is, the closedness of the figure outline. This attribute comes from the leading note diminished 7th of the Chord packet .

减七和弦是七声音阶特征膜和弦，三个减七和弦各有不同的完形状态，由此产生了七声音阶和弦空间包的完形差异，语义差异与空间秩序。

The Diminishedus 7th is the characteristic Membrane chords of the heptachord. The three diminished 7th have different gestalt states, which results in the gestalt difference, semantic difference and spatial order of the heptachord chord space Packet.

不同减七和弦包含不同完形状态与和弦语义，如：几何语义，生命语义，自然道德语义；这是和弦语言中最难理解之处。

Different diminished 7th include different gestalt states and chord semantics, such as Geometric semantics, life semantics, and natural moral semantics; this is the most difficult point in the chord language to understand.

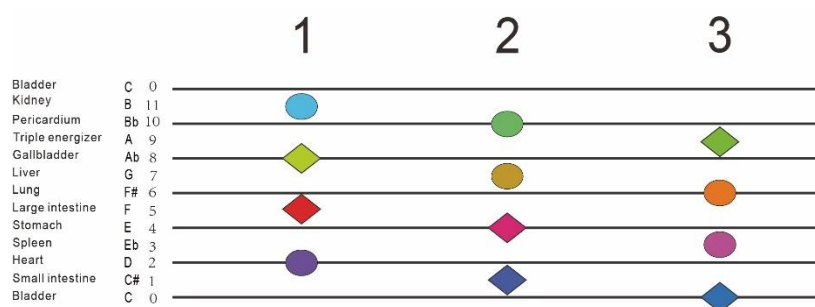


图 8.1、减七和弦表：1、{B,Ab,F,D}，2、{C#,Bb,G,E}，3、{A,F#,Eb,C}

Figure 8.1. diminished 7th table, 1.{B,Ab,F,D}, 2.{C#,Bb,G,E}, 3.{A,F#,Eb,C}.

也可使用缩写形式：B，C#，A。

Abbreviations can also be used: B, C#, A.

三和弦+导音减七和弦（Liading note diminished 7th）生成调，调中的三和弦可继承其导音减七和弦的完型性。

A triad + a Liading note diminished 7th generates a key in which the triad inherits the gestaltism of

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its leading note diminished 7th.

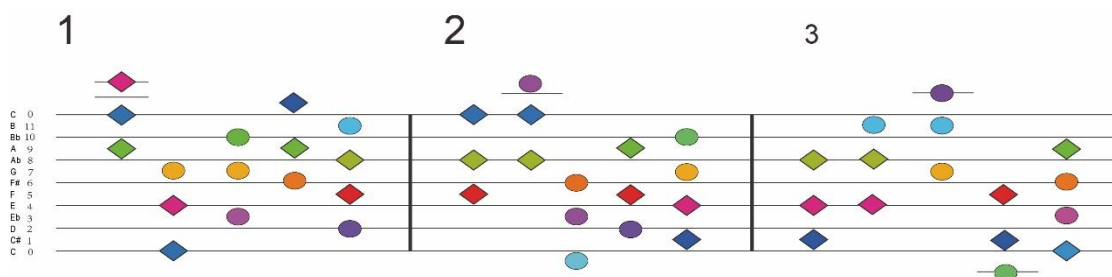


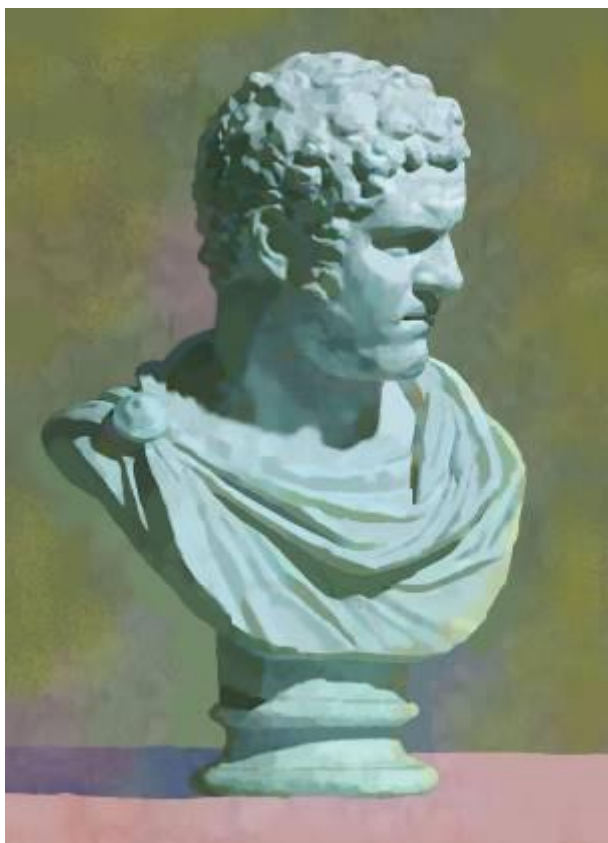
图 8-1.2、导音减七和弦生成的调群: {B,Ab,F,D}-{C#,Bb,G,E}-{A,F#,Eb,C}

Fig. 8-1.2 The key group generated by the leading note diminished 7th: {B,Ab,F,D}-{C#,Bb,G,E}-{A,F#,Eb,C}

8-1.Gestalt level | 完形级别

三个减七和弦的数学表达相同 (Diminished 7th={0,3,6,9}), 但是它们有着不同的完形状态及空间规则, 请看下面例图。

The mathematical expressions of the three diminished 7th are the same (Diminished 7th = {0,3,6,9}), but they have different gestalt states and space rules. Please see the following examples.



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B0919JJ3R7

图 8.2: {B,Ab,F,D}, 闭合图形

Figure 8-2: {B,Ab,F,D}, closed figure

{B,Ab,F,D}只能表现轮廓弦闭合的图形，我们将这种空间特征称作：完形性。

{B,Ab,F,D} can only express figures with closed contour. We call this space feature: Gestalt.



图 8.3、{A,F#,Eb,C}、开放图形

Figure 8-3. {A,F#,Eb,C} , Open figure

{A,F#,Eb,C} 只能表现轮廓线开放的图形，但是轮廓线仍有闭合倾向，我们将这种空间属性称作：弱完形性。

{A,F#,Eb,C} can only express figure with open contours, but the contours still have a tendency to close. We call this space attribute: weak Gestalt.



图 8.4、{C#,Bb,G,E}，闭合-开放兼容图形

Figure 8.4, {C#,Bb,G,E}, closed-open compatible figure

{C#,Bb,G,E}可表达轮廓线闭合图形，也可表达轮廓线开放图形，兼容两种完形状态，我们将这种空间特征称作：次完形性。

{C#,Bb,G,E} can express contour closed figure and contour open figure, and is compatible with two gestalt states. We call this spatial feature: sub gestalt.

综合以上观察，对三个减七和弦的完形规则总结如下：

Based on the above observations, the Gestalt rules for the three diminished 7th are summarized as follows:

- 1、{B,Ab,F,D}，闭合，完形。
1. {B,Ab,F,D}, closed, gestalt.
- 2、{C#,Bb,G,E}，闭合-非闭合兼容，次完形。
2. {C#,Bb,G,E}, closed-non-closed compatibility, sub-Gestalt
- 3、{A,F#,Eb,C}，非闭合，弱完形。
3. {A,F#,Eb,C}, non-closed, weak-Gestalt.

具有不同完形状态的三个减七和弦产生了和弦空间的完形差异，称为：完形级别（Gestalt level），

它在和弦空间中具有重要意义。

The three diminished 7th with different Gestalt states produce the Gestalt difference in the chord space, which is called Gestalt level, which is of great significance in the chord space .

三个减七和弦不能出现在同一个调中，但可以构成{B,Ab,F,D}-{C#,Bb,G,E}-{A,F#,Eb,C} 调群，产生平行空间，详情在后面的第 13 章介绍。

The three diminished 7th cannot appear in the same key, but they can form a {B,Ab,F,D}-{C#,Bb,G,E}-{A,F#,Eb,C} key group and generate parallel spaces. The details are introduced in Chapter 13 below.

认识和弦语义依赖自观察以及编译能力，这需要专门训练，包括：经络，音乐，绘画等和弦语言经验。

Understanding chord semantics relies on self-observation and compilation ability, which requires special training, including experience in chord language such as meridians, music, and painting.

8-2.The Gestalt level of T-D-S |T-D-S 的完形级别

T-D-S 三和弦也包含完形状态：主和弦（Tonic）；属和弦（Dominant），下属和弦（Sub-dominant），都存在完形状态差异，这种差异来自三和弦隐含的导音减七和弦。

T-D-S triads also contain gestalt states: tonic chords; dominant chords (Dominant), sub-dominant chords (Sub-dominant), there is a gestalt state difference, this difference comes from the triad's implied leading tone diminished 7th.

T-D-S 三和弦所在的和弦包中，完形性较高的图形处于主体地位，完形性较低的图形处于从属地位。

There are differences in gestalt between T-D-S triads, the figure with higher gestalt is in the dominant position, and the figure with lower gestalt is in the subordinate position.

T-D-S 三和弦的完形状态差异，以及由此产生的主体-从属关系与恒星，行星的秩序相关。

Gestalt state differences of the T-D-S triad, and the resulting subject-subordination relationship is related to the order of stars, planets.

8-3.Main Part | 主体

在多空间包的七声音阶系统中，有一个空间包充当系统主体，称为：主体空间包，其余空间包有着向主体空间包接近的倾向。

In the heptachord system with multiple space packet, there is a space packet that acts as the main part of the system, called the main space packet, and the rest of the space packet have a tendency to approach the main space packet.

主体空间包按完形状态产生，系统中完形状态最高的空间包充当主体空间包。

The main space packet is generated according to the gestalt state, and the space packet with the highest gestalt state in the system acts as the main space packet.

Reference | 参考

Basic Theory Of Music; 音乐基础理论

Harmony; 和声学

Chord Painting; 和弦绘画

General Physics; 普通物理学

9. Jazz Scale | 爵士音阶

爵士音阶是弱调性系统，它屏蔽了七声音阶的部分和弦语义，并具有无调性兼容性，常见于一些现代音乐形式。

The jazz scale is a weak tonality system, which shields part of the chord semantics of the heptachord scale and has atonal compatibility. It is common in some modern forms of music.

爵士音阶有两个特征膜和弦（等比和弦）：全音阶和弦（Diatonic chord）与增三和弦（Augmented triad），三和弦+全音阶和弦构成爵士音阶和弦包，三和弦+增三和弦构成爵士五声音阶和弦包。

The jazz scale has two characteristic membrane chords (geometric progression chords): diatonic chords and augmented triads. Triads + diatonic chords constitute the jazz scale chord package, and triads + augmented triads constitute the jazz pentatonic scale chord package.

全音阶和弦包含±增三和弦，也可看作是全音阶和弦的组成部分。

The diatonic chords include the ± augmented triads, which can also be considered as components of the diatonic chords.

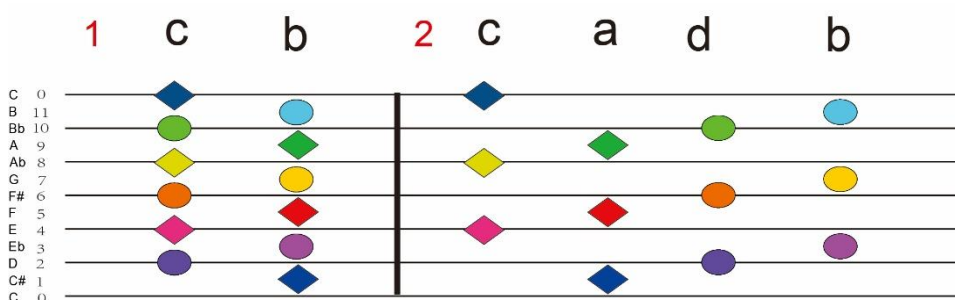


图 9-1、爵士音阶特征和弦，1、全音阶和弦（Diatonic chord），2、增三和弦（Augmented triad）（◆=正音符，●=负音符，色彩=色荷）

Figure 9-1. Characteristic chords of the jazz Scale, 1. Diatonic chord, 2. Augmented triad (◆ = +note, ● = -note)

爵士音阶的主要特征如下：

The main features of the jazz Scale are as follows:

爵士音阶由主和弦+导音膜和弦（全音阶和弦，增三和弦）构成，与七声音阶（heptachord）不同的是：爵士音阶的三和弦与导音膜和弦包含重叠音符，所有三和弦都是重叠和弦，并且允许主七和弦，主九和弦，主十一和弦等重叠和弦，甚至允许主音与膜和弦音符重叠；因此，爵士音阶中的三和弦（主

和弦)具有丰富的变化形式。

The jazz scale consists of a tonic chord plus leading-tone membrane chords (whole-tone chords, augmented triads). Unlike the heptachord, the jazz scale's triads and leading-tone membrane chords contain overlapping notes. All triads are overlapping chords, and the jazz scale allows overlapping chords such as major seventh chords, major ninth chords, and major eleventh chords. It even permits the tonic to overlap with the membrane chord tones. Therefore, the triads (tonic chords) in the jazz scale exhibit a rich variety of forms.

2) 爵士音阶是弱调性体系，既可作调性解决 (resolve)，也可作无调性解决。(参见：10、无调性体系)

2) The jazz scale is a weak tonal system, which can be solved as both tonal and atonal solutions. (See: 10, Atonal system)

3) 独立的爵士音阶空间包没有完型性倾向，可以表达任意图形。(参见：8、完型性)

3) The independent jazz scale space package has no gestalt tendency and can express any figure. (See: 8. gestalt)

4) 爵士音阶常在多层调群 (Multi-Layer Key Group) 中充当从属调 (参见：13、多层调群)；七声音阶调集团中的爵士音阶可以保留完形语义，这来自三和弦隐含的导音减七和弦。

4) The jazz Scale often acts as a sub-key in the Multi-Layer Key Group (see: 13, Multi-Layer Key Group); the jazz Scale in the heptatonic key group can retain the Gestalt semantics, which comes from Triads implicitly leading note diminished 7th chords.

9-1. Figure-Ground Relation |图底关系

图-底关系 (figure-ground relation) 由图形与背景构成，是空间知觉的基本元素，图底关系包括两种类型：绝对图底关系与相对图底关系，分别由不同调群表达。

figure-ground relation is a basic element of space perception and is composed of figures and backgrounds. There are two types of figure-ground relation: absolute figure-ground relation and relative figure-ground relation, expressed by different tone groups.

关于图底关系，在前面内容中已有较多介绍，不再重复，可参阅：5-1. Figure-Ground Relation 图-底关系。

As for the Figure-Ground Relation, it has been introduced more in the previous content and will not be repeated, see: 5-1. Figure-ground relation.

9-1.1. Augmented Fourth Major-Minor|增四度大-小调

爵士音阶中的绝对图-底关系（FIGURE-GROUND RELATION）由纯大调与纯小调构成，两调的主音为增四度（AUGMENTED FOURTH）关系，拥有相同的导音减七和弦（LEADING NOTE DIMINISHED 7TH），纯大调表达绝对背景，纯小调表达绝对图形。

The absolute figure-ground relation in the jazz is composed of pure major and pure minor, and the principal of the two keys is an Augmented fourth, with the same Leading note diminished 7th. Pure major expresses absolute background, pure minor expresses absolute figure.

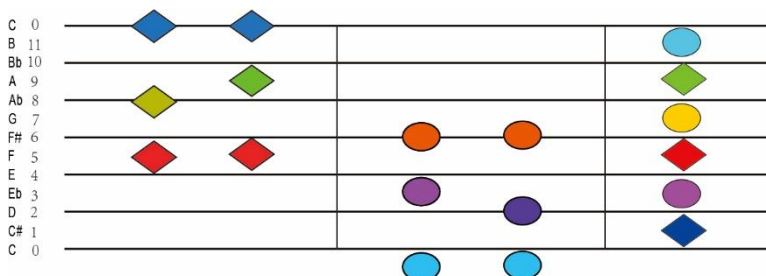


图 9-1.1、爵士音阶中的±纯三和弦（1、3）构成图-底大小调。

Figure 5-1.1.The ± Pure triads (1, 3) in the jazz constitute a figure-ground relational key.



图 9-1.2、爵士音阶中的绝对图-底关系。

Figure 9-1.2 The absolute figure-ground relationship in the jazz scale.

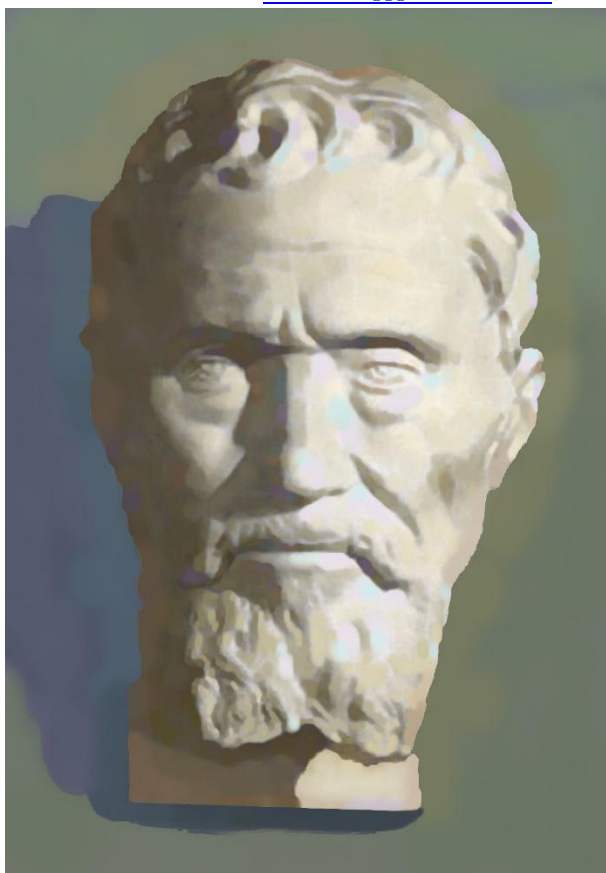


图 9-1.3、爵士音阶中的绝对图-底关系。

Figure 9-1.3 The absolute figure-ground relationship in the jazz scale.

9-1.2.Parallel Major-Minor|平行大-小调

爵士音阶的平行大小调（Parallel Major-Minor）包含一个正调，一个副调，两调的主音为小三度关系，含有同一个全音阶和弦。见图：9-1

The Parallel Major-Minor of the jazz scale consists of a positive key and a sub-key, and the tonic of the two keys is a minor third relationship and contains the same diatonic chord.

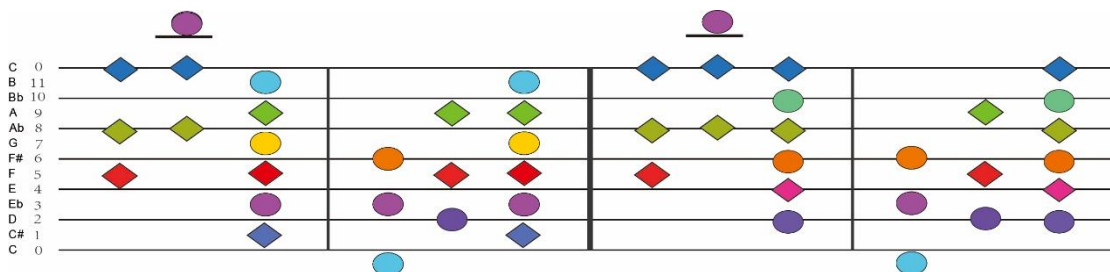


图 9-1.4、爵士音阶和弦包：1、C 大调，2、F# 小调，3、Eb 小调，4、A 大调（◆=正音符，●=负音符，色彩=色荷）

Figure 9-1. Jazz scale chord packet: 1, C major, 2, F# minor, 3, Eb minor, 4, A major (◆=positive CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3, ISBN:9781370273348, ASIN:

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note, ●=negative note, color=color charge)

爵士音阶中的平行大-小调（Parallel Major-Minor）用于表达相对图-底关系（figure-ground relationship），大调表达背景，小调表达图形。

The Parallel major-minor key in the jazz scale is used to express the relative figure-ground relationship, with the Major expressing the background and the Minor expressing the figure.



图 9-1.5、爵士音阶平行大-小调，升 f 小调，A 大调

Figure 9-2. Jazz Scale parallel major-minor, f-sharp minor, A major

主调（tonic key）与副调（sub key）：平行大-小调中，其中一调包含导音全音阶和弦，该调为系统主调，另一调的主音也包含在全音阶和弦中，该调为副调。

Tonic key and sub key: In the parallel major-minor scale, one of the keys contains the leading note diatonic chords, which is the tonic key of the system, and the tonic of the other key is also contained in the diatonic chords, which is the sub key.

主调与副调可以通过改变导音全音阶和弦进行切换，下面为主调-副调的切换。

The main key and secondary key can be switched by changing the leading note diatonic chord, as shown below.



图 9-1.6、平行大-小调，升 f 小调，A 大调

Figure 9-3. Parallel major-minor, f-sharp minor, A major



图 9-1.7、平行大-小调，A 大调，升 f 小调

Figure 9-4. Parallel major-minor, A major, f-sharp minor

爵士音阶中，主和弦与导音全音阶和弦（Leading note diatonic chord）有 1-2 个音符重合，调性较弱。

In the jazz Scale, the tonic and the leading note diatonic chord have 1-2 notes overlapping, and the tonal is weak.

副调的主音与主调的导音膜和弦重叠，通常以主七和弦，主九和弦的形式出现。

The tonic of the subkey overlaps with the leading-tone membrane chord of the main key, usually appearing in the form of major seventh chords or major ninth chords.

9-2、Same Root Major Minor | 同根大-小调

根音符相同的大-小三和弦构成同根大-小调（Same Root Major Minor），同根大-小调只用于在同调中产生轮廓线与分面线，不产生图-底关系，其中的大三和弦生成轮廓线（闭弦），小三和弦生成分面线（开弦）。

Major-minor triads with the Same Root note form the Same Root Major Minor, which is only used to produce contours and Fecet line in the homology, and does not produce a figure-ground relationship, where the major triads generate contours (closed strings) and the minor triads generate Fecet line (open strings).

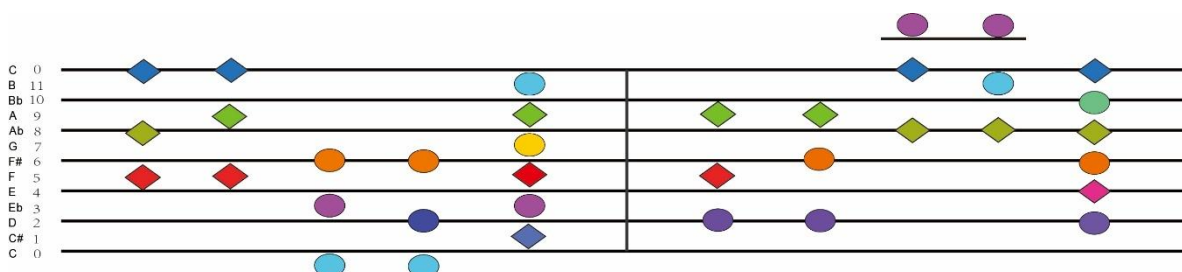


图 9-2.1、同根大-小三和弦，大-小调。

Figure 9-2.1, same root major - minor triad, major - minor.

同根大-小调中，主和弦是标准三和弦。

In the same root major-minor key, the main chord is the standard triad.



图 9-2.2.、同根大-小三和弦，大-小调。

Figure 9-2.2, same root major - minor triad, major - minor.

9-3. Augmented Triad | 增三和弦

增三和弦（Augmented triad）的三个音符具有相同的正-负属性，正音符具有向后的倾向（远），负音符具有向前的倾向（近），可产生空间系统的景深。

The three notes of an augmented triad have the same positive-negative properties: positive notes have a backward tendency (distant), while negative notes have a forward tendency (near), creating a sense of depth in the spatial system.

9-4、Coincident Chord | 重合和弦

爵士音阶的主和弦与导音（leading note）全音阶和弦含有重复音符，因此，爵士音阶的主和弦是重合和弦，也允许主七和弦，主九和弦等，用于和弦几何语义不确定的场合。

The major and leading note diatonic chords of the jazz scale contain repeated notes, so the major chords of the jazz scale are coincident chords, which also allow the major seventh chord, the major

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ninth chord, etc., to be used in situations where the geometric semantics of the chord are uncertain.

9-5、Solution | 解决

爵士音阶中，膜和弦具有寻找线和弦倾向，从而达到稳定，这一属性称作解决（solution）倾向。

In the jazz scale, membrane chords have a tendency to find line chords and thus achieve stability, a property called solution tendency.

在爵士音阶的膜和弦中，导音与五音具有较强的解决倾向，对于调的构成相对重要。

In the membrane chords of the jazz scale, the leading note and the fifth note have a strong tendency to resolve, and are relatively important for the formation of the key.

爵士音阶的全音阶和弦中含有两个导音：与主音为小二度关系的两个音符。

A diatonic chord of the jazz scale contains two leading notes: two notes in minor second relation to the tonic.

爵士音阶的全音阶和弦中包含主和弦（T Chord）的五音，其性质类似导音。

The diatonic Chord of the jazz scale contains the five notes of the major chord (T Chord), which are similar in nature to the leading note.

9-5. Neutral Colour | 无彩色

爵士音阶具有无调性兼容性，具体表现在：

The jazz scale has atonality compatibility, which is manifested in:

无彩色（neutral colors）出现在空间系统的最暗，最亮部分，类似七声音阶中的属和弦，下属和弦的作用。

Neutral colors appear in the darkest and brightest parts of the spatial system, similar to the role of dominant and subordinate chords in the heptachord scale.

其中的膜和弦可向无彩色（neutral colors）解决，构成无调性解决。

The membrane chords can be resolved towards neutral colors, constituting atonal solutions.

10. Atonal System | 无调性系统

在某些特定情况下，和弦与调性会消失，如：无彩色（neutral colors），单色（monocolour），连续频谱，这类情况统称为：非和弦（无调性）系统。

In certain cases, chords and tonality disappear, such as achromatic colour, monocolour, continuous spectrum, and these cases are collectively referred to as non-chord (atonal) systems.



图 10-1，无彩色

Figure 10-1, Neutral colors



图 10-2、单色

Figure 10-2. Monochrome

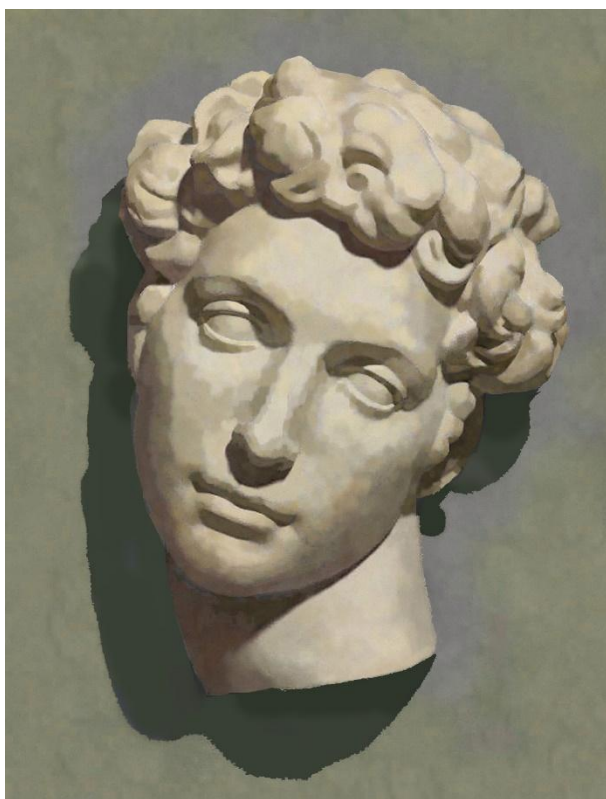


图 10-3、连续频谱

Figure 10-3 Continuous spectrum

三种非和弦（无调性）空间状态中，无彩色（neutral colors）具有较高的稳定性，并能表现出线几何语义，单色，连续频谱都有向无彩色（neutral colors）解决的倾向。

Among the three non-chord (atonal) space states, achromatic colour has higher stability and can express linear Geometric semantics. Monochrome and continuous spectrum all tend to resolve towards neutral colors .

非和弦（无调性）系统是和弦（调性）系统的反过程，它屏蔽了和弦系统的所有编码，语义逻辑，主要由亮度变化来产生视觉空间。

The non-chord (atonal) system is the inverse process of the chord (tonal) system, which blocks out all the coding, semantic logic of the chord system, and produces visual space mainly by brightness changes.

和弦（调性）与非和弦（无调性）具有不同的语义逻辑，是不同的宇宙观。

Chord (tonality) and non-chord (atonicity) have different semantic logic and different cosmological views.

半音阶可以作为连续频谱的近似形式，也是音乐中的常用方式，有乐器技术上的原因。

The chromatic scale can be used as an approximation of the continuous spectrum and is commonly used in music for instrumental technical reasons.

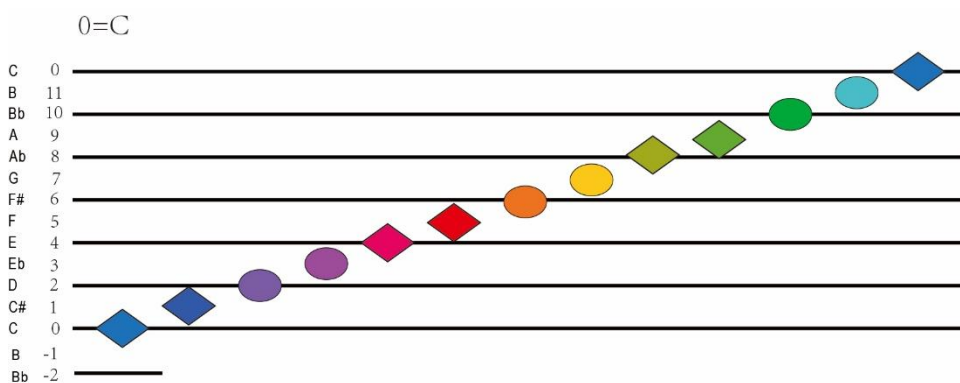


图 10.1、半音阶，（菱形=+ 音符，圆形=- 音符）

Figure 10.1 Chromatic scale, (diamond =+ note, circle = -note)

连续频谱构成的无调性系统仍需要保持单色倾向，通常不超过大三度范围，并有一个主色。

Atonal systems consisting of a continuous spectrum still need to maintain a monochromatic

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tendency, usually not exceeding a major third, and have a dominant color.

半音阶频谱具有向无彩色（neutral colors）解决的倾向。

The chromatic spectrum has a tendency to resolve towards achromatic colour.



图 10-4、连续频谱

Figure 10-4 Continuous spectrum

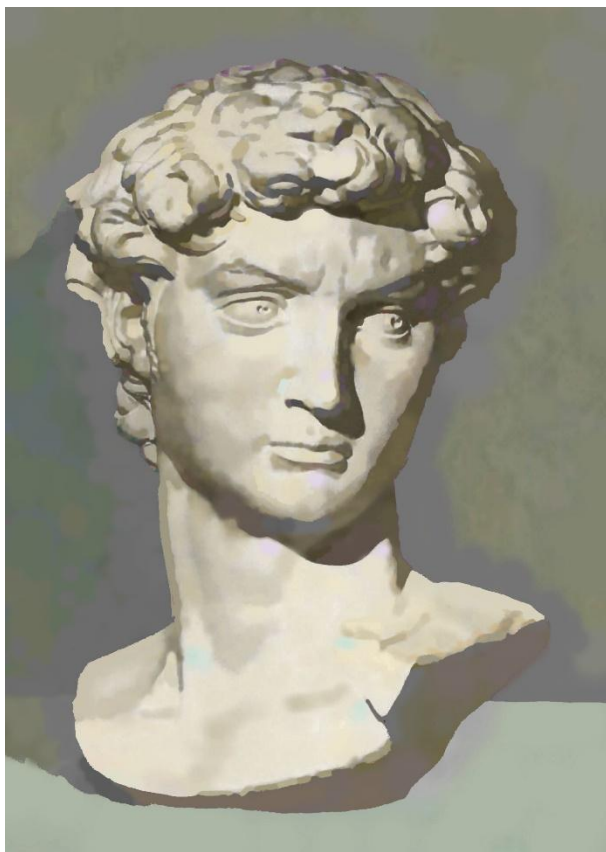


图 10-5、连续频谱

Figure 10-5 Continuous spectrum

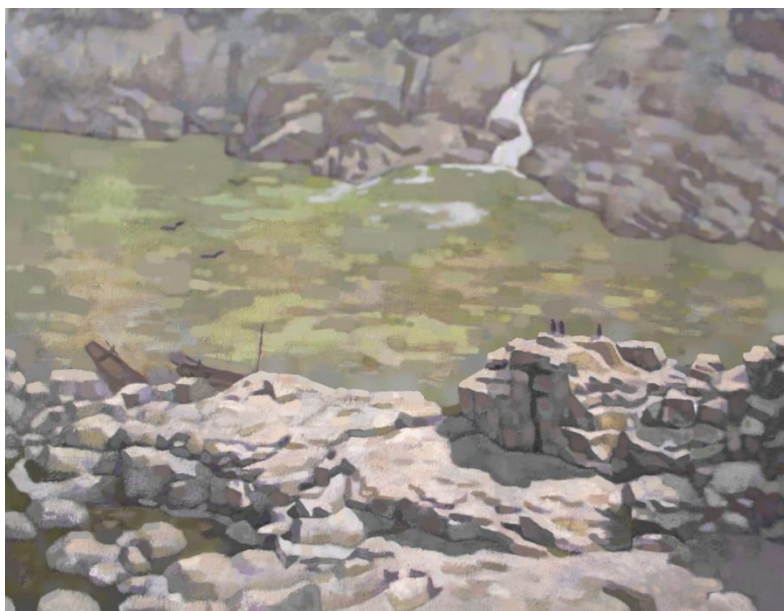


图 10-6、连续频谱

Figure 10-6 Continuous spectrum

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11. Melody Of Color | 色彩旋律

前面的讨论和弦语句是以“和弦”为单位，本章讨论的旋律语句则以音符（色）为单位，两者既有联系，又有相对独立性。

The chord statement discussed above is in the unit of "chord", while the melodic statement discussed in this chapter is in the unit of note (color), which are both related and relatively independent.

旋律在音乐中表现为非同时组织，而在和弦绘画中则表现为同时性组织。

Melody is not synchronic organization in music, but synchronic organization in chord painting.

色彩旋律发生在一个空间包之内，不同空间包则视作不同的旋律段落。

Color melody occurs within a space packet, and different space packets are treated as different melodic paragraphs.

按旋律的语义作用，色彩旋律可分为三种形式：M-L 旋律，分面旋律，点旋律。

According to the semantic function of melody, color melody can be divided into three forms: M-L melody, faceted melody and dot melody.

11-1. M-L Melody | M-L 旋律

M-L 旋律是膜和弦+线和弦语句的省略形式，语句中的和弦被省略为音符，产生 M-L 旋律进行（melodic progression）。

The M-L melody is an abbreviated form of the Membrane chords + line chord sentence. The chords in the sentence are omitted as notes, resulting in an M-L melody progression.

M-L 旋律发生在膜和弦与线和弦之间，膜和弦具有寻找线和弦形成空间包的倾向，这种倾向称为：膜和弦解决（solve）。

The M-L melody occurs between the Membrane chords and the line chord. The Membrane chords has a tendency to find the line chord to form a space packet. This tendency is called: Membrane chords solve.

在七声音阶（Heptachord）中，减七和弦（Diminished 7th）向主和弦解决（solve）。

In the Heptachord, the Diminished 7th is resolved to the tonic.

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在爵士音阶系统中，全音阶和弦向主和弦解决。

In the Weak Tonal System, the Diatonic is resolved toward the tonic.

主和弦为大三和弦（闭和弦）时，膜和弦向着轮廓线解决。

When the tonic is a major triad (closed chord), the Membrane chords is resolved toward the contour line.

主和弦为小三和弦（开和弦）时，膜和弦向着分面线解决。

When the tonic is a minor triad (open chord), the Membrane chords is resolved toward the Fecet line.

和弦解决语句中，和弦省略为音符（色）时，表现为色彩旋律，产生色相知觉。

In the chord resolved sentence, when the chord is omitted as a note (color), it is expressed as a color melody and produces a sense of hue.

膜和弦各音符（色）都可以向线和弦各音符（色）解决，但以下形式比较常见：

Each note (color) of the Membrane chords can be solved by the note (color) of the line chord, but the following forms are more common:

导音（leading note）-主音（key-note）语句：导音（leading note）是与主音（key-note）相邻的膜和弦音符（色），具有最强的解决（solve）倾向。

Leading note-key-note sentence: Leading note is the Membrane chords note (color) adjacent to the key-note, which has the strongest tendency to solve.

与主和弦的三度，五度相邻的膜和弦音符（色），可向着主和弦三度，五度解决，见下图：

The Membrane chords note (color) adjacent to the third and fifth degrees of the tonic can be solve toward the third and fifth of the tonic, as shown in the figure below:

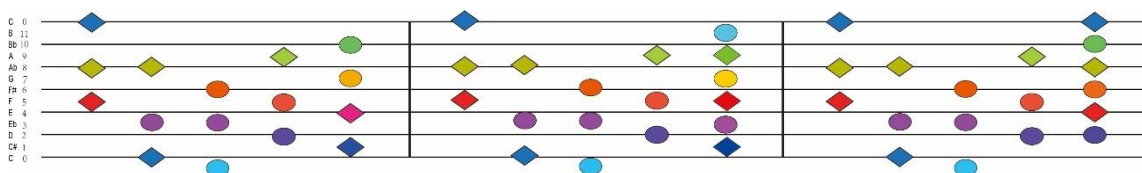


图 11.1、M-L 解决语句

Figure 11.1, M-L resolved statement



图 11.2、系统背景上，减七和弦（Diminished 7th）的两个色分别向主和弦上的根音（root-note）、五度（fifth）作 M-L 解决。

Figure 11.2. On the background of the system, the two colors of Diminished 7th are resolved by M-L to the root-note and fifth of the tonic.

11-2.Facet Melody |分面旋律

分面旋律是最常见的色彩旋律进行（melodic progression），用于在空间包上产生不同亮度的分面，不同亮度的分面由不同音符（色）构成，称为：分面旋律。

Faceted melody is the most common color melody progression (melodic progression), which is used to produce facet of different brightness on the space packet. The faceg of different brightness are composed of different notes (colors), called: faceted melody.



图 11.3、分面旋律表达的明-暗分面

Figure 11.3: Light-dark Facet line expressed by faceted melody

分面旋律只适用膜和弦，大调的分面旋律只发生在一个膜和弦内，小调的分面旋律可发生在多个膜和弦之间。

The faceted melody only applies to the Membrane chords, the faceted melody of the major key only occurs in one Membrane chords, and the faceted melody of the minor key can occur between multiple Membrane chords.

正序旋律与反序旋律：在平均律（Equal Temperament）色环中，红色（E）的能量级最低，紫红色（bE）的能量级最高，其它色的频率高-低是相对的，如：绿色相对黄色，绿色频率更高。

Positive order melody and reverse order melody: In the Equal Temperament color circle, red (E) has the lowest energy level, magenta (bE) has the highest energy level, and the high-low frequencies of other colors are relative, such as : Green is relatively yellow, and green has a higher frequency.

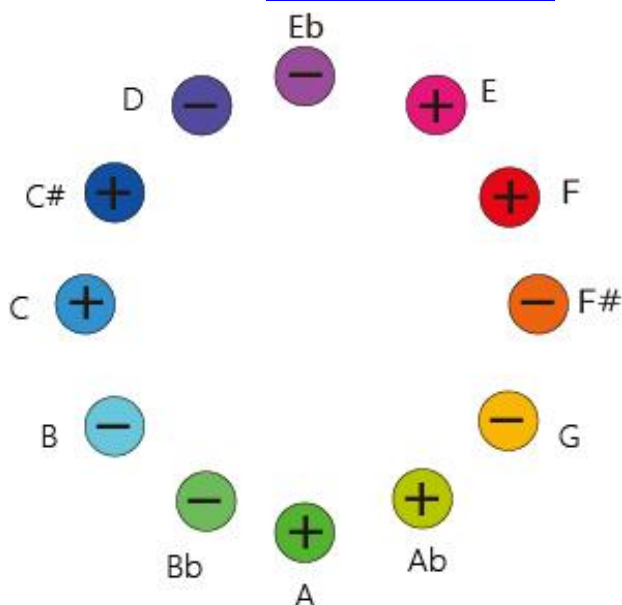


图 11.4、平均律色环

Figure 11.4, equal temperament color circle

分面旋律分为：正序旋律与反序旋律。

Faceted melody is divided into: Positive order melody and reverse order melody.

正序旋律：相对高频色在亮部，相对低频色在暗部。

Positive order melody: relatively high frequency colors are in the bright part, and relatively low frequency colors are in the dark part.

反序旋律：相对高频色在暗部，相对低频色在亮部。

Reverse melody: relatively high frequency colors are in the dark part, and relatively low frequency colors are in the bright part.

正序旋律具有图形（近）倾向，反序旋律具有背景（远）倾向，这一特征可表现在调性，无调性体系中。

The positive sequence melody has a figure (near) tendency, and the reverse sequence melody has a background (far) tendency, which can be manifested in the tonality and atonal system.

调性系统中，正序旋律通常出现在构成图形的小调上，反序进行旋律通常出现在构成背景的大调上，也出现可在同一个调中，表现相对图-底关系，见下图：

In the tonal system, the Positive order melody usually appears on the minor key that constitutes the figure, and the reverse order melody usually appears on the major key that constitutes the

background. It can also appear in the same key, showing the relative figure-ground relation, as shown in the figure below.

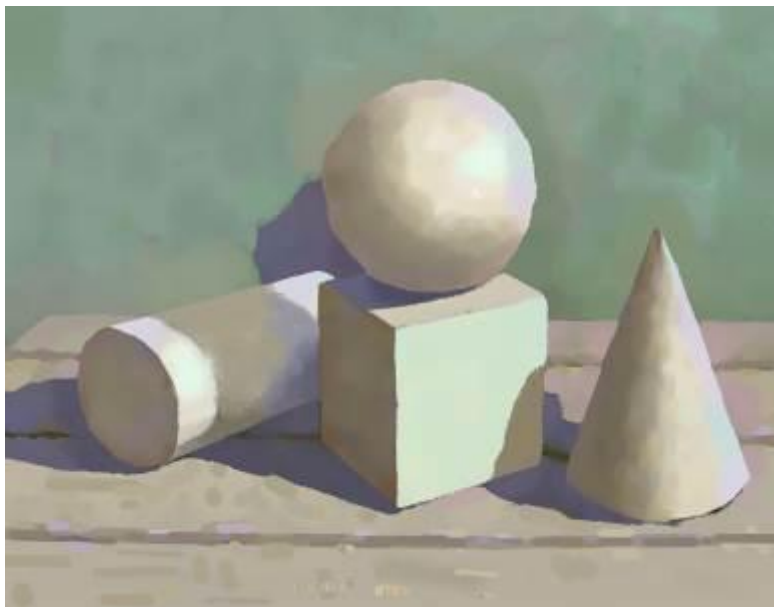


图 11.5、七声音阶（Heptachord）旋律进行：图形（石膏几何形）为升 f 小调，采用正序旋律，背景（墙，桌面）为 A 大调，采用反序旋律。

Figure 11.5. Heptachord melody progress: the figure (plaster geometry) is in f-sharp minor and the Positive order melody is adopted, and the background (wall, desktop) is in A major and the reverse order melody is adopted.

正序旋律，反序旋律通常用于区别图-底关系（figure-ground relation），在图-底关系不确定系统中，可减弱正序，反序旋律的区别。

Positive order melody and reverse order melody are usually used to distinguish the figure-ground relation. In the figure-ground relation uncertain system, the difference between the positive order and the reverse order melody can be weakened.

11-3、Point Melody |点旋律

“点”是线和弦的特殊形式，用于表达一维空间上的点，如：端点，角点等，只适用于三和弦。

"Point" is a special form of line chords, used to express points in one-dimensional space, such as endpoints, corners, etc. It is only suitable for triads.

线和弦由三个音符（色）构成，表达 1 维几何语义，但是当线和弦（闭和弦，开和弦）上出现点、

端点、角点时，三和弦转为分解和弦（broken chord）形式，出现在点、端点、角点上。

line chords are composed of three notes (colors), expressing the semantics of one-dimensional space, but when points, endpoints, and corners appear on the one-dimensional line chords (closed chords, open chords), the triads are converted to broken chords. , Appears on points, endpoints, and corners.

见下图：#F 小调主和弦转为分解和弦，出现在：点，端点，角点处。

See the picture below: The #F minor tonic is converted into a broken chord, which appears at: point, end point, corner point.



图 11.7、#F 小调主和弦（tonic）变为分解和弦（broken chord）表达图形上的点，角点，端点等

Figure 11.7, #F minor tonic becomes broken chord to express the points, corners, endpoints, etc. on the figure.

11-4、Parallel Melody |并行旋律

同调的空间包上出现多组旋律，称：并行旋律，常用于区别色相，分面与投影，相对图形与相对背景等。

There are multiple sets of melodies on the same key space packet, called: parallel melodies, which are often used to distinguish hue, facet and projection, relative figure and relative background, etc.

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图 11.8、并行旋律

Figure 11.8, Parallel Melody

上图的衬布上有三组分面旋律，有正序旋律，也有反序旋律，称为：并行旋律。

There are three-group faceted melody on the lining cloth of the above picture, there are positive melody and reverse melody, called: parallel melody.

12. Non-Chord Tone | 和弦外色

和弦外音 (non-chord tone)，调内的和弦之外的色，在和弦绘画中通常有两种用途：1、产生亚旋律；2、削弱色相、和弦的确定性，在和弦绘画中常用的有：邻音 (Neighbor note)，非离散 (non-discrete)，持续音 (pedal point)、延留音 (Vorhalt)、先现音 (Anticipation) 等。

Non-chord tone, the color outside the chord within the key, usually has two uses in chord painting: 1. Produce sub-melody; 2. Weaken the certainty of hue and chord. Commonly used in chord painting are: neighbor note, non-discrete, pedal point, vorhalt, anticipation, etc.

和弦外色 (non-chord color) 有几种常见形式：

There are two common forms of non-chord color:

和弦的频率偏移，如：邻音 (Neighbor note)，非离散 (non-discrete)。

The frequency offset of the chord, such as: Neighbor note, Glide.

和弦空间区域偏移，如：持续音 (pedal point)、延留音 (Vorhalt)、先现音 (Anticipation)。

The chord space area offset, such as: continuous tone (pedal point), sustained tone (Vorhalt), anticipation (Anticipation).

12-1. Frequency Offset | 频率偏移

和弦频率偏移的形式很多，按照用途可归入两类：1、产生亚旋律，2、削弱和弦内色的色相确定性。

There are many forms of chord frequency offset, which can be classified into two categories according to their purposes: 1. to generate sub-melody, 2. to weaken the hue certainty of the colors in the chord.

邻音 (Neighbor note)：用于产生分面亚旋律，通常是膜和弦的和弦外色。

Neighbor note: used to produce faceted sub-melody, usually the chord outer color of the Membrane chords.

下图为增三和弦构成的无调性系统，图形上与背景上都有由邻音 (Neighbor note) 产生的亚旋

律，图形上用于表现分面，背景上用于表现投影。

The figure below shows an Atonal system composed of augmented triads. There are sub-melody generated by Neighbor notes on the figure and on the background. The figure is used to express facet, and the background is used to express projection.

邻音（Neighbor note）可以改变音符的正-负属性，正音符具有背景（远）的倾向，负音符具有图形（近）的倾向，常用于改变特定空间区域的景深。

Neighbor notes can change the positive-negative properties of notes, positive notes have a background (far) tendency, and negative notes have a figure (near) tendency, often used to change the depth of field in a specific spatial area.



图 12.1、邻音（Neighbor note）产生的景深

Figure 12.1. Depth of field generated by Neighbor note

非离散（non-discrete），和弦系统基于特定离散值，采用了非离散处理后，和弦特征削弱，可以削弱色相的确定性，表达色相不确定的对象，如：水、玻璃等。

non-discrete: The chord system is based on specific discrete values. After the non-discrete

treatment is adopted, the chord features will be weakened, which can weaken the certainty of the hue and express the objects with uncertain hue, such as water and glass.

下图的水面使用了非离散（non-discrete）处理，削弱了水面的色相的确定性。

The water surface below uses non-discrete treatment, which reduces the certainty of the hue of the water surface.



图 12.2、爵士音阶 C 大调

Figure 12.2, Weak Tonal System C major

12-2.Space Region Offset | 空间区域偏移

和弦空间区域偏移通常表现为：线和弦与膜和弦互相跨界，进入对方的空间区域，类似音乐中的持续音（pedal point）、延留音（Vorhalt）、先现音（Anticipation），通常用于表达空间系统所需要的模糊性。

The offset of the chord space area is usually expressed as: the line chord and the membrane chord cross each other and enter the space area of Used to express the ambiguity required by spatial systems.

在下图中的天空部分，主和弦（线和弦）与全音阶和弦（膜和弦）互相越界，导致和弦结构与和弦语义含混，并产生空间景深，类似音乐中的：持续音（pedal point），延留音（Vorhalt），先现音（Anticipation）。

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In the sky part in the picture below, the tonics (line chords) and the Diatonics (membrane chords) cross each other, resulting in the chord structure and the chord semantics being ambiguous, and the spatial depth of field is generated, similar to music: pedal point, Vorhalt, anticipation.



图 12.4、爵士音阶 A 大调

Figure 12.4, Weak Tonal System A major

空间区域偏移通常发生在线和弦与膜和弦之间，其它形式有待观察。

The spatial region offset usually occurs between the online chord and the Membrane chords, other forms are to be seen.

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13. Multi-layered Tuning And Cosmic Models | 多层调群与宇宙模型

一个和弦空间系统包含多个和弦包（调），称为：调群，它是以和弦包（调）为单位的组织形式。

A chord space system contains multiple Chord packets (key), called: key group, which is an organizational form of Chord packets (key) as a unit.

和弦语言中包含多种调群：图-底大小调（Figure-Ground Major-Minor），平行大小调（Parallel Major-Minor），B-C#-A 调群，T-D-S 调群，前两种是同导音膜和弦（Leading note Membrane chords）调群，是同层空间系统，在前面的第 6 章、第 9 章已经介绍；本章只介绍不同导音膜和弦（Leading note Membrane chords）构成的调群：B-C#-A 调群与 T-D-S 调群，这类调群包含多个膜和弦，分别具有不同的完形状态；称为：多层调群。

The chord language contains multiple key groups: Figure-Ground Major-Minor, Parallel Major-Minor, B-C#-A key group, T-D-S key group, the first two are same Leading note Membrane chords key group is a same-layer space system, which has been introduced in the previous chapters 6 and 9; this chapter only introduces the key group composed of different leading note Membrane chords: B-C#-A key group and T-D-S key group. This type of keys group contains multiple Membrane chords, each with a different Gestalt state; it is called: multi-layer key group.

多层调群包含多个膜和弦，具有完形级别；三个减七和弦构成的 B-C#-A 调群是和弦时空的全局组织形式，与天体、生命秩序相关。

The multi-layer keys group contains multiple Membrane chords and has a Gestalt level; the B-C#-A keys group composed of three diminished 7th is the global organization of chord space time, which is related to the order of celestial bodies and life.

13-1.B-C#-A Key Group |B-C#-A 调群

B-C#-A 是三个减七和弦{B,Ab,F,D}，{C#,Bb,G,E}，{A,F#,Eb,C}的缩写，减七和弦的完形差异产生 B-C#-A 调群的解决方向与主次秩序。

三个减七和弦的完形状态分别是：

1、{B,Ab,F,D}，闭合，完形。

1. {B,Ab,F,D}, closed, gestalt.

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2. {C#,Bb,G,E}, 闭合-非闭合兼容, 准完形。

2. {C#,Bb,G,E}, closed-non-closed compatibility, middle Gestalt.

3. {A,F#,Eb,C}, 非闭合, 弱完形。

3. {A,F#,Eb,C}, non-closed, weak-Gestalt.

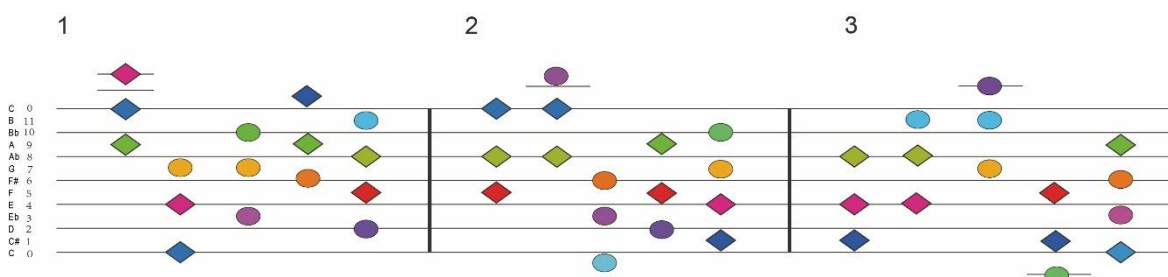


图 13-1.1、{B,Ab,F,D}-{C#,Bb,G,E}-{A,F#,Eb,C} 调群

Figure 13-2.1, {B,Ab,F,D}-{C#,Bb,G,E}-{A,F#,Eb,C} keys group

解决规则：B-C#-A 调群依照导音减七和弦（leading note diminished 7th）的完形性产生主次秩序，完形性相对较高的调群为主调群，完形性相对较低的调群为次调群，完形性较低的调群向完形性较高的调群解决。（参见：8、减七和弦的完形性）

Resolved rule: B-C#-A keys group produces primary and secondary order according to the leading note diminished 7th gestalt. The key group with relatively high gestalt is the main keys group, and the gestalt is relatively low. The keys group of is the sub-keys group, and the keys group with lower gestalt is resolved to the keys group with higher gestalt. (See: Diminished 7th And Gestalt)



图 13-1.2、B-C#-A 调群

Figure 13-1.2.B-C#-A key group

说明：前面的正方体与圆球体是{B,Ab,F,D}，闭合图形，完形，是系统主调群（Main key group）。

Explanation: The cube and sphere in the front are the diminished {B,Ab,F,D}, which is a closed figure with the highest gestaltness, and is the main key group of the system.

中间的分面球与十字锥，{C#,Bb,G,E}，闭合，准完形，充当系统次调群（second key group）。

The facet sphere and cross cone in the middle, {C#,Bb,G,E}, closed, quasi-gestalt, act as the second key group of the system.

墙上的石膏挂像，{A,F#,Eb,C}，开放图形，弱完形，只能充当系统最次调群（last key group）。

The plaster statues on the wall, {A,F#,Eb,C}, open figure, weak gestalt, can only serve as the last key group of the system.

B-C#-A 调群也可以采用省略形式：只含两个减七和弦。

The B-C#-A key group can also be omitted: it contains only two diminished 7th.

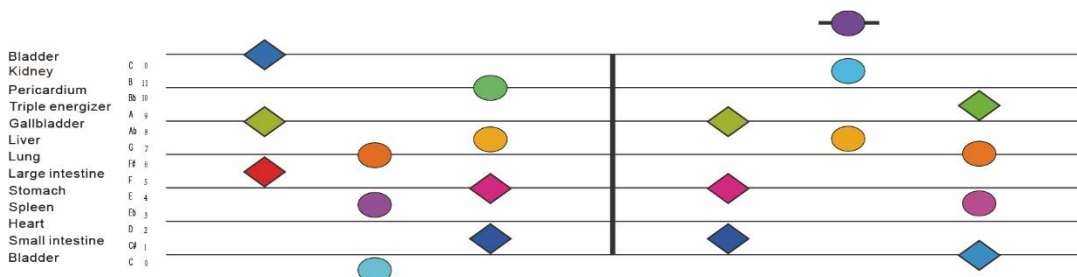


图 13-1.3、B-C#-A 调群的省略形式：{C#,Bb,G,E},{A,F#,Eb,C}调群

Figure 13-1.3, the omitted form of B-C#-A keys group: {C#,Bb,G,E}, {A,F#,Eb,C} keys group



图 13-1.4、B-C#-A 调群的省略形式：{C#,Bb,G,E}，{A,F#,Eb,C} 调群

Figure 14,the omitted form of B-C#-A keys group: {C#,Bb,G,E}, {A,F#,Eb,C} keys group

前面的正方体，球体，{C#,Bb,G,E}，准完形，充当系统主调群。

The front cube, sphere, {C#,Bb,G,E}, quasi-gestalt, act as the main keys group of the system.

后面墙上的石膏挂像，{A,F#,Eb,C}，开放图形，弱完形，充当系统次调群（last keys）。

The plaster hanging statue on the back wall, {A,F#,Eb,C}, open figure, weak gestalt, acts as the last keys of the system.

B-C#-A 调群的省略形式还可有：{B,Ab,F,D}-{A,F#,Eb,C}调群，{B,Ab,F,D}-{C#,Bb,G,E}调群。

The omission form of B-C#-A keys group can also include: {B,Ab,F,D}-{A,F#,Eb,C} keys group, {B,Ab,F,D}-{C#,Bb,G,E} keys group.

B-C#-A 调群是全局控制调群，可以包含 T-D-S 调群，同层调群。

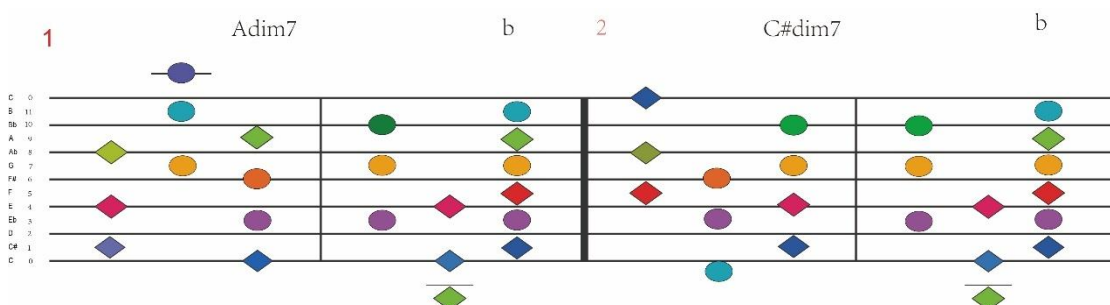
The B-C#-A keys group is a global control keys group, which can include the T-D-S keys group, and the same layer keys group.

13-1.1、The Reverse Resolved Of B-C#-A Key Group |B-C#-A 调群的反常解决

七声音阶 B-C#-A 调群中的个别和弦包可转入其弱调性形式——爵士音阶，B-C#-A 调群也因此包含了两种音阶形式：在这种状态下，爵士音阶和弦包向七声音阶和弦包解决，B-C#-A 和弦包的解决方向与完形状态无关。

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The individual chord packet in the heptachord B-C#-A key group can be transferred to its weak-tonal form—the jazz Scale. The B-C#-A key group therefore contains two scale forms; in this state, the Jazz Scale Chord packet is resolved to the heptachord Chord packet, and the resolved direction of the B-C#-A Chord packet has nothing to do with the Gestalt state.



13-3.1、七声音阶-爵士音阶混合的 B-C#-A 调群

13-3.1, B-C#-A keys group mixed with heptachord-jazz Scale

在下面的两个例图中，石膏正方体与球体为爵士音阶和弦包，墙上的石膏挂像为七声音阶和弦包，完形状态较高的爵士音阶和弦包向完形状态较低的七声音阶和弦包解决。

In the following two examples, the plaster cube and the sphere are the diatonic Chord packets, and the plaster hanging image on the wall is the heptachord Chord packet. the diatonic Chord packet with the higher gestalt state is resolved to the heptachord Chord packet with the lower gestalt state.



图 13-3.2、七声音阶降 A-d 调与爵士音阶，降 b-E 调混合调群

Figure 13-3.2, the mixed keys group of the heptachord A flat-d and the jazz Scale b flat-E

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图 13-3.3、七声音阶 C，升 f 调与爵士音阶降 b-E 调混合调群

Figure 13-3.3, the heptachord C, f-sharp tone and the jazz Scale b flat-E tone mixed tone group

独立的爵士音阶和弦包不含完形语义，但在七声音阶调群中的爵士音阶和弦包可以获得完形语义：与其三和弦在七声音阶中的完形语义一致。

The independent jazz Scale Chord packet does not contain Gestalt semantics, but the jazz Scale Chord packet in the heptachord key group can obtain the Gestalt semantics: it is consistent with the Gestalt semantics of its triad in the heptachord.

13-1.2.Chord Universe Model|和弦宇宙模型

B-C#-A 调群是和弦语言（和弦时空）的全局组织结构，也可视作和弦宇宙模型。

The B-C#-A key group is the global organization structure of the chord language (chord space-time), and can also be regarded as a chord universe model.

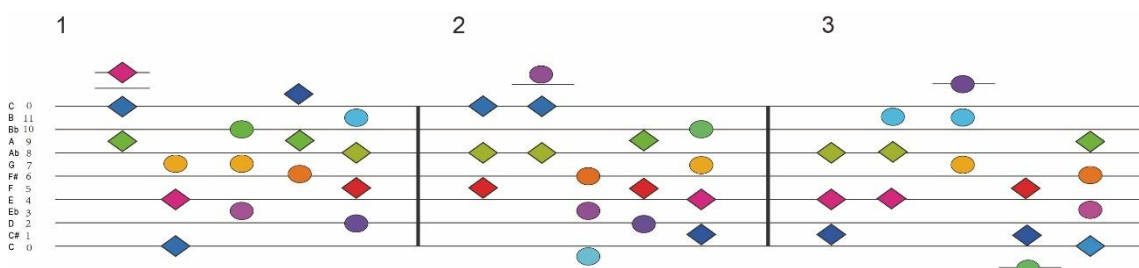


图 13-1.1、{B,Ab,F,D}，{C#,Bb,G,E}，{A,F#,Eb,C}调群

Figure 13-1.1, {B,Ab,F,D}, {C#,Bb,G,E}, {A,F#,Eb,C} keys group

和弦宇宙模型的两个基本法则：

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Two basic laws of the chord universe model:

1) 和弦语言中，纯大调构成非生命空间（天体），纯小调构成生命空间，两者是七声音阶的±大-小调对称法则体现，生命是和弦宇宙的必然部分。

1) In the chord language, the pure major scale constitutes the non-living space (celestial body), and the pure minor scale constitutes the living space, both of which are the embodiment of the ± major-minor symmetry law of the heptachord, and life is an inevitable part of the chord universe.

2) 和弦空间按照完形性产生天体-生命秩序，完形性高的和弦包处于主导地位，完形性较低的和弦包处于被从属地位。

2) The chord space produces the order of celestial bodies-life according to gestalt, the chord packet with high gestalt is in the dominant position, and the chord packet with lower gestalt is in the subordinate position.

完形性较高的纯大调和弦包处于非生命空间（天体）的中心，完形性较低的纯大调和弦包处于非生命空间（天体）的边缘。

The pure major chord packet with higher gestalt is at the center of non-living space (celestial body), and the pure major chord packet with lower gestalt is at the edge of non-living space (celestial body).

完形性较高的纯小调和弦包在生命系统中处于主导地位，完形性较低的纯小调和弦包在生命系统中处于从属地位。

The pure minor chord packet with higher gestalt is dominant in the life system, and the pure minor chord packet with lower gestalt is in the subordinate position in the life system.

13-2.T-D-S Key Group |T-D-S 调群

T-D-S 调群是 T-D-S 三和弦的转调形式，用于表达空间系统中不同亮度的分形-分面关系；较 T-D-S 三和弦具有更高的确定性。

The T-D-S keys groups is a transition form of the T-D-S triad, which is used to express the fractal-facet relationship of different brightness in the spatial system; it has a higher certainty than the T-D-S triad.

T-D-S 调群是七声音阶（heptachord）调群，其中的属和弦（Dominant）、下属和弦

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(Subdominant) 分别转为属调 (dominant key)、下属调 (Subdominant Key), 两调使用爵士音阶形式, 常见形式是: 三和弦+导音 (leading note) 增三和弦。

The T-D-S key group is a heptachord Key group, in which the Dominant and Subdominant chords are converted to the dominant key and Subdominant Key respectively, and the two keys use the jazz scale form. The common form is: Triad + leading note augmented triad.

大调的属调 (dominant key)、下属调 (Subdominant Key) 表达不同亮度的分形图形; 小调的属调 (dominant key)、下属调 (Subdominant Key) 表达同一图形上不同亮度的分面。

The dominant key and subdominant key of the major key express fractal figure of different brightness; the dominant key and the subdominant key of minor key express the facet of different brightness on the same figure.

T-D-S 调群与 T-D-S 三和弦一样: 副调群 (second key group) 服从正调群 (first key group) 的和弦亮度级关系。

The T-D-S keys group is the same as the T-D-S triad: the second key group obeys the chord intensity relationship of the first key group.

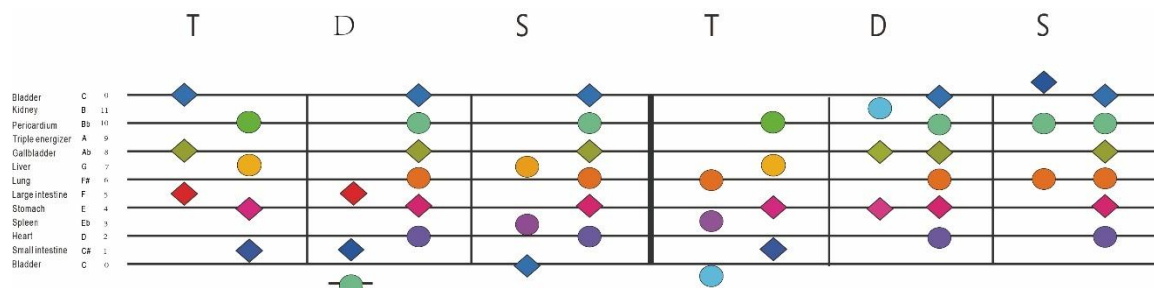


图 13-2.1、1 栏: C 大调 T-D-S 调群; #F 小调 T-D-S 调群

Figure 13-2.1, column 1: C major T-D-S key group; #F minor T-D-S key group



13-2.2、#F 小调、C 大调 T-D-S 调群

13-2.2, #F minor, C major T-D-S key group

#f 小调（石膏图形），亮面=#f 小调-属调（dominant key）；暗面=#f 小调-下属调（Subdominant Key），中间色=#f 小调主和弦。

#f minor (gypsum graphics), bright side = #f minor-dominant key; dark side = #f minor-subdominant key, middle color = #f minor major chord.

C 大调（背景）：墙上的白色挂盘=C 大调的属调（dominant key）；墙上的黑色挂盘=C 大调的下属调（Subdominant Key）。中间色背景=C 大调主和弦。

C major (background): the white hanging plate on the wall = the dominant key of C major; the black hanging plate on the wall = the subdominant key of A major. Mid-color background = C major major chord.

13-2.2、Solar System Model|太阳系模型

T-D-S 调集团中，各调存在完形状态差异，这种差异来自三和弦隐含的导音减七和弦。

In the T-D-S key group, there are differences in the Gestalt state of each key, and this difference comes from the leading diminished 7th implied by the triad.

太阳系（恒星系）是 C 大调 T-D-S 调集团系统，下属调构成太阳，属调构成地球，主调构成背景空间。(见图：13-2.2)

The solar system (star system) is a group system in the key of C major, T-D-S. The subordinate key

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constitutes the sun, the dominant key constitutes the earth, and the tonic key constitutes the background space. (See Figure: 13-2.2)

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14、Chord Spacetime | 和弦时空

24 届世界哲学大会会议论文

Papers of the of 24th World Congress of Philosophy

自然依托于时空框架，现存两种时空体系：

和弦时空——基于和弦（量子化频谱），构成和弦场，常用于音乐、绘画等，描述内在结构与自组织关系；非和弦时空——屏蔽和弦，依赖外部参考系（时钟、尺子、参照物），常用于经典物理学，构建相对性经验与概念。

和弦时空基于内在频谱的共振结构，非和弦时空则基于测度与坐标系统。

Nature depends on the space-time framework, there are two space-time systems:

Chord space-time - based on the chord (quantized spectrum), constitute the chord field, often used in music, painting, etc., to describe the internal structure and self-organization relationship; Nonchord spacetime - shielded chords, dependent on external reference frames (clocks, rulers, referents), often used in classical physics to construct relativistic experiences and concepts.

The chord space-time is based on the resonance structure of the intrinsic spectrum, while the non-chord space-time is based on the measure and coordinate system.

和弦时空由和弦表达，取值公式： $n.f, H^{n.f}$ ($H=1.059463, n=$)。 ($n.f) h$ ($h=6.626 \times 10^{-34}$) 得到普朗克量子假设，其中 $f1-f6$ 形成大三和弦， $f1-f7$ 形成属 7 和弦， $f1-f9$ 形成属 9 和弦，“量子化”与和弦相关。

Chord spacetime is expressed by chords, and the value formula is: $n.f, H^{n.f}$ ($n=1,2,3,..., H=1.059463$). ($n.f)h$ ($h=6.626 \times 10^{-34}$) gives Planck's quantum hypothesis, where $f1-f6$ forms a major triad, $f1-f7$ forms a dominant 7th chord, and $f1-f9$ forms a dominant 9th chord. "Quantization" is related to chords.

和弦时间与和弦空间镜像对称： $\{-7, -4, 0, 4, 7\} \bmod 12$ （互为反和弦，反调），可数学转换，空间具有定域性，时间具有非定域性，表现为时空二相性（波粒二相性）。

Chord time and chord space are mirror-symmetric: $\{-7, -4, 0, 4, 7\} \bmod 12$ (mutually anti-chords and anti-tuning), which can be mathematically converted. Space is local and time is non-local, which

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manifests as the duality of space and time (wave-particle duality).

和弦具有几何语义（开弦，闭弦，膜弦），表达空间的状态与作用，并产生空间场。

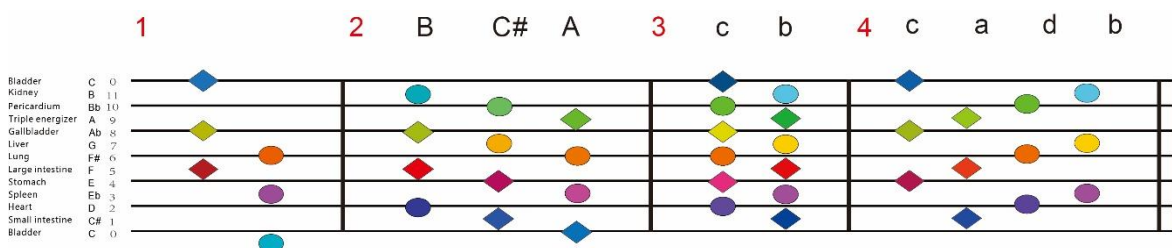
Chords have geometric semantics (open string, closed string, membrane string), express the state and action of space, and generate spatial fields.

音符具有±属性，这是频率的物理属性，应涉及所有波动、频率相关现象，如：电磁场，量子场。

Notes have \pm properties, which are the physical properties of frequency and should be involved in all wave and frequency-related phenomena, such as electromagnetic fields and quantum fields.

和弦时空是量子化的时空框架。

Chord space-time is a quantized space-time frame.



基本和弦表：1-1、大三和弦（闭弦），1-2、小三和弦（开弦）、2、减七和弦（膜弦）、3、全音阶和弦（膜弦），4、增三和弦（膜弦）

*和弦频谱公式： $n*f$, H^n*f , ($H=1.059463$, $n \in \mathbb{Z}$)

*符号：◆=+ 音符，●=- 音符，音符色=色荷

*本文使用 mod12 记谱法

Basic chord table: 1-1, major triad (closed string), 1-2, minor triad (open string), 2, diminished 7th (membrane string), 3, diatonic chord (membrane string), 4, augmented Triads (membrane strings)

* Chord spectrum formula: $n*f$, H^n*f ($H=1.059463$, $n \in \mathbb{Z}$)

* Symbol: ◆=+ note, ●=- note, note color = color charge

** This article uses mod12 notation

关键词 | Keywords: 和弦时空、量子化、和弦场、音乐、绘画、电磁场、弦理论

Chord spacetime, quantization, chord field, music, painting, electromagnetic field, string theory

14-1.The Structure Of Chord Spacetime |和弦时空的结构

和弦由“音符”组成，这是和弦时空的“基本粒子”，音符为特定离散值 (n^*f , $H^n n^*f$)，具有正-负属性与十二种色荷，总数为 12^n 。

A chord is made up of "notes", which are the "elementary particles" of chord space-time, and the notes are specific discrete values (n^*f , $H^n n^*f$), with positive-negative properties and twelve color charges, for a total of 12^n .

和弦是和弦时空的“单词”，线和弦（开弦，闭弦）定义膜和弦（膜弦）的边界（轮廓线，分面线等），由此产生时空，时空（宇宙）开始于和弦。

Chords are the "words" of chord space-time, line chords (open, closed string) define the boundaries (contours, Fecet line, etc.) of membrane chords (membrane string), from which space-time arises, and space-time (the universe) begins at chords.

线和弦定义膜和弦的边界，产生和弦包（调），这是和弦时-空的基本单位。

Line chords define the boundaries of membrane chords, producing chord packets (keys), which are the basic unit of chord space-time.

多个和弦包（调）组成和弦包群（调群），这是和弦时空的全局形式，和弦系统是一个由调群控制的整体，其中的音符，和弦，和弦包（调）相互联系，协同作用。

Multiple chord packages (keys) form the chord package group (key group), which is the global form of chord space-time, and the chord system is a whole controlled by the key group, in which the notes, chords, and chord packages (keys) are interrelated and synergistic.

和弦空间的产生原理已在本书前面部分介绍，请回顾前面章节。

The generation principle of chord space has been introduced in the previous part of this book, please review the previous chapter.

*和弦取值的计算方法见：1、和弦数学

* The calculation method of chord value is as follows: 1. Chord mathematics

本文相关图形实验： Graphic experiments related to this article:

[\(PDF\) Chord Painting \(researchgate.net\)](#)

14-2.Chord Packet |和弦包

和弦空间由和弦表达，基本语句形式是：和弦空间包（调），在前面章节已有介绍；本节主要讨论和弦空间包与电-磁现象之间的关系。

The chord space is expressed by chords, and the basic sentence form is: chord space packet (key), which has been introduced in the previous chapters; this section mainly discusses the relationship between the chord space packet and electro-magnetic phenomena.

本章的讨论默认采用爵士音阶，下面分析一个典型的和弦空间包。

The discussion in this chapter uses the jazz Scale by default, and a typical chord space package is analyzed below.

三和弦（开弦，闭弦）定义全音阶和弦（膜和弦）的边界（轮廓线，分面线等），生成爵士音阶的和弦空间包，下面以 C 大调，F#小调为例：

Triads (open chords, closed chords) define the boundaries (contours, Fecet line, etc.) of diatonic chords (membrane chords), and generate the chord space packet of the jazz Scale. The following takes C major and F# minor as examples:

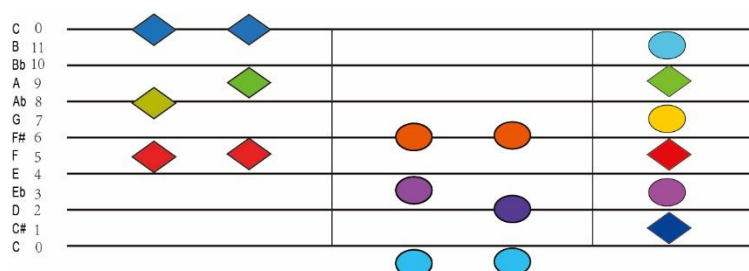


图 14-2.1、爵士音阶和弦包：1、C 大三和弦（闭弦），2、F#小三和弦（开弦），3、全音阶和弦（膜弦）（◆=正音符，●=负音符，色彩=色荷）

Figure 14-2.1, jazz Scale chord package: 1,C major triad (closed string), 2,F# minor triad (open string), 3,diatonic chord (membrane string) (◆=positive note, ●=negative note, color=color charge)

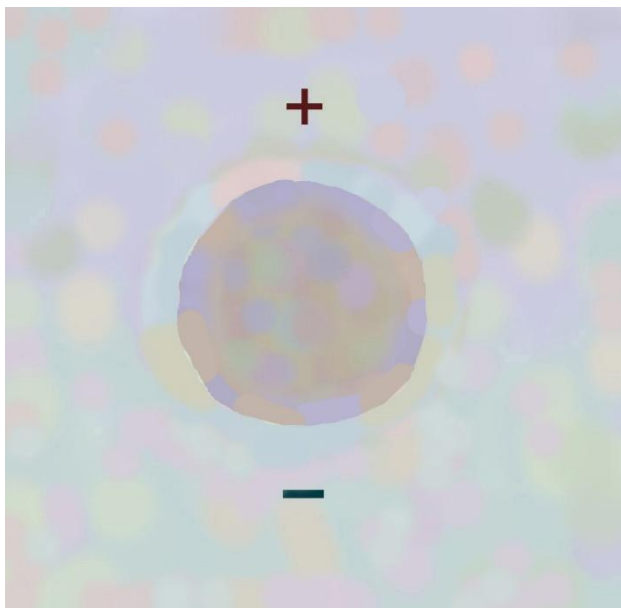


图 14-2.2、爵士音阶，C 大调，f#小调空间包

Figure 14-2.2, jazz Scale C major ,f# minor space packet

实验 1：C 大三和弦（闭弦），构成了图形的闭合轮廓线，全音阶和弦（膜弦）填充所有非线性空间，包括图形与背景。

Experiment 1: The C major triad (closed string) forms the closed contour of the figure, and the diatonic chord (membrane string) fills all non-linear Spaces, including the figure and background.

空间包的轮廓线由大三和弦（闭弦）构成，用于束缚空间包，轮廓线（闭弦）的内部由全音阶和弦（膜弦）充实，线和弦与膜和弦分别构成和弦空间包的外层与内核。

The contour of the space packet is composed of major triads (closed strings), which are used to bind the space packet. The interior of the contour line (closed strings) is enriched by diatonic chords (membrane strings), and the line chord and membrane chord form the outer and inner core of the chord space packet respectively.

原子，天体也是空间形态，是否也是和弦空间包呢？这涉及和弦时空法则的普遍性，空间形态应该服从时空自然法则。

Atoms, celestial bodies are also spatial forms, are they also chord space packages? This involves the universality of the space-time law of the chord, and the spatial form should obey the natural laws of space-time.

观察原子的最好方式是获得完整的视觉经验，这个无法做到，现在将上图 15-3.2 与下面的照片比

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较。

The best way to look at atoms is to get a full visual experience, which can't be done, now compare Figure 15-3.2 with the photo below.

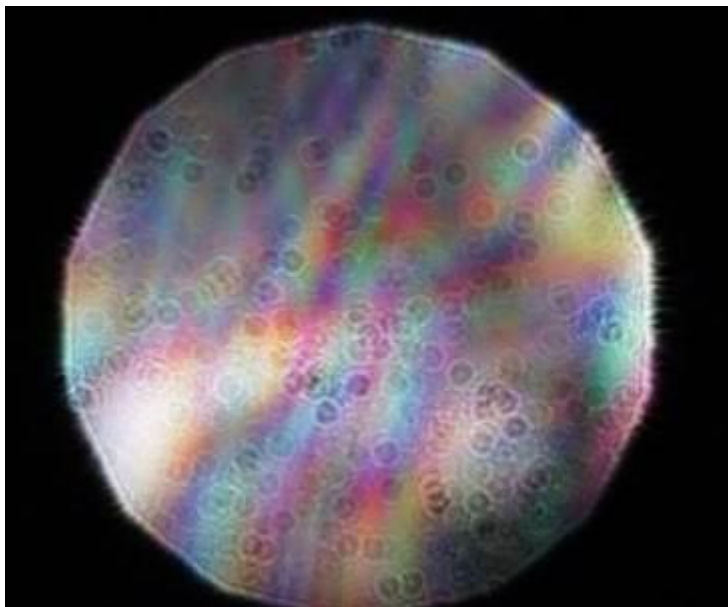


图 14-2.3、孔径光栅显微镜拍摄的铁原子（图片来自互联网）

Figure 14-2.3. Iron atoms taken by aperture grating microscope (picture from Internet)



图 14-2.4、孔径光栅显微镜拍摄的铁原子（图片来自互联网）

Figure 14-2.4. Iron atoms taken by aperture grating microscope (picture from Internet)

14-2.1.Electric Charge And Magnetic Charge |电荷与磁荷

和弦语言；李晓虹；DOI: 10.13140/RG.2.2.25415.65440/3；ISBN:9781370273348；ASIN: B0919JJ3R7

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音符具有正负属性，由此产生和弦的正负属性，正和弦的根音符为正音符，负和弦的根音符为负音符，通常：正和弦为大三和弦（闭弦），负和弦为小三和弦（开弦）。见图：14-2.1

The notes have positive and negative properties, resulting in the positive and negative properties of the chord, the root note of the positive chord is a positive note, the root note of the negative chord is a negative note, generally: the positive chord is a major triad (closed string), and the negative chord is a minor triad (open string). See Figure 14-2.1

【电荷】下图和弦包中包括正和弦（大三和弦，闭弦）与 负和弦（小三和弦，开弦），闭弦构成轮廓线，开弦构成分面线，膜弦充满所有非线性空间。

[Charge] The chord package in the figure below includes positive chords (major triads, closed strings) and negative chords (minor triads, open strings). Closed strings form contour lines, open strings form Fecet line, and membrane strings fill all non-linear spaces.



图 14-2.5、和弦空间包的构成

Figure 14-2.5, the composition of the chord space packet

下面是一组和弦空间包相互作用的视觉实验。

Below is a visual experiment of a set of chord space packages interacting with each other.

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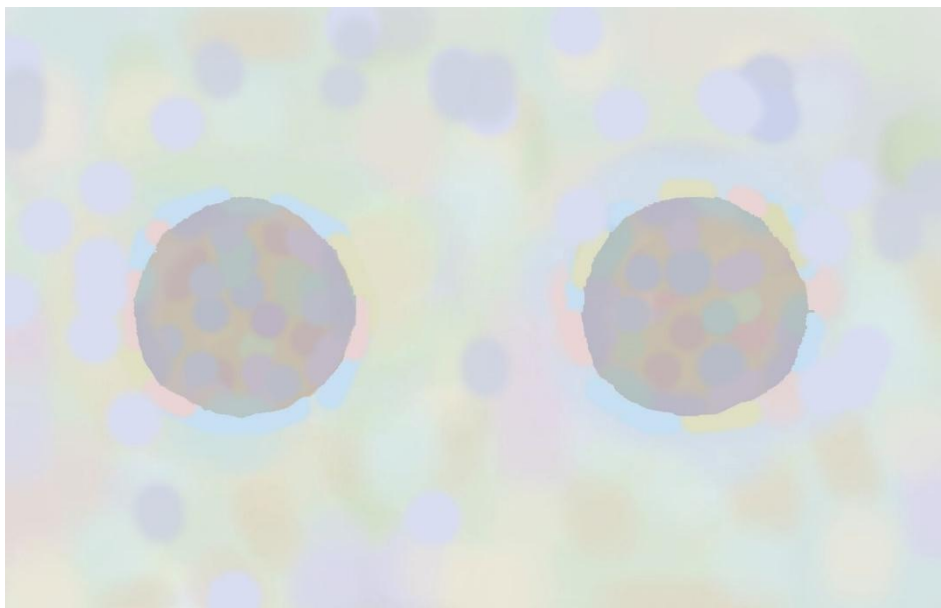


图 14-2.6、左右两个和弦空间包均含有正和弦（大三和弦，闭弦），负和弦（小三和弦，开弦），表现为稳定状态。

Figure 14-2.6. Both the left and right chord space packages contain positive chords (major triad, closed string) and negative chords (minor triad, open string), which are represented as stable states.

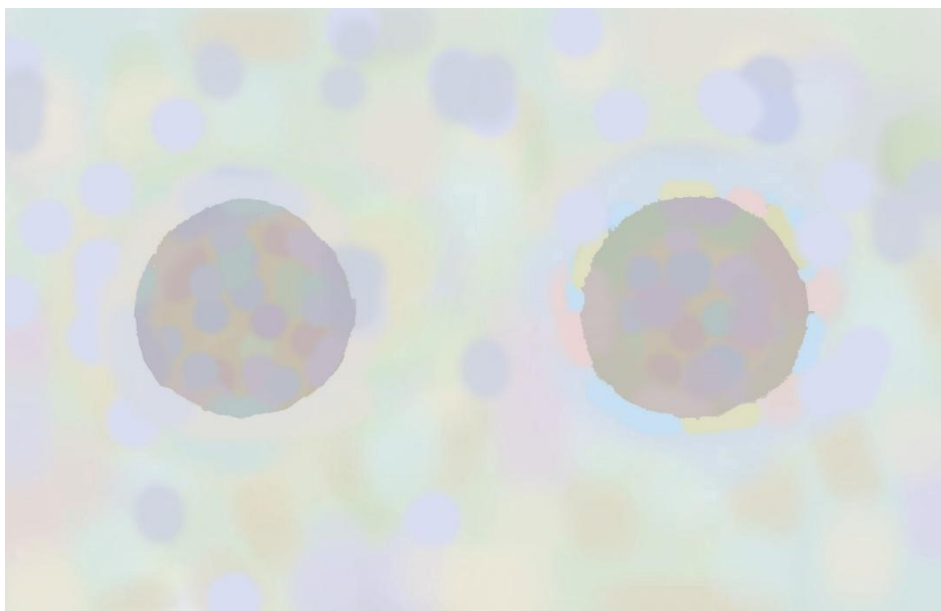


图 14-2.7、左图含大三和弦（正和弦，闭弦），右图含小三和弦（负和弦，开弦），分别为正、负和弦空间包，表现出相互吸引的倾向。

Figure 14-2.7, the left picture contains the major triad (positive chord, closed string), the right picture contains the minor triad (negative chord, open string), respectively, positive and negative chord

space packages, showing a tendency to attract each other.

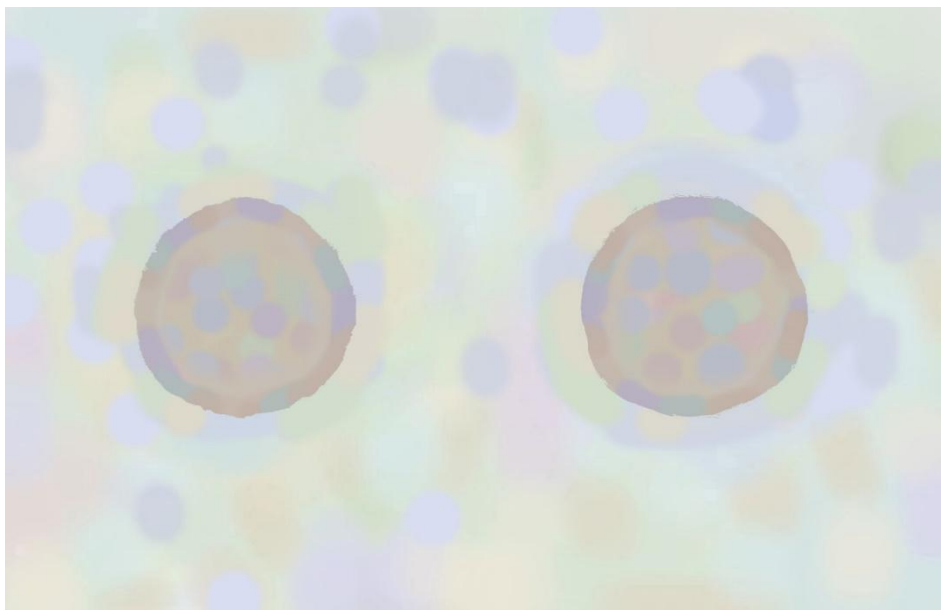


图 14-2.8、左，右两个和弦包都含同种三和弦（小三和弦，负和弦，开弦），表现出相互排斥的倾向。

Figure 14-2.8. Both left and right chord packages contain the same triad (minor triad, negative chord, open string), showing a tendency to exclude each other.

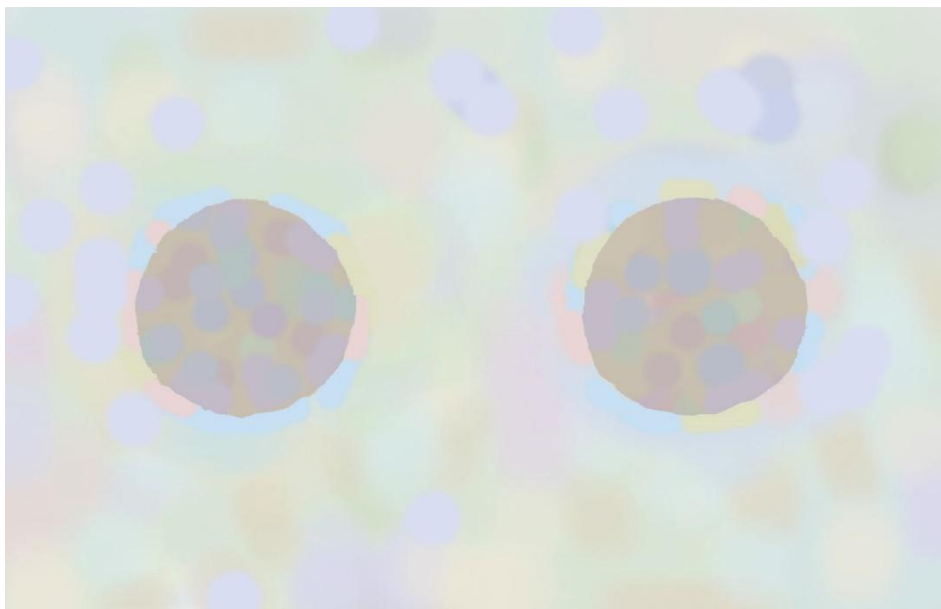


图 14-2.9、左，右两个和弦包都含同种三和弦（大三和弦，正和弦，闭弦），表现出相互排斥的倾向。

Figure 14-2.9, left and right chord packages contain the same triad (major triad, normal chord,

closed string), showing a tendency to exclude each other.

上面的视觉实验中，和弦空间包的表现类似电场效应，两种和弦之间存在库伦力，合理的解释是：正-负电荷来自正-负和弦。

In the above visual experiment, the chord space package behaves like an electric field effect, there is a coulomb force between the two chords, and the reasonable explanation is that the positive-negative charge comes from the positive-negative chord.

大三和弦（闭弦、正电荷）用于构成轮廓线，封闭、束缚空间包，不能脱离和弦空间包，小三和弦（开弦、负电荷）可以自由的出现在和弦空间包的内-外。

Positive major triads (closed strings, positive charges) are used to form contour lines, closed and bound space packet, and cannot be separated from membrane chords space packet, minor triads (open strings, negative charges) can freely appear inside-outside of the chord space packet .

【磁荷】爵士音阶和弦包的膜和弦是全音阶和弦，全音阶和弦包含六个音符，各音符分别具有正-负属性与色荷，所有色荷混合产生白色。

【Magnetic charge】The membrane chord of the chord packet of the jazz Scale is the diatonic chord. The diatonic chord contains six notes, and each note has positive-negative attributes and color charges, and all color charges are mixed to produce white.

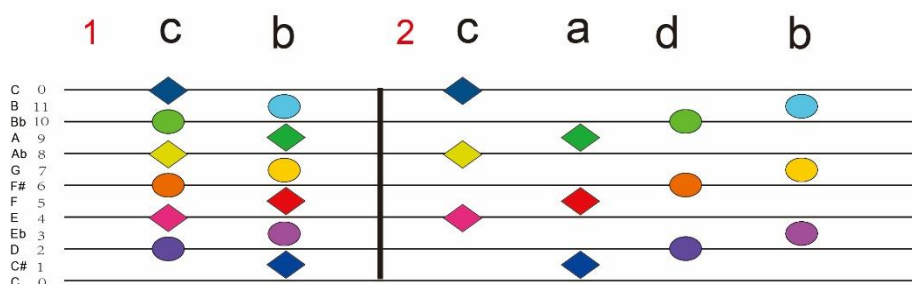


图 14-2.10、1、全音阶和弦；2、增三和弦（◆=正音符，●=负音符，色彩=色荷）

Figure 14-2.10, 1. Diatonic chords; 2. Augmented triads (◆=positive note, ●=negative note, color=color charge)

全音阶和弦充满所有非线性空间——包括空间系统的图形与背景，背景上的全音阶和弦表现出如下特征：其中的正-负音符分别倾向于在图形两端的对立位置聚集，形成正极与负极，类似磁场中的±磁荷分布形态。

Diatonic chords fill all non-linear Spaces, including the figure and background of the spatial system. Diatonic chords on the background show the following characteristics: the positive and

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negative notes tend to gather at opposite positions at both ends of the figure, forming positive and negative poles, similar to the distribution of \pm magnetic charges in a magnetic field.

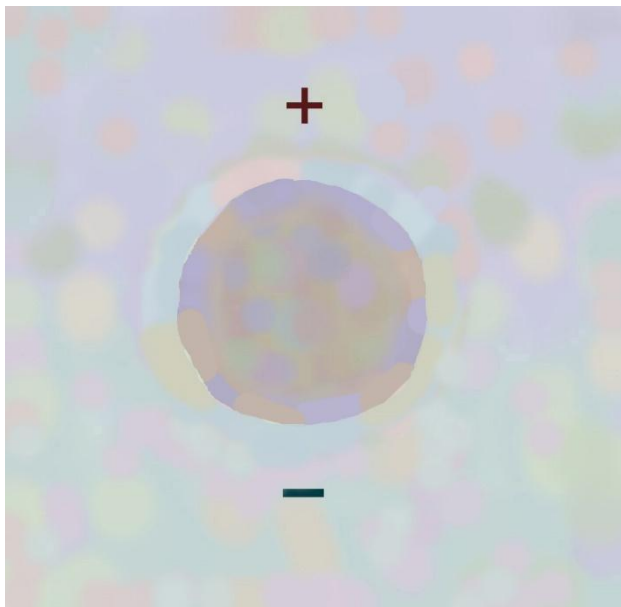


图 14-2.11a、全音阶和弦中的 \pm 音符分布表现出类似 \pm 磁荷的特征

FIG. 14-2.11a. the \pm notes in diatonic chords show characteristics similar to \pm Magnetic charge

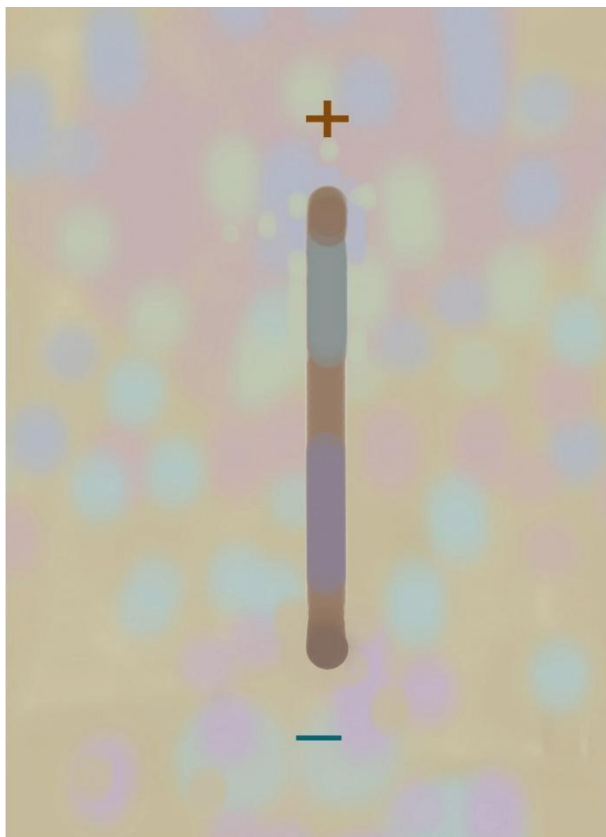


图 14-2.11b、全音阶和弦中的±音符分布表现出类似±磁荷的特征

FIG. 14-2.11b. the \pm notes in diatonic chords show characteristics similar to \pm Magnetic charge

以上观察表明：电荷来自三和弦，磁荷来自膜和弦，大三和弦（正和弦）带正电荷，小三和弦（负和弦）带负电荷，膜和弦中的正-负音符产生正-负磁荷。

The above observations show that the charge comes from the triad, the magnetic charge comes from the membrane chord, the major triad (closed string) has a positive charge, the minor triad (open string) has a negative charge, and the positive-negative notes in the membrane chord produce a positive-negative magnetic charge.

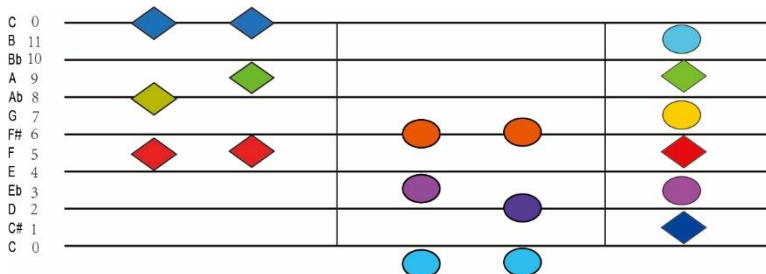


图 14-2.12、爵士音阶和弦包：1、C 大三和弦（闭弦，正电荷），2、F#小三和弦（开弦，负电荷），3、全音阶和弦（膜弦，磁荷）（◆=正音符，●=负音符，色彩=色荷）

CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3, ISBN:9781370273348, ASIN:

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Figure 14-2.12. The chord packet of the jazz Scale: 1, C major triad (closed string, positive charge), 2. F# minor triad (open string, negative charge), 3, diatonic chord (membrane string, Magnetic charge) (◆=positive note, ●=negative note, color=color charge)

大三和弦（闭弦），小三和弦（开弦），等比和弦（膜弦）产生电荷，磁荷，电磁场。

Major triads (closed strings), minor triads (open strings), and isometric series chords (membrane strings) generate electric charges, magnetic charges, and electromagnetic fields.

上面观察表明：±电荷，±磁荷来自±音符。

The above observation shows that ± charge, ± magnetic charge comes from ± note.

大三和弦（闭弦，正电子）与其束缚在内部的膜和弦（膜弦）不能分离，两者共同表现为质子，带正电荷。

The major triad (closed string, positron) cannot be separated from its bound membrane chord (membrane string), which together appear as a proton and are positively charged.

膜弦中的各音符被大三和弦（闭弦，正电子）束缚在和弦包中，类似夸克禁闭与强相互作用。

Each note in the membrane string is bound in a chord package by a major triad (closed string, positron), similar to quark confinement and strong interaction.

开弦在和弦包中产生分离作用：包括分面与图形分裂，类似弱相互作用。

Open strings produce separation effects in the chord package: including faceting and figure splitting, similar to weak interactions.

膜和弦在无调性解决（solution）时，和弦包不含三和弦（正-负电子），表现为不带电荷的中性和弦包（中子）。

Membrane chords In the atonal solution, the chord package contains no triads (positive-negative electrons) and appears as a neutral chord package with no charge (neutrons).

增三和弦（augmented triads）只含有正音符或负音符，不能表现出±磁荷。

augmented triads contain only positive or negative notes and cannot show ± magnetic charges.

天体与原子都是和弦空间包（调），但前者是七声音阶系统，后者是爵士音阶系统，两者具有很大的区别。

Both celestial bodies and atoms are chord space packages (keys), but the former is a heptachord system, the latter is a jazz scale system, and the two have a big difference.

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上面讨论的只是和弦基本形式，和弦还有许多变化形式，包括正开弦，负闭弦等，在本书其它章节中有介绍。

What is discussed above is only the basic form of chords. There are many variations of chords, including positive open chords, negative closed chords, etc., which are introduced in other chapters of this book.

14-2.2.Chord Packet Spectrum |和弦包光谱

和弦空间的基本单位为和弦空间包，各调的和弦空间包都有其特征光谱。

The basic unit of chord space is the chord space packet, and the chord space packet of each key has its characteristic spectrum.

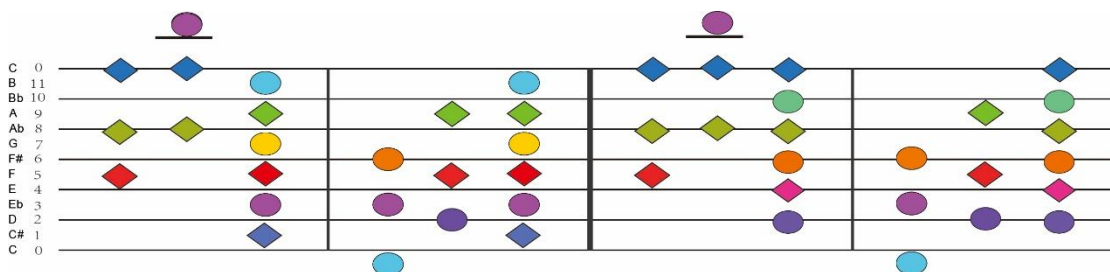


图 14-2.13: C 大调、Eb 小调、f#小调；A 大调和弦包特征光谱

Figure 14-2.13: C major, Eb minor, f# minor; A major chord packet characteristic spectrum

将和弦空间包的特征光谱与原子光谱进行比较，或是个好主意。

It may be a good idea to compare the characteristic spectrum of the chord space Packet with the spectrum of atoms.

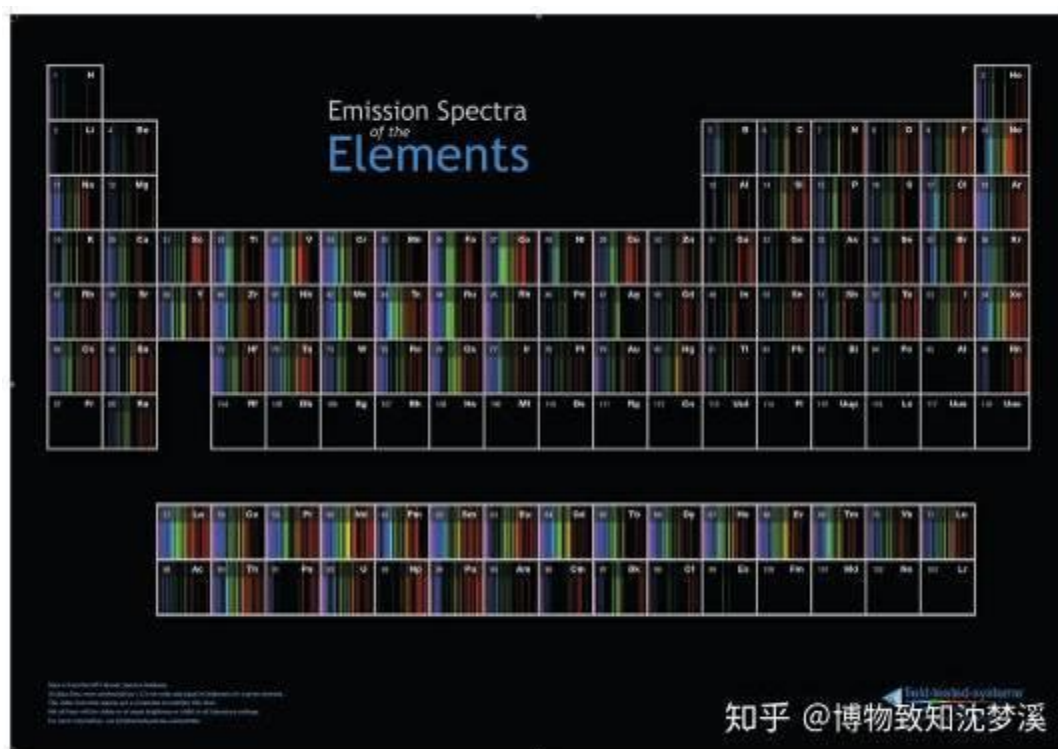


图 14-2.14、元素光谱

Figure 14-2.14, element spectrum

（计算方法见：和弦（量子）数学）

(For the calculation method, see: 1. Chord Mathematical; Chord Math)

14-2.3. Celestial Body |天体

原子与天体都是闭合空间，如果和弦空间具有普遍性，则两者都是和弦空间包。

Both atoms and celestial bodies are closed Spaces, and if chord space is universal, then both are chord space packages.

只有在七声音阶系统中才能解释天体的秩序，由此假设：天体是七声音阶和弦包，而原子是爵士音阶和弦包。

The order of the celestial bodies can only be explained in a system of heptachord scales, from which it is assumed that the celestial bodies are the package of heptachord scales and the atoms are the package of jazz scales.

生命和弦包只能由七声音阶表达，由此假设，七声音阶是宏观时空的生成形式。

The life chord package can only be expressed by the heptachord scales of, so it is assumed that the heptachord scales are the generative form of macroscopic space-time.

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和弦语言；李晓虹；DOI: 10.13140/RG.2.2.25415.65440/3；ISBN:9781370273348；ASIN: B0919JJ3R7

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天体组成恒星系，星系，是众多和弦空间包的集合，其组织形式是七声音阶调群。

The celestial bodies make up the star system, the galaxy, which is a collection of many chord space packages, organized in the form of a heptachord tone group.

原子是单一的和弦空间包，原子的行星模型是错误的类比。

The atom is a single chord space package, and the planet model of the atom is a false analogy.

天体的组织秩序涉及七声音阶的多层调群，内容较多，需要专门的章节介绍；参见：13.Multi-Layer Key Group;多层调群)。

The organizational order of celestial bodies involves multi-layered tone groups of heptachord, which requires a special chapter to introduce. See also: 13.Multi-Layer Key Group; Multilayer tone group).

14-3. Space-Time Duality |时-空二相性

和弦语言包含时间表达与空间表达，前面部分介绍了和弦的空间表达，本节将讨论时-空关系。

Chord language includes time expression and space expression. The previous section introduced the spatial expression of chords. This section will discuss the time-space relationship.

和弦语言包含时间语义（始-末，进行）与空间语义（线，膜），分别表达时间与空间。

和弦时间与和弦空间镜像对称：

$$\{-7,-4,0\} \leftrightarrow \{0,4,7\} \bmod 12$$

两者互为反结构：反和弦，反调，数学上可数学转换。

空间具有定域性，时间具有非定域性，整体表现为时空二相性，类似波粒二相性。

The chord language contains time semantics (beginning-end, progression) and space semantics (line, membrane), which express time and space respectively.

Chord time and chord space are mirror-symmetric:

$$\{-7,-4,0\} \leftrightarrow \{0,4,7\} \bmod 12$$

The two are inverse structures: anti-chord, anti-tune, mathematically convertible.

Space is localized, time is non-localized, and the overall performance is space-time duality, similar to wave-particle duality.

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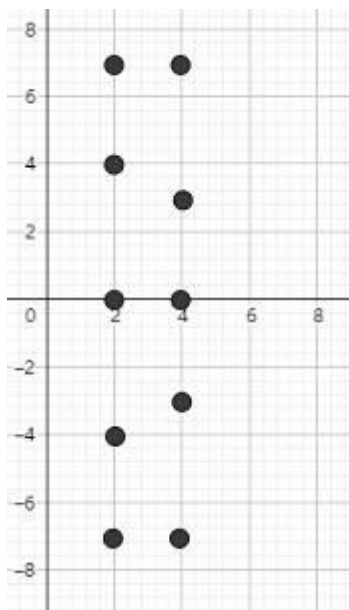


图 14-3.1、大三和弦-小三和弦的升序，降序，镜像对称形式。Y=平均律数列的指数

Figure 1-3, Major triad - minor triad ascending, descending, mirror-symmetric form. Y= exponents of the equal temperament series.

大三和弦，升序：{0, 4, 7}，大三和弦，降序：{-7, -4, 0} (mod 12)

Major triad, ascending: {0,4,7}, Major triad, descending: {-7, -4, 0} (mod 12)

小三和弦，升序：{0, 3, 7}，大三和弦，降序：{-7, -3, 0} (mod 12)

Minor triad, ascending: {0,3,7}, Major triad, descending: {-7, -3, 0} (mod 12)

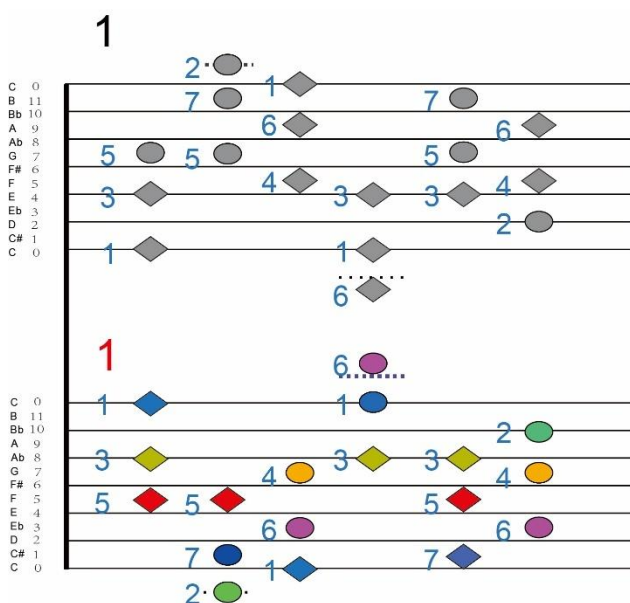


图 14-3.2、和弦镜像：和弦时间（上），和弦空间（下）互为反和弦。

Figure 14-3.2, Chord mirror image: Chord time (top) and chord space (bottom) are each other's antichords.

图 1-3.2、大三和弦-小三和弦的升序，降序，镜像对称形式。七声音阶（Heptachord），C 大调，关系小调。

Figure 1-3.2. Ascending, descending, mirror-symmetric forms of Major - minor triads. Heptachord, C major, relation minor.

Formula; 公式:

C 大三和弦（升序）= $H^{0,4,7}.C$

C major chord, (ascending)= $H^{0,4,7}.C$

a 小三和弦（升序）= $H^{0,3,7}.a$

a minor triad (ascending)= $H^{0,3,7}.a$

C 大三和弦（降序）= $H^{0,-4,-7}.C$

C major chord(descending)= $H^{0,-4,-7}.C$

E_b 小三和弦（降序）= $H^{0,-3,-7}.E_b$

E_b minor triad (descending)= $H^{0,-3,-7}.E_b$

和弦时间与和弦空间具有相反的数学结构，甚至还有相反的物理属性：定域性与非定域性。

和弦时间不含几何语义，没有空间状态；和弦空间不含时间语义，没有时间状态。两者整体表现为时空二相性，类似于量子力学中的波粒二象性。

Chord time and chord space have opposite mathematical structures and even opposite physical properties: locality and non-locality.

Chord time does not contain geometric semantics and has no spatial state; chord space does not contain temporal semantics and has no temporal state. The two as a whole show the duality of space and time, which is similar to the wave-particle duality in quantum mechanics.

纯时间 vs. 纯空间：巴赫与莫奈的对比

在巴赫的音乐中，我们只能观察到和弦与旋律的时间变化，无法感知任何几何形状或位置。

纯时间状态下，空间属性无法被观察，空间位置处于叠加态（Superposition State）。

如果要在巴赫的音乐中观察到空间属性，唯一的方式是将和弦时间转换为其镜像对称形式——和弦空间。

CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3, ISBN:9781370273348, ASIN: B0919JJ3R7

结论：巴赫的音乐是和弦时间，莫奈的绘画是和弦空间。在纯时间状态下，空间位置的概念是无意义的，相当于所有位置的叠加。

Pure time vs. pure space: Bach and Monet's comparison

In Bach's music, we can only observe the time changes of chords and melodies, and cannot perceive any geometric shapes or positions.

In the pure time state, spatial properties cannot be observed, and spatial positions are in a superposition state.

If you want to observe spatial properties in Bach's music, the only way is to convert chord time into its mirror-symmetric form - chord space.

Conclusion: Bach's music is chord time, and Monet's paintings are chord space. In the pure time state, the concept of spatial position is meaningless, which is equivalent to the superposition of all positions.



图 14-3.3、巴赫手稿

Figure 14-4.2. Bach manuscript

3. 莲花的时空二相性：莫奈 vs. 莫扎特

莫奈的莲花（绘画）是空间表达，具有定域性，即它不能同时出现在卢浮宫和奥赛博物馆。

莫扎特的莲花（音乐）是时间表达，具有非定域性，可以处于任意空间位置的叠加态，包括卢浮宫和奥赛。

和弦语言；李晓虹；DOI: 10.13140/RG.2.2.25415.65440/3；ISBN:9781370273348；ASIN: B0919JJ3R7

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这意味着，莲花同时具有莫奈（空间）-莫扎特（时间）二相性，类似于波粒二象性：

作为绘画（莫奈）时，它是粒子，位置固定。

作为音乐（莫扎特）时，它是波动，位置可叠加。

结论：

莲花在“莫奈-莫扎特”二相性中展现了时空结构的波粒二象性。

从和弦时间到和弦空间的转换，与量子测量导致波函数坍缩的过程类似。

The Space-Time Duality of the Lotus: Monet vs. Mozart

Monet's lotus (painting) is a spatial expression, characterized by locality, meaning it cannot be in both the Louvre and the Musée d'Orsay at the same time.

Mozart's lotus (music) is a temporal expression, characterized by non-locality, able to be in a superposition of any spatial location, including the Louvre and the Musée d'Orsay.

This implies that the lotus possesses both Monet (space)-Mozart (time) dualities, similar to wave-particle duality:

As a painting (Monet), it is a particle with a fixed position.

As music (Mozart), it is a wave, with positions that can be superimposed.

Conclusion:

The lotus exhibits the wave-particle duality of space-time structure within the "Monet-Mozart" duality.

The transition from chord time to chord space is analogous to the collapse of the wave function due to quantum measurement.

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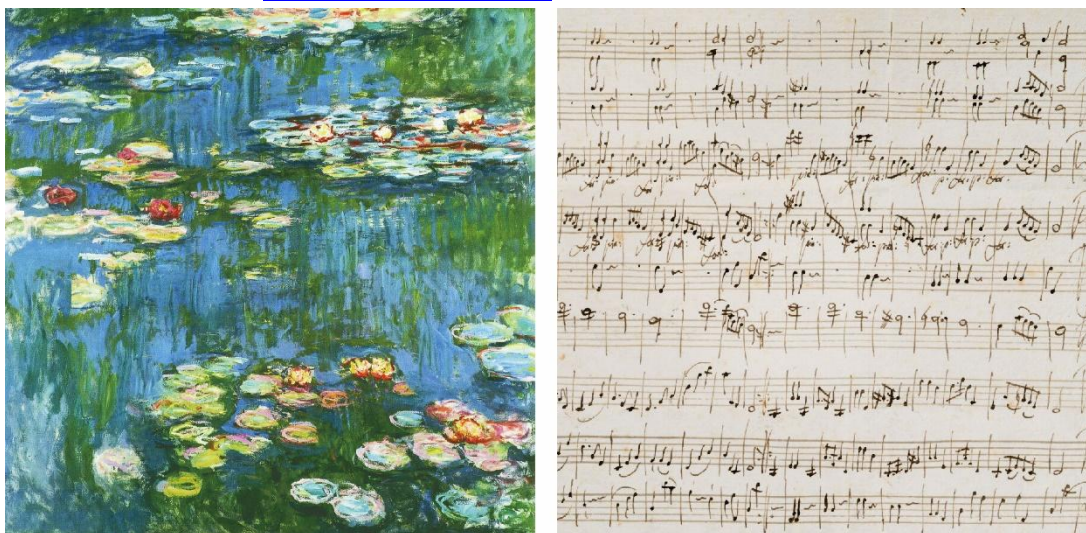


图 14-3.4：莫奈-莫扎特二相性。

Figure 14-3.4: Monet-Mozart duality.

14-3.1. Chord Spacetime: A Conceptual Framework|和弦时空概念框架

和弦时空由和弦（量子化频谱）构成，时间与空间是能量的不同形式，由此有：

$$E=t+m$$

和弦时空中存在 纯时间（ $s=0$ ）与纯空间（ $t=0$ ），这需要与其适应的时空框架。

时间能量（T）：非定域性，类似量子态，不依赖外部时钟。

空间能量（S）：定域性，具有几何属性，如形状、位置等。

时间与空间的互补关系：

设和弦时空的总能量归一化为 1，则：

$$S+T=1$$

其中：

S 代表和弦空间的能量占比。

T 代表和弦时间的能量占比。

当 $S=0$ （纯时间）时，无空间信息，时间完全非定域。

当 $T=0$ （纯空间）时，无时间信息，空间完全定域。

结论：时间和空间是互补变量，它们的分布决定了和弦时空的性质。

2. 速度的定义：由于速度是时间（非定域性）与空间（定域性）的叠加，时间能与空间能的比值

$$v=T/S+T=T$$

由于 $S+T=1$ ，我们有：

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B0919JJ3R7

$$v=1-S$$

这表明：

当 $S=0$ （纯时间）， $v=1$ （无空间状态，时间完全非定域）。

当 $T=0$ （纯空间）， $v=0$ （无时间状态，空间完全定域）。

速度 v 是时间能量的占比，独立于外部参考系，仅由和弦时空内部状态决定。

结论：

速度 v 不是外部测量的运动速度，而是时间能量的占比。

在和弦时空中，时间能量越高（越非定域），速度越大；空间能量越高（越定域），速度越小。

这类似于量子力学中的“不确定性关系”——时间越模糊，空间信息越清晰，反之亦然。

3. 和弦时空的不连续性

和弦时间（ T ）与和弦空间（ S ）互为反和弦（镜像对称），可数学转换。

在纯时间中（ $S=0$ ），空间信息完全消失。

在纯空间中（ $T=0$ ），时间信息完全消失。

这表明：

和弦时空可以是不连续的，即时间和空间可以在某些状态下完全分离。

当 $S \rightarrow 0$ 或 $T \rightarrow 0$ 时，和弦时空表现出类似“量子跃迁”的行为，即从一种完全状态跳跃到另一种完全状态，而不是连续变化。

4. 质量的测量问题

时间无法测量质量，因此质量只存在于空间（图形与背景），这意味着：

质量必须在定域的空间状态（ $S>0$ ）下才能被测量。

在纯时间状态（ $S=0$ ）下，质量无法定义，因为没有空间参考。

质量仅能在具有几何结构的区域内被测量，这意味着质量是空间定域性的表现。

数学表达：

设质量 m 依赖于空间定域性 S ，则：

$$m=MS$$

其中 M 为某个常数。

当 $S=0$ （纯时间），则 $m=0$ ，即纯时间状态下无法测量质量。

当 $S=1$ （纯空间）， $m=M$ ，即质量完全在空间中表现。

由此得出质量-速度关系：

$$m+t=1$$

能量，质量，速度关系为： $E=s+t=m+t=1$

结论：

质量只存在于和弦空间，而不存在于和弦时间。

5. 总结：

时间能（T）和空间能（S）满足归一化关系： $S + T = 1$ 。

速度 $v = T$ ，决定于时间能量的占比，而不是外部参考系。

在纯时间状态（ $T = 1, S = 0$ ），空间信息消失；在纯空间状态（ $S = 1, T = 0$ ），时间信息消失。

和弦时空的不连续性表明，时间和空间可以完全分离，表现出类似量子跃迁的行为。

质量只存在于和弦空间，在纯时间状态下无法测量质量。

Chord Spacetime: A Conceptual Framework

Chord spacetime is composed of chords (quantized spectrum). Time and space are different forms of energy, hence:

$$E = t + m$$

In chord spacetime, there exist pure time ($s=0$) and pure space ($t=0$), which require their respective spacetime frameworks.

Time Energy (T): Non-local, similar to quantum states, not dependent on external clocks.

Space Energy (S): Local, possesses geometric properties such as shape, position, etc.

The Complementary Relationship Between Time and Space

Assuming the total energy of chord spacetime is normalized to 1, then:

$$S + T = 1$$

Where:

S represents the energy proportion of chord space.

T represents the energy proportion of chord time.

When $S=0$ (pure time), there is no spatial information, and time is completely non-local.

When $T=0$ (pure space), there is no time information, and space is completely local.

Conclusion: Time and space are complementary variables, and their distribution determines the

nature of chord spacetime.

2. Definition of Velocity

Since velocity is the superposition of time (non-local) and space (local), the ratio of time energy to space energy is:

$$v = T / (S + T) = T$$

Since $S + T = 1$, we have:

$$v = 1 - S$$

This indicates that:

When $S=0$ (pure time), $v=1$ (no spatial state, time is completely non-local).

When $T=0$ (pure space), $v=0$ (no time state, space is completely local).

Velocity v is the proportion of time energy, independent of external reference frames, and determined solely by the internal state of chord spacetime.

Conclusion: Velocity v is not the speed of motion measured externally, but rather the proportion of time energy.

In chord spacetime, the higher the time energy (more non-local), the greater the velocity; the higher the space energy (more local), the smaller the velocity.

This is similar to the "uncertainty relationship" in quantum mechanics – the more blurred the time, the clearer the spatial information, and vice versa.

3. Discontinuity of Chord Spacetime

Chord time (T) and chord space (S) are anti-chords (mirror symmetry) and can be converted mathematically.

In pure time ($S=0$), spatial information completely disappears.

In pure space ($T=0$), time information completely disappears.

This suggests that:

Chord spacetime can be discontinuous, meaning that time and space can be completely separated in certain states.

When $S \rightarrow 0$ or $T \rightarrow 0$, chord spacetime exhibits behavior similar to "quantum leaps," that is, jumping from one complete state to another complete state, rather than continuous change.

CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3, ISBN:9781370273348, ASIN: B0919JJ3R7

4. The Problem of Mass Measurement

Time cannot measure mass, so mass only exists in space (graphics and background), which means that:

Mass must be measured in a local spatial state ($S > 0$).

In a pure time state ($S = 0$), mass cannot be defined because there is no spatial reference.

Mass can only be measured in regions with geometric structure, which means that mass is a manifestation of spatial locality.

Mathematical expression:

Let mass m depend on spatial locality S , then:

$$m = MS$$

Where M is a certain constant.

When $S = 0$ (pure time), then $m = 0$, that is, mass cannot be measured in the pure time state.

When $S = 1$ (pure space), $m = M$, that is, mass is completely manifested in space.

From this, the mass-velocity relationship is derived:

$$m + t = 1$$

The relationship between energy, mass, and velocity is: $E = s + t = m + t = 1$

Conclusion: Mass only exists in chord space and does not exist in chord time.

5. Summary:

Time energy (T) and space energy (S) satisfy the normalization relationship: $S + T = 1$.

Velocity $v = T$, determined by the proportion of time energy, not an external reference frame.

In the pure time state ($T = 1, S = 0$), spatial information disappears; in the pure space state ($S = 1, T = 0$), time information disappears.

The discontinuity of chord spacetime indicates that time and space can be completely separated, exhibiting behavior similar to quantum leaps.

Mass only exists in chord space, and mass cannot be measured in the pure time state.

4. Spatial Interaction |空间相互作用

在和弦空间场中，所有和弦，和弦空间包都相互关联与作用，常见的作用方式为：分离与结合。

CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3, ISBN:9781370273348, ASIN: B0919JJ3R7

In the chord space field, all chords and chord space packages are related and acted on each other, and the common modes of action are: separation and combination.

闭和弦（闭弦，轮廓线）主要表现为结合作用，包括：图形结合与图-图结合（figure-figure combine），也有分离作用，如：图-底分离，图-图分离。

Closed chords (closed strings, contour lines) mainly manifest themselves as combining effects, including: figure combining and figure-figure combining (figure-figure combine), and also have separating effects, such as: figure-ground separation, figure-figure separation.

开和弦（开弦，分面线）主要表现为分离作用，在图形轮廓线的内-外产生分面作用，其变化形式下也能产生图-图分离作用。

Open chords (open strings, faceting lines) mainly manifest as a separating effect, producing a faceting effect inside and outside the figure contour line, and its changing form can also produce a figure-figure separating effect.



图 14-4.1、闭弦，开弦，膜弦的空间作用

Figure 14-5.1. The space effect of closed strings, open strings, and membrane strings

空间相互作用有两种方式：电磁作用与非电磁作用：和弦（调性）空间的相互作用是闭弦（正电子），开弦（负电子），膜弦（磁场）的作用，是电磁作用；非和弦（无调性）空间不含闭弦（正电子）、开弦（负电子），磁极，是非电磁作用。

There are two ways of space interaction: electromagnetic and non-electromagnetic interaction: CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3, ISBN:9781370273348, ASIN:

B0919JJ3R7

Chord (tonality) Space interaction is closed string (positron), open string (negative electron), membrane string (magnetic field), is electromagnetic action; Non-chord (atonal) space does not contain closed strings (positrons), open strings (negative electrons), magnetic poles, and non-electromagnetic interactions.



图 14-4.2、无调性空间相互作用

Figure 14-5.2. Figure-figure combination of the Membrane chords。

空间相互作用还包括七声音阶与爵士音阶两种方式。

Spatial interaction also includes heptachord scales and jazz scales in two ways.

七声音阶空间包用于生命、天体表达，涉及宏观系统及电磁作用，可能与引力有关。

The heptachord space package is used to express life and celestial bodies, involving macroscopic systems and electromagnetic effects, and may be related to gravity.

在七声音阶中，空间结合力与完型性相关，并由此产生空间的主-次秩序，完型性越高，空间结合力越大，主体性越强，并依此法则组成天体秩序。参见：8.Gestalt;完形性，13.Multi-Layer Key Group;多层调群。

In the heptachord scales, the spatial binding force is related to the gestalt, and thus produces the main-secondary order of space. The higher the gestalt, the greater the spatial binding force and the stronger the subjectivity, and the celestial order is formed according to this law. See also: 8.Gestalt; 13.Multi-Layer Key Group.

CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3, ISBN:9781370273348, ASIN: B0919JJ3R7



图 14-4.3、完型性的结合（引力）作用

Figure 14-4.3. Binding (gravitational) action of gestalt

该内容涉及较多，需要参阅本书前面全部章节。

This section is much more extensive, and you need to refer to all the previous chapters in this book.

14-5.Chord Space-Time Measurement |和弦时空测量

在和弦时空的观察、测量中，一些和弦语言特征可能被观察到。

In the observation and measurement of chord space -time, some chord language features may be observed.

1、离散性：和弦时-空由和弦表达，可测量到一系列频率（能量）值，不是任何频率（能量）都能进入和弦系统，系统只接受和弦法则允许的一系列离散值（ $C=H^n \cdot f$, $H=1.059463$ ），表现为和弦频谱。

1, discrete: chord space-time is expressed by the chord, can be measured to a series of frequency (energy) values, not any frequency (energy) can enter the chord system, the system only accepts a series of discrete values allowed by the chord law ($C=H^n \cdot f$, $H=1.059463$), expressed as the chord spectrum.

2、和弦几何语义：和弦空间由和弦表达，和弦按几何语义分为：开弦，闭弦，膜弦。（参见：3、

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和弦与弦)

2. Chord Geometric semantics: Chord space is expressed by chords, and chords are divided into open strings, closed strings, and membrane strings according to geometric semantics. (See: 3, Chords and Strings)

3、±对称：和弦时-空的“基本粒子”是±音符；和弦属性都涉及±音符及对称性。

3. ± symmetry: The "elementary particles" of chord space-time are ± notes; all chord properties involve ± notes and symmetry.

4、时-空二相性：时间和弦与空间和弦互为反和弦，数学形式为：镜像对称，和弦时间具有非定域性，和弦空间具有定域性，在观察中会表现出“时空二相性”（波粒二相性）。

4. Time-space duality: time chord and space chord are antichords to each other, and the mathematical form is: mirror image and symmetry. Chord time has non-locality, chord space has locality, and the observation will show "space-time duality" (wave-particle duality).

Reference;参考

Basic Theory Of Music; 音乐基础理论

Harmony; 和声学

Chord Painting; 和弦绘画

General Physics; 普通物理学

15. Chord Biology | 和弦生命

人类观察到两种生命的形式：**和弦场与生物体**，分别来自和弦观察者（自观察者）与非和弦观察者（外观察者），生命是两者的二层存在。

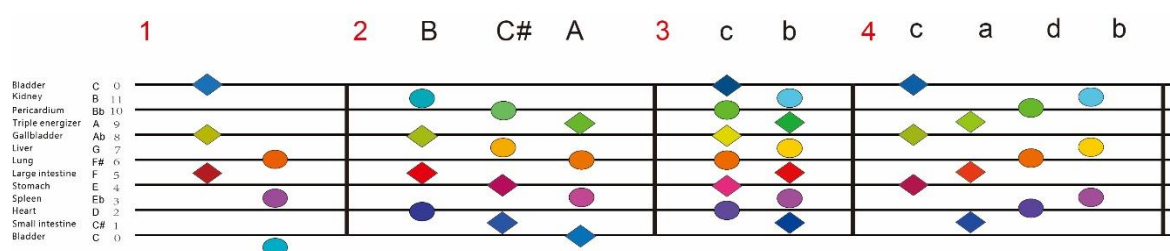
Humans observe two forms of life: the **chord field and the organism**, from the chord observer (self-observer) and the non-chord observer (external observer) respectively, and life is a two-layer existence of both.

和弦在人体上表现为经络（脉轮）系统，来自观察者（和弦观察者）；十二经络具有受激反应特征频率，分布为：十二平均律（ $H^n \cdot f$, $H=1.059463$, $n=1,2,3,\dots,n$ ），与音乐，绘画基于相同的物理（量子化频谱），数学形式，表现为和弦场。

Chords are represented on the human body as a system of meridians (chakras) from the observer (chord observer); Twelve meridians have the characteristic frequency of stimulated response, and the distribution is as follows: Equal Temperament ($H^n \cdot f$, $H=1.059463$, $n=1,2,3,\dots,n$), as music, painting is based on the same physics (quantized spectrum), mathematical forms, expressed as chord fields.

和弦场是生命（自我）的物理、数学形式，是生物体的底层作用与生命的本体。

Chord field is the physical and mathematical form of life (self), the underlying function of living organism and the noumenon of life.



基本和弦表：1-1、大三和弦（闭弦），1-2、小三和弦（开弦）、2、减七和弦（膜弦）、3、全音阶和弦（膜弦），4、增三和弦（膜弦）

*和弦频谱公式： $n \cdot f$, $H^n \cdot f$, ($H=1.059463$, $n \in \mathbb{Z}$)

*符号：◆=+ 音符，●=- 音符，音符色=色荷

*本文使用 mod12 记谱法

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和弦语言；李晓虹；DOI: 10.13140/RG.2.2.25415.65440/3；ISBN:9781370273348；ASIN: B0919JJ3R7

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Basic chord table: 1-1, major triad (closed string), 1-2, minor triad (open string), 2, diminished 7th (membrane string), 3, diatonic chord (membrane string), 4, augmented Triads (membrane strings)

* Chord spectrum formula: $n \cdot f$, $H^n \cdot f$ ($H=1.059463$, $n \in \mathbb{Z}$)

* Symbol: \blacklozenge = + note, \bullet = - note, note color = color charge

** This article uses mod12 notation

5-1. Qualitative And Dimensional | 定性与量纲

十二正经（Twelve regular meridians）是经络系统的主体，每一经络都具有特征频率与正-负（阴-阳）属性，这是本节的要点。

Twelve regular meridians are the main body of the meridian system. Each meridian has a characteristic frequency and positive-negative attributes. This is the main point of this section.

本文数据来自对人体经络系统（和弦编码系统）的自观察：经络对乐音-色光的受激反应；不同的频率的乐音-色光在不同经络上诱发受激反应，表现为经络线路区域出现相应体觉——循经传感（Propagated sensation along the channels），特定经络的受激反应与乐音-色光的频率相关。

The data in this article comes from the self-observation of the human body meridian system (chord coding system): the stimulated response of the meridian to the music tone-color light; the different frequency of the music-color light induces the stimulated response on the different meridians, which is expressed as the meridian Corresponding somatosensory emerges in the line area—Propagated sensation along the channels. The stimulated response of a specific meridian is related to the frequency of music tone-color light.

上述观察得到如下结果：

The above observations have the following results:

在十二正经（Twelve regular meridians）中，每一经络均能在乐音信号作用下产生受激反应，表现为：循经传感（Propagated sensation along the channels）。

In the Twelve regular meridians, each meridian can produce an stimulated response under the action of music signals, which is expressed as: Propagated sensation along the channels.

特定经络只对特定频率的乐音产生受激反应，对其余频率无确定的反应：十二正经（Twelve regular meridians）具有受激反应特征频率，具有类似“弦共振”的性质。

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Specific meridians only produce an stimulated response to music with a specific frequency, and have no definite response to other frequencies: Twelve regular meridians have a characteristic frequency of stimulated response, which is similar to "string resonance"

以膀胱经（bladder meridian）为例：下表中的频率均能在膀胱经（bladder meridian）上诱发受激反应。

Take the bladder meridian as an example: the frequencies in the table below can all induce a stimulated response on the bladder meridian.



图 15-1.1、C 音的倍频数列。

Figure 15-1.1. The octave sequence of C tone.

*和弦取值的计算方法见：1、和弦数学模型

*For the calculation method of chord value, please refer to: 1. Chord Mathematical Model

用色光作刺激信号，对十二正经（Twelve regular meridians）进行观察，得出如下结果：

Using colored light as a stimulus signal and observing the Twelve regular meridians, the following results are obtained:

1、在十二正经中，各经络均能在色光的刺激作用下出现受激反应。

1. In the twelve regular meridians, each meridian can have a stimulated response under the stimulation of color light.

2、特定经络只在特定频率的色光作用下产生反应，而对其它频率的反应不确定。

2. A specific meridian only reacts under the action of the color light of a specific frequency, and the response to other frequencies is uncertain.

这与光电效应非常相似，经络只接受特定能量值，仍以膀胱经（bladder meridian）为例：它只在频率为 690 兆赫的蓝光作用下出现受激一反应，而对其它频率的反应不确定。

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This is very similar to the photoelectric effect. The meridian only accepts a specific energy value.

Take the bladder meridian as an example: it only appears stimulated-response under the action of blue light with a frequency of 690 MHz, while the response to other frequencies is uncertain.

十二正经分别具有不同的受激-反应特征频率，乐音、色光、十二正经与十二平均律的对应关系之间如下：

The Twelve regular meridians have different stimulus-response characteristic frequencies, and the corresponding relations between musical tone, color light, Twelve regular meridians and the equal temperament are as follows:

音名↵ pitch names↵	色彩↵ Color↵	十二经络 ↵ Twelve Meridians↵	±↵
C↵	blue↵	足太阳膀胱经-Foot Taiyang Bladder Meridian↵	+↵
B↵	cyan↵	足少阴肾经-Foot Shaoyin Kidney Meridian↵	-↵
Bb↵	Green↵	手厥阴心包经 - Hand Jueyin Pericardium Meridian↵	-↵
A↵	Yellowgreen↵	手少阳三焦经-Hand Shaoyang Sanjiao (Triple Burner) Meridian↵	+↵
Ab↵	Yellow↵	足少阳胆经 - Foot Shaoyang Gallbladder Meridian ↵	+↵
G↵	yelloworange↵	手厥阴肝经 - Hand Jueyin Liver Meridian↵	-↵
F#↵	orange↵	手太阴肺经 - Hand Taiyin Lung Meridian↵	-↵
F↵	Rot-orange↵	手阳明大肠经 - Hand Yangming Large Intestine Meridian↵	+↵
E↵	Red↵	足阳明胃经 - Foot Yangming Stomach Meridian↵	+↵
Eb↵	purplishred↵	足太阴脾经 - Foot Taiyin Spleen Meridian↵	-↵
D↵	purplishred↵	手少阴心经 - Hand Shaoyin Heart Meridian↵	-↵
C#↵	indigo↵	手太阳小肠经 - Hand Taiyang Small Intestine Meridian↵	+↵

平均律（Equal Temperament）元素对应表

Equal Temperament element correspondence table

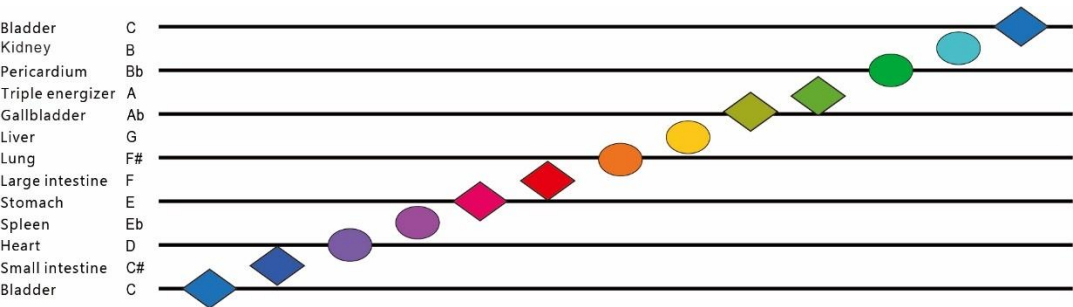


图 15-1.3.2：乐音、色光、十二正经与十二平均律的对应关系（坐标）

Figure 15-1.3.2: Correspondence between music tone, color light, Twelve regular meridians and twelve equal temperament (coordinates)

*和弦取值的计算方法见：1、和弦数学模型

*For the calculation method of chord value, please refer to: 1. Chord Mathematical Model

以上定性、定量观察表明：经络是和弦语言现象。

The above qualitative and quantitative observations show that the meridian is a phenomenon of chord language.

表中的音符含有±标记，这是经络（频率）的另一重要属性。

The notes in the table contain ± marks, which is another important attribute of meridians (frequency).

经络的正-负（阴-阳）属性，由《黄帝内经》等古代医学著作记载，频率值与正-负（阴-阳）值不可分割，应是某种物理属性。见图 15-1.2，图 15-1.3，请注意音符上的±标记。

The positive-negative (yin-yang) attribute of the meridian is recorded in ancient medical works such as Huangdi Neijing. The frequency value is inseparable from the positive-negative (yin-yang) value and should be a certain physical attribute. See Figure 15-1.2, Figure 15-1.3, please pay attention to the ± mark on the note.

频率值与正-负值都是重要的和弦编码元素，对和弦语法、语义具有支配作用，在和弦实验中可观察，验证。请参阅前面：1，2，3，4 等章节。

Frequency and positive-negative values are both important chord coding elements, which dominate the chord syntax and semantics, and can be observed and verified in chord experiments. Please refer to the previous chapters: 1, 2, 3, 4, etc.

15-2.Chord Distribution On The Human body |人体上的和弦分布

和弦语言在人体上表现为经络系统，线和弦（线和弦）、膜和弦（膜弦）在人体上都有相应的形态-定位，两种和弦组成生命和弦包。

Chord language is expressed as a meridian system on the human body. line chords (line chords) and Membrane chords (membrane chords) have corresponding shapes-positions on the human body. The two chords form a life Chord packet et.

15-2.1.Line Chord |线和弦

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线和弦（大三和弦、小三和弦）分布在身体左右两侧的十二正经上。

The line chords (major triad, minor triad) is distributed on the Twelve regular meridians on the left and right sides of the body.

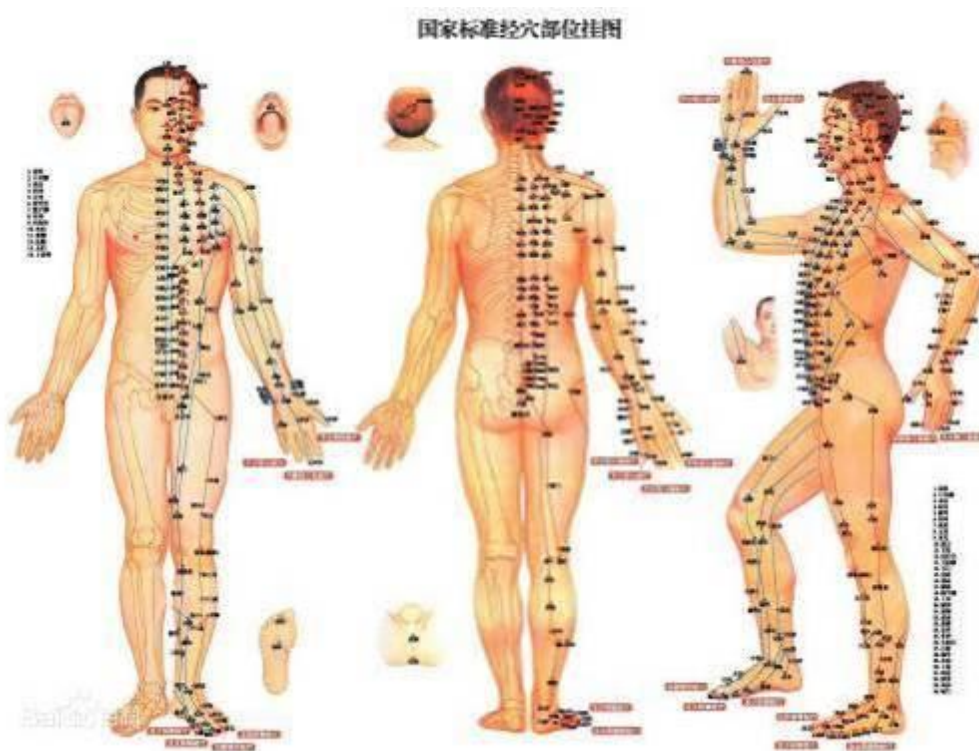


图 15-2.1、十二正经

Figure 15-2.1, Twelve regular meridians

十二正经具有特征频谱与正-负属性，请注意下图中各和弦上的+、-符号。

The twelve regular meridians have characteristic frequency spectrum and positive-negative attributes. Please pay attention to the + and - signs on each chord in the figure below.

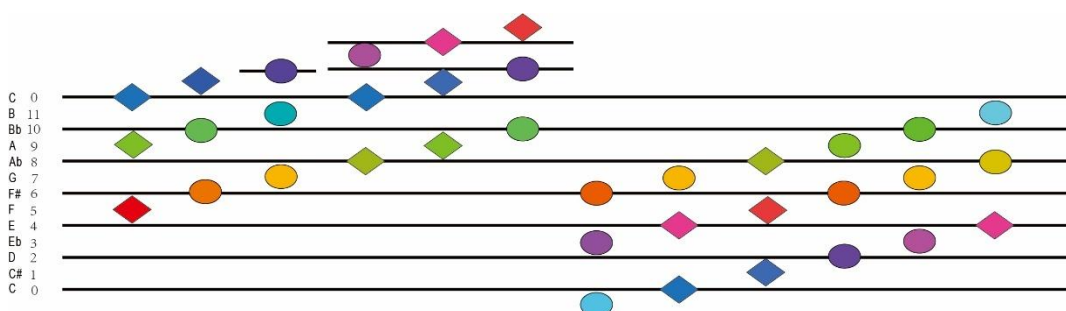


图 15-2.1、十二正经上的线和弦（◆=正音符，●=负音符，色彩=色荷）

Figure 15-2.1 The line chords on the Twelve regular meridians (◆=positive note, ●=negative

note, color=color charge)

*和弦取值的计算方法见：1、和弦数学模型

*For the calculation method of chord value, please refer to: 1. Chord Mathematical Model

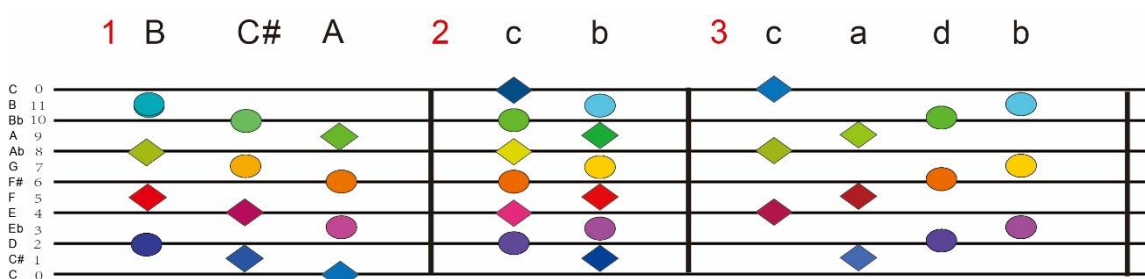
身体左右两侧的线和弦相同，但两侧的音阶、调集团形式有显著的区别，在后面有专门介绍。

The line chords on the left and right sides of the body are the same, but there are significant differences in the scales and key groups on both sides, which will be introduced later.

15-2.2.Membrane chords |膜和弦

膜和弦分布在躯干中央的任脉（Ren meridian）、督脉（Du meridian）上。

The Membrane chords is distributed on the Ren meridian and Du meridian in the center of the trunk.



等比和弦表：1、减七和弦（膜弦）、2、全音阶和弦（膜弦），3、增三和弦（膜弦）

*◆=正音符，●=负音符，色彩=色荷

Geometric chords table: 1, diminished 7th chord (membrane chord), 2, diatonic chord (membrane chord), 3, augmented Triads (membrane chord)

* ◆=positive note, ●=negative note, color=color charge

*和弦取值的计算方法见：1、和弦数学模型

*For the calculation method of chord value, please refer to: 1. Chord Mathematical Model

下图：膜和弦在人体上的分布

Below: the distribution of the Membrane chords on the human body

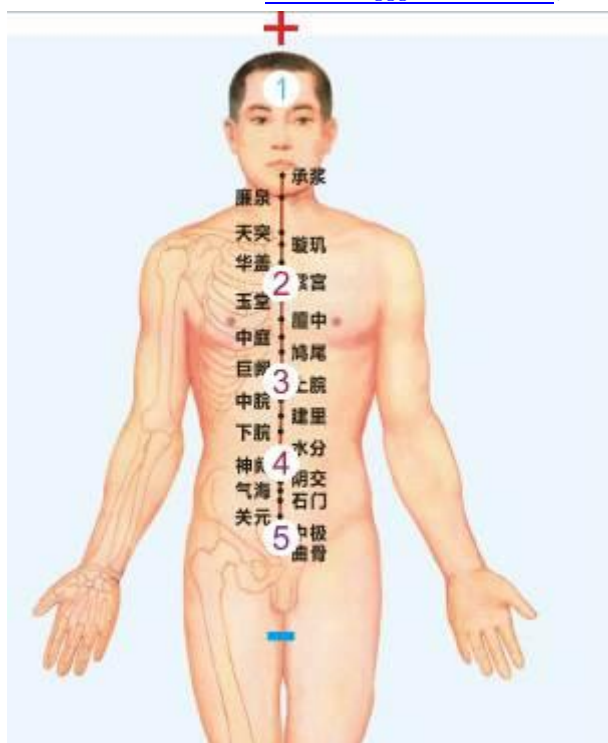


图 15-2.3、膜和弦在任脉，督脉上的分布

Figure 15-2.3, the distribution of the Membrane chords on the Ren and Du channels

膜和弦在任脉与督脉上按照完型状态分布，原则是：完型性较高者在上，完型性较低者在下，具有相对性，参考位置：1、{B,Ab,F,D}：神庭； 2、3、{C#,Bb,G,E}：膻中，上腕*； 4、{A,F#,Eb,C}：关元，中极，长强。

百会：正磁极*；会阴：负磁极*。

Baihui: positive magnetic pole *; Hui yin: negative magnetic pole *.

*{C#,Bb,G,E}具有动态位置，其完形状态越高，位置越靠上，并可占据其它减七和弦的位置。

*{C#,Bb,G,E} has dynamic positions, the higher the gestalt state, the higher the position, and can occupy the position of other diminished 7th.

*表中+、一号位置是人体的南北磁极。

*The positions of + and-in the table are the north and south magnetic poles of the human body.

*全音阶和弦是减七和弦的弱调性形式。

经络（中国医学）与脉轮（瑜伽），丹田（道教）具有显著的相关性，从下面图例中可以看出他们之间的联系：

CHORD LANGUSGE, Li Xiaohong, DOI: 10.13140/RG.2.2.25415.65440/3,ISBN:9781370273348, ASIN: B0919JJ3R7

Meridians (Chinese medicine), chakras (yoga), and dantian (Taoism) have a significant correlation.

The connection between them can be seen from the following illustration:



图 15-2.5、三脉七轮图（瑜伽及相关宗教）

Figure 15-2.5, Three Chakras and Seven Chakras (Yoga and related religions)

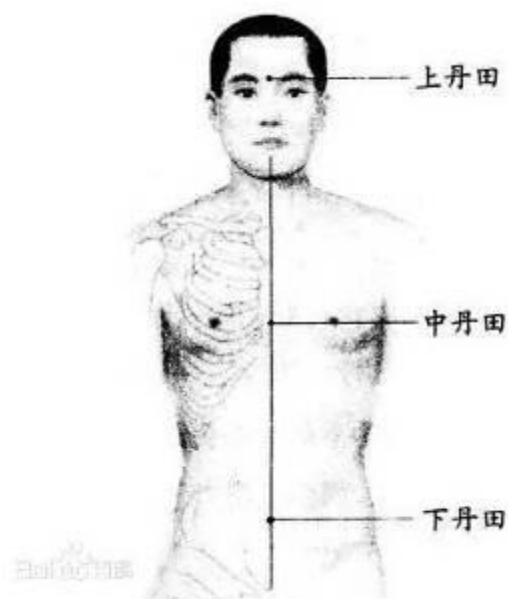


图 15-2.6、丹田位置图（中国道教）。

Figure 15-2.6. Location map of Dantian (Chinese Taoism).

从上面三个图例中，可以看出东方的生命-宗教的观察方法（自观察）与观察基础。

From the above three illustrations, we can see the method of observation (self-observation) and the basis of observation of Eastern life-religion.

15-3.Chord Life Packet | 和弦生命包

位于躯干中轴任脉（Ren meridian）、督脉（Du meridian）上的膜和弦向身体左、右侧的 12 正经（The Twelve regular meridians）上的线和弦解决，构成和弦时空包，和弦生命包是和弦时空包的形式之一。（参见：基本和弦表）

The Membrane chords on the Ren meridian and Du meridian on the central axis of the torso is resolved to the line chords on the twelve regular meridians on the left and right sides of the body, forming a chord space-time packet and a Chord Life packet It is one of the forms of the chord space-time packet. (See: Basic chord Table)

膜和弦分别向身体的左侧与右侧解决，产生各种和弦包。

The Membrane chords resolves to the left and right sides of the body, respectively, producing various chord packet.

左侧解决：减七和弦（diminished 7th）向身体左侧解决，形成七声音阶（Heptachord）和弦包，与七声音阶调集团。

Left side resolution: diminished 7th is resolved to the left side of the body, forming the Heptachord chord package and the Heptachord key group.

生命和弦包的构成形式为：纯小三和弦+导音减七和弦（leading note diminished 7th），其语义逻辑是生命的底层设计与控制机制，是生命的本质。

The form of life chord package is: pure minor triad + leading note diminished 7th, and its semantic logic is the underlying design and control mechanism of life, and is the essence of life.

右侧解决：全音阶和弦，增三和弦向身体右侧解决，形成爵士音阶和弦包，无调性和弦包。

Right side resolved: diatonic chords, augmented triads are resolved to the right side of the body, forming a jazz Scale chord packet, atonal chord packet.

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爵士音阶与无调性体系都会削弱七声音阶的和弦语义，在和弦生命语言中有着特殊的用途。

Both the jazz Scale and the Atonal system weaken the chord semantics of the heptatonic scale and have special uses in the language of chord life.

15-3.1.Mirror (Exterior And Interior) Relationship; 镜像（表里）关系

在生命的和弦表达中，每个和弦都有其镜像和弦，两者互为反和弦，根音符为相邻的两个正负音符。（参阅：1-5.镜像对称）

In the chord expression of life, each chord has its mirror chord, with the two being opposite chords and the root note being two adjacent positive and negative notes. (Refer to: 1-5. Mirror Symmetric)

十二调（十二经络）中有六对镜像和弦，在中医中被称为：表里（exterior and interior）关系。*

There are six pairs of mirrored chords in the twelve tones (twelve meridians), which are referred to as the "exterior and interior" relationship in traditional Chinese medicine*

15-4.Correspondence Between Human And Universe | 天人相应

本节的内容涉及和弦宇宙模型的两个基本法则。（参见：13-1.2、和弦宇宙模型）

This section deals with two fundamental laws of the chord universe model. (See also: 13-1.2, the chord universe model)

1) 和弦语言中，七声音阶纯大调表达天体空间，七声音阶纯小调表达生命空间，是和弦语言±对称法则的体现，生命是宇宙的必然部分。

1) In the chord language, the pure major of the heptatonic scale expresses the celestial space, and the pure minor scale of the heptatonic scale expresses the life space, which is the embodiment of the chord language \pm symmetry law, and life is an inevitable part of the universe.

生命-天体关系在七声音阶中表现为图-底大-小调（Figure-Ground Major-Minor），背景纯大调表达天体，图形纯小调表达生命，两者相互依存。（参阅：5-1、图-底大-小调）

The relationship between life and celestial bodies is expressed in the heptatonic scale as Figure-Ground Major-Minor, the pure major key of the background expresses the celestial body, and the pure minor key of the figure expresses life, and the two are interdependent. (See: 5-1, Figure-ground Major-Minor)

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2) 和弦空间按照完形性产生天体-生命秩序，完形性高的和弦包处于主导地位，完形性较低的和弦包处于被从属地位。

2) The chord space produces the order of celestial bodies-life according to gestalt, the chord packet with high gestalt is in the dominant position, and the chord packet with lower gestalt is in the subordinate position.

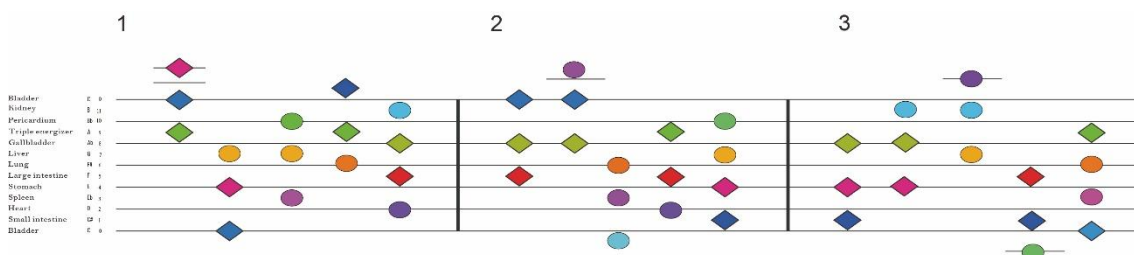


图 15-4、七声音阶图-底大小调

Figure 15-4. heptachord figure-ground major-minor

15-5. Gestalism | 完型性

生命和弦包的构成形式为：纯小三和弦+导音减七和弦（Leading note diminished 7th），是生命的物理形式。

The form of the life chord package is: pure minor triad + Leading note diminished 7th, which is the physical form of life.

生命和弦包具有完型性差异，由此产生语义表达差异，如：自我，情绪等。

Life chord packages have gestalt differences, which lead to differences in semantic expression, such as: self, emotion, etc.

导音减七和弦（Leading note diminished 7th）{B,Ab,F,D}，{C#,Bb,G,E}，{A,F#,Eb,C}具有不同的完形状态，分别表达不同的生命和弦包，并形成生命的完形等级。

Leading note diminished 7th {B,Ab,F,D}，{C#,Bb,G,E}，{A,F#,Eb,C} have different gestalt states, expressing different life chord packages and forming the gestalt hierarchy of life.

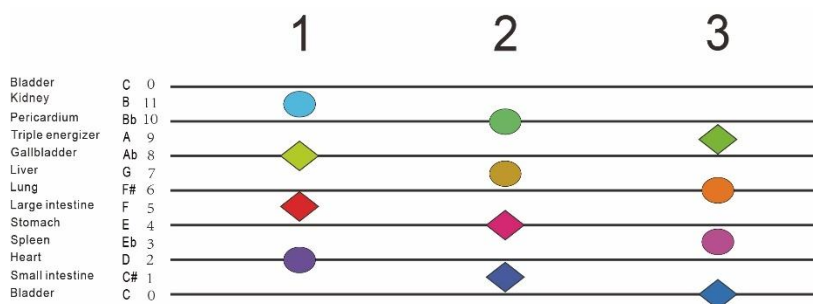


图 8.1、减七和弦表： 1、{B,Ab,F,D}， 2、{C#,Bb,G,E}， 3、{A,F#,Eb,C}

Figure 8.1. diminished 7th table, 1. {B,Ab,F,D}, 2. {C#,Bb,G,E}, 3. {A,F#,Eb,C}

七声音阶中，纯大调表达天体状态，纯小调表达生命状态，三个导音减七和弦分别表达不同的完形状态。

In the heptatonic scale, the pure major expresses the state of celestial bodies, the pure minor expresses the state of life, and the three leading note diminished 7th chords express different gestalt states respectively.

1) {B,Ab,F,D}: 完形；纯小调：自我，神，爱，永生；背景纯大调：星系。

1) {B,Ab,F,D}: Gestalt; Pure minor: Self, God, love, eternal life; Background pure major: Galaxies.

2) {C#,Bb,G,E}，次完形，纯小调：弱自我，人性，今生；背景纯大调：恒星系。

2) {C#,Bb,G,E}, secondary gestalt, pure minor: weak self, human nature, this life; Background pure major: Star system.

3) {A,F#,Eb,C}：弱完形；纯小调：最弱自我，植物性，仇恨；背景纯大调：星云。

3) {A,F#,Eb,C} : weak gestalt; Pure minor: Weakest self, vegetarianism, hatred; Background pure major: Nebula.

*全音阶和弦是减七和弦的弱调性形式。

*The diatonic chord is the weak form of the diminished 7th chord.

{C#,Bb,G,E}是当前生命系统，{B,Ab,F,D}，{A,F#,Eb,C} 是非同时生命系统。

{C#,Bb,G,E} is the current life system, {B,Ab,F,D}，{A,F#,Eb,C} are non-simultaneous life systems.

*参阅：8、完形性

*See also: 8.Gestalt

减七和弦决定生命个体的完形状态，人体中含有三个减七和弦，同时性条件下，由其中之一处于主导地位。

The diminished 7th chord determines the gestalt state of the individual life. There are three diminished 7th chords in the human body, and under the condition of simultaneity, one of them is dominant.

解决方向：三个减七和弦（diminished 7th）组成 B-C#-A 调群，这是和弦语言的全局形式；完形状态较低的和弦包向完形状态较高的和弦包解决，解决方向产生生命的需要：{B,Ab,F,D}具有最高完形状态，是生命的终极需要，其和弦语义有：自我，神，永生，爱等。（参见：13-2、B-C#-A 调群）

Resolved direction: Three diminished 7th chords form the B-C#-A key group, which is the global form of chord language; the chord packet with a lower gestalt state is resolved to a chord packet with a higher gestalt state, and the resolved direction is generated The need of life: {B,Ab,F,D} has the highest gestalt state and is the ultimate need of life, and its chord semantics are: self, god, immortality, love, etc. (See: 13-2, B-C#-A key group)



图 15-4.3、{B,Ab,F,D}-{C#,Bb,G,E}-{A,F#,Eb,C} 调群

Figure 15-4.3, {B,Ab,F,D}-{C#,Bb,G,E}-{A,F#,Eb,C} key group

生命和弦包的不同完形-自我状态具有不同的执行结果，类似东方宗教中的“业力”。

The different gestalt-ego states of the life chord packet have different execution outcomes, similar to "karma" in Eastern religions.

和弦生命中，神是生命（自我）和弦包的最高完形状态，既可存在于生命内部，也可存在于生命外部。

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In the chord life, God is the highest gestalt state of the life (self) chord packet, which can exist both inside the life and outside the life.

15-5.1.Natural Morality |自然道德

自然道德基于减七和弦的完形性，通常表现为对生命的态度：爱-恨，善意-恶意，暴力-和平，等。

Natural morality is based on the gestalt of the diminished 7th, which is usually expressed as an attitude towards life: love-hate, kindness-maliciousness, violence-peace, etc.

自然道德现象不限于人类，如：母爱，感恩，互助等，它是具有生物意义的自然法则。

Natural moral phenomena are not limited to humans, such as: maternal love, gratitude, mutual assistance, etc., it is a natural law with biomass significance.

和弦包的完形状态及和弦语义主要存在于七声音阶系统，在爵士音阶，无调性体系中被不同程度屏蔽。

The gestalt state and chord semantics of the Chord packet mainly exist in the heptachord system, and are shielded to varying degrees in the jazz Scale and Atonal system.

常见的道德现象包括：自然道德（Natural morality）与契约道德（Contract morality）；前者是和弦语言的天然语义与自然法则，具有普世性；后者是人类的社会契约，具有民族-地域特征；道德是自然道德与契约道德二层存有。

Common moral phenomena include: natural morality and contract morality; the former is the natural semantics and natural laws of the chord language, which is universal; the latter is the social contract of mankind, with ethnic-regional characteristics; Morality is the two-layer existence of natural morality and contractual morality.

自然道德包含自然奖惩机制，实现途径是：和弦生命包的完形状态与自然道德状态保持一致。

Natural morality includes a natural reward and punishment mechanism, and the way to achieve it is: the gestalt state of the Chord Life packet is consistent with the natural moral state.

自然奖惩按以下规则执行：

Natural rewards and punishments are implemented according to the following rules:

1、爱与善意会提升和弦生命包的完形性。

1. Love and kindness increase the gestalt of the chord life Packet.

2、仇恨与攻击会降低和弦生命包的完形性。

2. Hate and attack will reduce the gestalt of the chord life packet.

3、仇恨、伤害他人会以降低自己的完形性为代价；被仇恨、攻击所伤害者，会以提升自己的完形性为补偿。

3. Hate and hurt others will reduce their gestalt at the cost; Victims of hate and aggression compensate by improving their gestalt.

自然奖惩机制在各种宗教经典都有相应的表达，如东方宗教的“因果报应”；最被人熟悉还有耶稣的一段话：你们听见有话说，以眼还眼，以牙还牙。只是我告诉你们，不要与恶人作对。有人打你的右脸，连左脸也转过来由他打。（圣经-新约）

The natural reward and punishment mechanism has corresponding expressions in various religious classics, such as the "karma" of Eastern religions; the most familiar one is a passage from Jesus: You have heard something saying, "An eye for an eye, and a tooth for a tooth." But I tell you, don't fight the wicked. If someone slaps you on the right cheek, turn around and let him hit even the left cheek. (Bible-New Testament)

由自然奖惩获得的和弦包完形状态可以被存储、执行；不同的完形状态有不同的执行结果；具有类似“业”的性质。

The gestalt state of the Chord packet obtained by natural rewards and punishments can be stored and executed; different gestalt states have different execution results; they have a similar "karma" nature.

对自己的仇恨、伤害行为进行忏悔，或者承受痛苦，可以提升自己和谐生命包的完形性，这包含在主流宗教的实践中。

Repentance for one's hateful, hurtful actions, or suffering from pain, can enhance the gestalt of one's chord life package, which is included in the practice of mainstream religions.

15-6.Life And Death | 生-死

人的生命有两种存在形式：和弦（经络，脉轮等）与生物体；分别来自两种观察者：和弦观察者（自观察者）与非和弦观察者（外观察者）——生命是两者的二层存在。

Human life has two forms of existence: chords (meridians, chakras, etc.) and organisms; they come from two kinds of observers: chord observer (self-observer) and non-chord Observer (Outer Observer)

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- Life is the second layer of existence of both.

生死是对生物体的状态描述，和弦在人体上表现为经络（脉轮）；是生命的和弦场形式，也是自我的和弦场形式，服从和弦场的自然法则，我们没有在和弦场中观察到对应的状态。

Life and death is the description of the state of the organism, and the chords are expressed as meridians (chakras) on the human body; It is the chord field form of life and the chord field form of the self, subject to the natural laws of the chord field, and we do not observe corresponding states in the chord field.

和弦生命的形式是纯小三和弦+导音减七和弦，这里涉及到三个导音减七和弦，{C#,Bb,G,E}是当前生命（今生）和弦，{B,Ab,F,D}，{A,F#,Eb,C} 都不是当前（今生）和弦，这就意味着当前生命（今生）存在过去、未来状态。

The form of chord life is pure minor triad + leading diminished 7th chord, which involves three leading note diminished 7th chords, {C#,Bb,G,E} is the current life (this life) chord, {B,Ab,F,D}, {A,F#,Eb,C} are not the current (this life) chord, this is It means that the present life (this life) has past and future states.

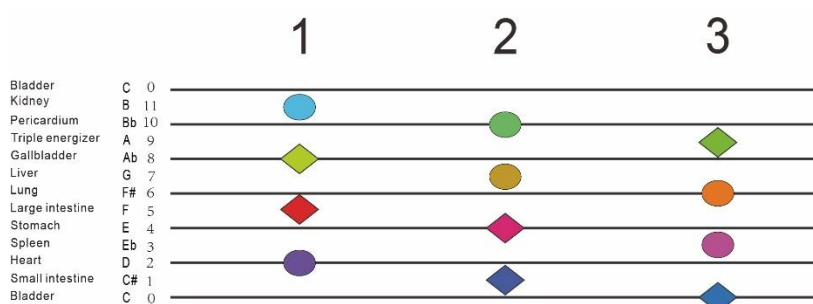


图 8.1、减七和弦表：1、{B,Ab,F,D}，2、{C#,Bb,G,E}，3、{A,F#,Eb,C}

Figure 8.1. diminished 7th table, 1. {B,Ab,F,D}, 2. {C#,Bb,G,E}, 3. {A,F#,Eb,C}

三个减七和弦：{B,Ab,F,D}，{C#,Bb,G,E}，{A,F#,Eb,C} 在时-空维度上分离（不同时间或不同空间），但又能够通过转调（modulation）相互切换；其中之一用于当前生命（今生），其余两个必然存在，但处于不同时间，或不同空间；死亡是当前生命（今生）的转调事件。

Three diminished 7th chords: {B,Ab,F,D}, 2. {C#,Bb,G,E}, 3. {A,F#,Eb,C} are separated in the space-time dimension (different time or different space), but can be switched to each other by Transpose; one of them is used for the current life (this life), The other two necessarily exist, but in different times, or in different spaces; death is the transmutation event of the present life (this life).

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三个减七和弦是过去，现在，未来生命的和弦逻辑证据，转调（transpose）过程类似“轮回”，减七和弦是轮回主体，生命（自我）和弦包在转调中保持永生，完形状态（业）决定新生命（自我）的状态。

The three diminished 7th chords are chord logical evidence of past, present, and future life, the transpose process is similar to "reincarnation", the life (self) chord packet remains immortal in the "transpose", and the gestalt state (karma) determines the new life (self) status.

三个减七和弦中，{B,Ab,F,D}的和弦语义包括“永生”，这是“自我”的永生，也是物理实在。
{B,Ab,F,D}是全局调集团的主调，它产生了生命的终极需要。（见 13、多层调群）

Among the three diminished 7th, the chord semantics of {B,Ab,F,D} include "immortality", which is the immortality of "self" and physical reality; {B,Ab,F,D} is the main key of the global key group, which produces the ultimate need for life. (See 13. Multi-Layer Key Group)

生命和弦包是调性系统，移调后的生命可能会丢失无调性信息，如：自然语言。

Life chord packs are tonal systems, and life after transposition may lose atonal information, such as: natural language.

和弦生命由七声音阶系统表达；在爵士音阶与无调性体系中，和弦生命语义会减弱，甚至消失，这里还需要更多的观察。

The life of chords is expressed by the heptachord scale system; in the jazz Scale and the Atonal system, the chord life semantics will weaken or even disappear, and more observations are needed here.

15-6.1.Religion |宗教

多数宗教包含对和弦生命的认识，通常通过自观察方法获得。

Most religions contain an awareness of chord life, usually obtained through self-observation methods.

多数宗教把灵魂作为生命本体；和弦语义包含自我，它是否能独立于生物体存在，这是关键所在。

Most religions regard the soul as the essence of life; Chord semantics include the self, and whether it can exist independently of the organism is the key.

东方的宗教实践通常与经络（脉轮）相关，在前面的内容中已有提及。

Eastern religious practices are usually related to meridians (chakras), which have been mentioned

in the previous content.

和弦语义包含：完形状态，自然道德，自然奖-惩等，这存在于主流宗教的教义中。

Chord semantics include: gestalt state, natural morality, natural reward - punishment, etc., which exist in the teachings of mainstream religions.

自然语言与和弦语言之间具有可编译性，这是祷告的自然原理。

There is compilability between natural language and chord language, which is the natural principle of prayer.

和弦生命中，神是生命和弦包（空间包）的完形状态，只存在于调性系统中，在无调性系统中被完全屏蔽，这是“无神论者”的产生原因；有神论与无神论来自两种观察者：和弦观察者和非和弦观察者。

In Chord Life, God is the gestalt state of the chord packet of life (space packet). It only exists in the tonal system and is completely shielded in the atonic system. This is the reason for the production of "atheists"; theism and atheism come from Two kinds of observers: chord observer and non-chord observer.

世俗权威仍然基于和弦语义逻辑，与和弦包（空间包）的解决方向相关，解决方向为权威主体；完形解决为完形权威，如：由爱产生的权威；非完形解决的为非完形权威，如：恐怖、暴力产生的权威。（参阅前面章节：13）世俗权威不是一个独立的问题。

The secular authority is still based on the semantic logic of chords, and is related to the solution direction of the chord package (space package). The solution direction is the authority subject; the gestalt solution is the gestalt authority, such as: authority generated by love; the non-gestalt solution is non-gestalt authority, such as authority generated by terror and violence. (See previous chapter: 13) Secular authority is not an independent issue.

15-7.Chord Medicine |和弦医学

和弦生命现象包括：经络，脉轮等，相关的医学都属于和弦医学，如中国传统医学，瑜伽。

Phenomenon of chord life include: meridians, chakras, etc. Related medicines belong to chord medicine, such as traditional Chinese medicine and yoga.

音乐，绘画都可以直接激发人体的和弦系统（经络，脉轮），改善生命-健康状态，对此已有观察、

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应用，如：音乐、色彩治疗等。

Music and painting can directly stimulate the human body's chord system (meridians, chakras) and improve life-health status. This has been observed and applied, such as music, color therapy, etc.

一些东方宗教与经络，脉轮相关，含有和弦医学特征，如道教，佛教等。

Some eastern religions are associated with meridians, chakras, and contain chord medical features, such as Taoism, Buddhism, etc.

健康状态与自我状态关联，如：减七和弦{C#,Bb,G,E}是当前（今生）特征和弦，和弦语义包含“健康”，理论上，只要在保持在{C#,Bb,G,E}的状态下，便可以一直处于今生，健康状态。

The health state is related to the ego state, such as: the diminished 7th {C#,Bb,G,E} is the current (this life) characteristic chord, and the chord semantics includes "health". In theory, as long as the state of {C#,Bb,G,E} is maintained, it can always be in this life, health status.

如果病因来自人体的和弦场，便无法用其它方法，如：药物，手术等完全解决，至少，病因与生命和弦包的完型状态（自然道德状态）有关，这是和弦医学的观察方向。

If the cause comes from the chord field of the human body, it cannot be completely solved by other methods, such as drugs, surgery, etc. At least, the cause is related to the gestalt state (natural moral state) of the chord package of life, which is the direction of observation of chord medicine.

Appendix | 附录

Equal Temperament Periodic Table Of Elements;平均律元素周期表

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A	Bb	B	C	C#	D	Eb	E	F	F#	G	Ab
黄绿 Yellow green	绿 Green	蓝绿 Cyan	蓝 Blue	青紫 Indigo	紫 Violet	紫红 purplish red	红 Red	暗红 Red- Orange	橙色 Orange	黄橙 Yellow- Orange	黄 Yellow
三焦 triple warmer	心包 pericard- ium	肾 kidney	膀胱 bladder	小肠 Small-in- testine	心经 heart	脾经 spleen	胃经 stomach	大肠经 Large-in- testine	肺经 lung	肝经 liver	胆经 Gallblad- der
1 H 氢	2 He 氦	3 Li 锂	4 Be 铍	5 B 硼	6 C 碳	7 N 氮	8 O 氧	9 F 氟	10 Ne 氖	11 Na 钠	12 Mg 镁
13 Al 铝	14 Si 硅	15 P 磷	16 S 硫	17 Cl 氯	18 Ar 氩	19 K 钾	20 Ca 钙	21 Sc 钪	22 Ti 钛	23 V 钒	24 Cr 铬
25 Mn 锰	26 Fe 铁	27 Co 钴	28 Ni 镍	29 Cu 铜	30 Zn 锌	31 Ga 镓	32 Ge 锗	33 As 砷	34 Se 硒	35 Br 溴	36 Kr 氪
37 Rb 铷	38 Sr 锶	39 Y 钇	40 Zr 锆	41 Nb 铌	42 Mo 钼	43 Tc 锝	44 Ru 钌	45 Rh 铑	46 Pd 钯	47 Ag 银	48 Cd 镉
49 In 铟	50 Sn 锡	51 Sb 锑	52 Te 碲	53 I 碘	54 Xe 氙	55 Cs 铯	56 Ba 钡	57 La 镧	58 Ce 铈	59 Pr 镨	60 Nd 钕
61 Pm 钷	62 Sm 钐	63 Eu 铕	64 Gd 钆	65 Tb 铽	66 Dy 镝	67 Ho 铥	69 Er 铒	69 Tm 铥	70 Yb 镱	71 Lu 镥	72 Hf 铪
73 Ta 钽	74 W 钨	75 Re 铼	76 Os 锇	77 Ir 铱	78 Pt 铂	79 Au 金	80 Hg 汞	81 Tl 铊	82 Pb 铅	83 Bi 铋	84 Po 钋
85 At 砹	86 Rn 氡	87 Fr 钫	88 Ra 镭	89 Ac 锕	90 Th 钍	91 Pa 镤	92 U 铀	93 Np 镎	94 Pu 钚		

十二平均律元素周期表，来自和弦数学推导，有两种可能的形式：1，2，3行是降序形式，4，5，6行是升序形式；表中的音，色，经络，元素通过倍频数列（ $2^n \cdot F_0$ ）产生联系。

The Periodic Table of Elements of the equal temperament, derived from membrane chords mathematics, has two possible forms: rows 1, 2, 3 are in descending order, and rows 4, 5, 6 are in ascending order; The tone, color, meridian, and elements in the table are connected through an octave sequence ($2^n \cdot F_0$).

Five Elements Table;五行表

五行	木	火	土	金	水
五化	生	长	化	收	藏
五色	青（绿）	赤（红）	黄	白	玄（黑）
五方	东	南	中	西	北
五季	春	夏	长夏	秋	冬
五时	平旦	日中	日西	日入	夜半
五节	新年	上巳	端午	七夕	重阳
五星	木星	火星	土星	金星	水星
五声	呼	笑	歌	哭	呻
五音	角	徵	宫	商	羽
五恶	风	热	湿	燥	寒
五脏	肝	心	脾	肺	肾
五腑	胆	小肠	胃	大肠	膀胱
五志	怒	喜	思	悲	恐
五指	食指	中指	大拇指	无名指	小指
五官	目	舌	口	鼻	耳
五觉	色	触	味	香	声
五味	酸	苦	甘	辛	咸

子午流注

平均律扩展表中有一行是经络的时间属性，根据针灸中的子午流注学说列出；（表中时间是指观察者所在地的太阳时）。子午流注理论体系源于《黄帝内经》“天气始于子，地气始于午、子午相合、命曰岁立、谨候其时、气与可期。”其方法很多、并在针灸实践中广泛应用，各经络按其对应的时间开放，每日一个周期、周而复始。

+a	+9	-8	-7	+6	+5	-4	-3	+2	+1	-10	-b
A	^b A	G	[#] F	F	E	^b E	D	[#] C	C	B	^b B
黄绿	黄	黄橙	橙	朱红	红	紫红	紫	青紫	群青	湖蓝	绿
亥	子	丑	寅	卯	辰	巳	午	未	申	酉	戌
三焦	胆经	肝经	肺经	大肠经	胃经	脾经	心经	小肠经	膀胱经	肾经	心包经

图 15-6.1：十二正经特征频率表，子午流注周期表。

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这里所说的“开放”到底是指什么呢？恐怕谁也无法明确，经络具有受激反应特征频率，如果“开放”与此有关，那么特定时间具有特征频率，并能激发特定经络传感发生。

特定时间具有特征频率，不同时间的离散频率分布并符合十二平均律： $F_c = H \cdot F_0$ ，便会出现上表的结果。

又因、表中的时间周期与地球自转的周期相吻合。与观察者相对地球、太阳的位置有关，因此，由经络知觉到的随时间变化的频率周期还和地球的自转周期有关。

因此；在这里我们能看到两个地球——一个是视觉看到的实体的地球，这个地球、既有自转，又有公转。另一个是用经络看到的“波动”地球，这个地球是由十二个频率构成，这些频率都有自己的方位，它们平均的分布在一个圆上、各占据这个圆周的 1/12 的区域。这个“频率”地球的子、午联线永远指向太阳，因而这个地球只有公转、没有自转。而经络觉“看”到的时间是两个地球——实体地球相对于平均律地球的运动。

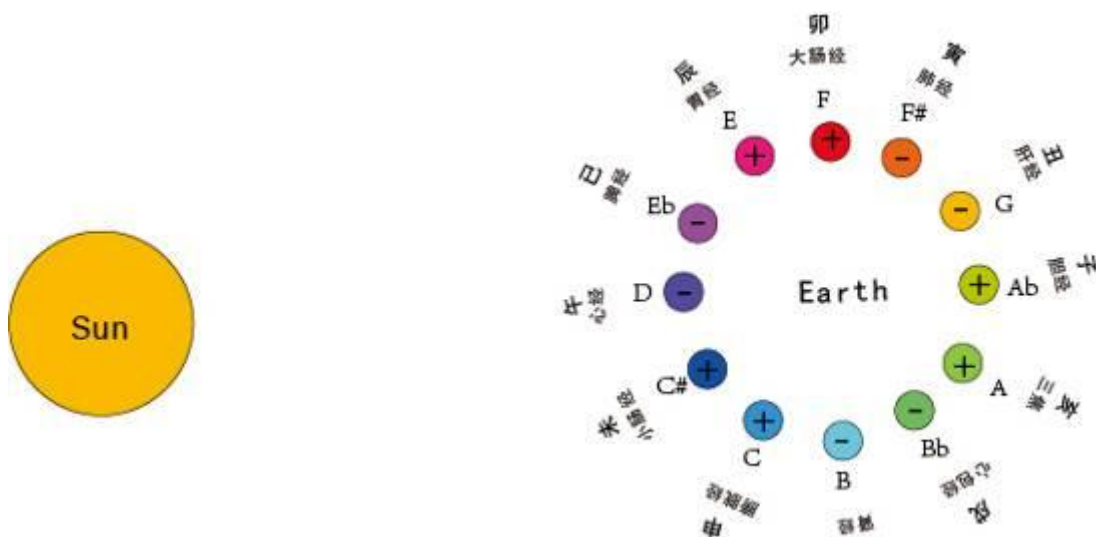


图 15-6.2，地球时间分布图

从上图中可以看出：

被特定的时间内、观察者在地球赤道某一特定点，利用经络觉观察到一系列不连续值（八度等音），例如这一点是申时点，测得值 C、C1、C2、C3、C4、C5.....一系列不连续值： $F_c = H^{12n} \cdot F$ （ $H=1.05946$ ， F =辐射频率， F_c =测得值， $n=0$ -正整数）。

观察者在 C 点，由申时开始。二十四小时后，测得 C、B、bB、A、bA、G.....一系列的不连续值： $F_i = h^n \cdot F$ （ n =相隔半音数， F =初始频率）。

也就是说，子午流注现象表明：地球时间是量子化的，并合乎十二平均律。

经络的表里关系

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和弦语言；李晓虹；DOI: 10.13140/RG.2.2.25415.65440/3；ISBN:9781370273348；ASIN: B0919JJ3R7

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中医里将经脉分为十二正经，分别对应者十二个脏腑。其中有六条阳经，六条阴经，阳经属表，阴经属里，有着表里相对应的关系。即太阴经对应阳明经，厥阴经对应少阳经，少阴经对应太阳经。

经络的表里关系可以反映出脏腑之间的联系，如当心火旺盛时往往小便也是灼热的，这是因为手少阴心经与手太阳小肠经相表里，心火下移小肠，导致小便灼热。

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圣经-新约

基础音乐理论；Basic music theory

和声学；Harmony

和弦绘画；Chord Painting

普通物理学教材：General Physics Textbooks:

经络学教材；Textbook of Meridian Studies

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16. Natural Spirit | 自然精神

24 届世界哲学大会会议论文

Papers of the of 24th World Congress of Philosophy

人类有两套语言系统：符号语言（后天语言）与和弦语言（先天语言）；前者是人工信息系统，基于语音符号，如：自然语言；后者是自然信息系统，基于和弦（量子化频谱，弦），如：音乐、绘画，经络等；精神是符号与和弦二层存有。

Humans have two sets of language systems: sign language (acquired language) and chord language (innate language); The former is an artificial information system based on phonetic symbols, such as natural language; The latter is a natural information system, based on chords (quantized spectrum, strings), such as: music, painting, meridian, etc.; The spirit is a two-layer being of symbols and chords.

人的认识来自两种观察者与经验：和弦观察者（和弦经验）与非和弦观察者（非和弦经验），前者产生音乐、绘画、经络、宗教等；后者产生科学与思辨哲学等——前者基于和弦语义，后者基于符号语义。

Human cognition comes from two kinds of observers and experiences: the chord observer (chord experience) and the non-chord observer (non-chord experience), the former producing music, painting, meridian, religion and so on; The latter produces science and speculative philosophy, the former based on chord semantics, the latter based on symbolic semantics.

非和弦观察者（非和弦经验）会屏蔽和弦语义逻辑，产生非和弦蒙蔽和偏见。

Non-chord observers (non-chord experience) can mask chord semantic logic, creating non-chord blindness and bias.

和弦语义来自和弦——量子化频谱，是自然精神与意志；和弦跨越物理，生命，音乐，绘画，表现出宇宙的统一性。

The semantics of chords come from chords - the quantized spectrum, which is the spirit and will of

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nature; The chords span physics, life, music, painting, and show the unity of the universe.

关键词：和弦，音乐，绘画，语言，符号，自然精神，自然意志，量子，弦理论

Key words: chord language, symbol language, innate language, acquired language, symbol semantics, chord semantics, natural spirit

*阅读本章时请同时参阅：15、和弦生命

*Please also refer to: 15. Chord Life when reading this chapter

16-1.Two Language | 两种语言

人类有两套语言系统：符号语言（后天语言）与和弦语言（先天语言）；前者是人工信息系统，基于语音符号，如：自然语言；后者是自然信息系统，基于和弦频谱，如：音乐、绘画，经络等；精神是符号与和弦二层存有。

Humans have two language systems: symbol language (acquired language) and chord language (innate language); the former is an artificial information system, based on phonetic symbols, such as natural language; the latter is a natural information system, based on the chord spectrum, such as music, Painting, meridian, etc.; spirit is the two-layer existence of symbols and chords.

自然语言是最常见的符号语言，它是通过第二信号系统的条件反射获得的符号语义；依赖人类设置，社会约定，后天学习；符号语言来自是人对感知经验的命名，符号语义具有不确定性，并存在命名主体与命名客体的差异。

Natural language is the most common symbolic language. It is a symbolic semantics obtained through the conditioned reflection of the second signal system; it relies on human settings, social conventions, and acquired learning; symbolic language comes from the naming of human perception experience, and symbolic semantics is uncertain There is a difference between named subject and named object.

和弦语言是物理事件，基本形式为：和弦频谱，和弦空间（开、闭、膜弦），和弦数学模型（ 2^{n*f} , $n*f$, H^{n*f} , $H=1.059463$ ）；是自然（物理）法则，没有主体（心）与客体（物）的差异，服从和弦语言也是服从自然法则。

Chord language is a physical event, and its basic forms are: chords spectrum, chord space(open, closed, membrane strings), mathematical models of chords (2^{n*f} , $n*f$, H^{n*f} , $H=1.059463$); it is a

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natural (physical) law , There is no difference between the subject (mind) and the object (thing), and obeying the chord language is also obeying the laws of nature.

和弦语义来自和弦频谱，常用于时空，生命表达。

Chord semantics comes from the chord spectrum, which is often used in time and space, and life expression.

1、时-空语义：和弦语言在音乐，绘画中分别表达时间与空间、两者在数学上表现为：镜像、对称关系。（参见：14、和弦时-空）

1. Space-time semantics: Chord language expresses time and space separately in music and painting, and the two are expressed mathematically as a mirror-symmetric relationship. (See: 14, Chord space-time)

2、生命语义：人体上存在一个和弦系统，表现为经络（脉轮）系统；,在人体上产生全局-整体控制作用。（参见：15、和弦生命）

2. Life semantics: There is a chord system on the human body, which is manifested as a meridian (chakra) system; it produces a global-overall control effect on the human body. (See: 15, Chord Life)

经络系统在人体实现和弦生命语言的表达-执行，如：终极目的（永生，神），自我（灵魂），自然道德（业）等，包含宗教现象的自然原理。

The meridian system realizes the expression-execution of the Chord Life language in the human body, such as: ultimate purpose, self (soul), natural morality (karma), etc., including natural principles of religious phenomena.

和弦语言包括心灵语义，如：爱，恨，自然伦理等，它们是时空-生命语义的必然成分，这是和弦语言的一个奇特特征。

Chord language includes spiritual semantics, such as: love, hate, natural ethics, etc. They are an inevitable component of spacetime-life semantics, which is a peculiar feature of chord language.

和弦语言有以下主要特征：

Chord language has the following main characteristics:

1、先天语言：和弦语言是自然精神，不依赖后天学习，如：人体的经络系统；欣赏音乐的能力并不依赖音乐学习，如：低龄儿童。

1. Innate language: Chord language is the spirit of nature, and does not rely on acquired learning,

such as the human body's meridian system; the ability to appreciate music does not rely on music learning, such as: young children.

2、和弦语言是和弦频谱的能量信息作用，没有主观-客观，精神-物质的对立。

2. Chord language is the energy information function of the chord spectrum, there is no subjective-objective, spiritual-material opposition.

3、和弦语言是和弦频谱的自然信息，但又包含自然道德语义，显示了自然伦理的存在。

3. Chord language is the natural information of the chord spectrum, but it also contains natural moral semantics, showing the existence of natural ethics.

4、和弦语言是能量、信息系统，具有可执行性。

4. Chord language is an energy and information system, which is executable.

5、和弦语义来自和弦频谱，是自然精神的存在形式。

5. Chord semantics comes from the chord spectrum, which is the existence form of natural spirit.

16-2.Compile |编译

符号语言可以被理解，和弦语言可以被执行，两者之间可编译。

The symbolic language can be understood, the chord language can be executed, and the two can be compiled.

常见的和弦语言经验是：自然语言编译为和弦语言，可产生执行性；和弦语言被编译为自然语言，可产生可理解性；两者之间具有可编译性，类似计算机的高级语言与低级语言。

Common chord language experience is: natural language is compiled into chord language, which can produce execution; chord language is compiled into natural language, which can produce intelligibility; there is compilability between the two, similar to high-level and low-level computer languages .

从一首乐曲中获得的和弦语言体验，如果不能编译为自然语言，便不能被理解，它只是一种说不出的内部体验；当人们试图将它说出来，如：音乐评论，这就是一个“编译”的尝试。

The chord language experience gained from a piece of music cannot be understood if it cannot be translated into natural language. It is just an unspeakable internal experience; when people try to say it, such as: music review, this is a compilation Try.

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编译的困难在于其确定性，我们可以认为巴赫，莫扎特的某首乐曲表达了某种“意义”，或者还有很多人也有类似体验，但是这种体验缺乏确定性，无法被重复观察验证。

The difficulty of compilation lies in its certainty. We can think that a certain piece of Bach and Mozart's music expresses a certain "meaning", or that many people have similar experiences, but this experience lacks certainty and cannot be verified by repeated observations.

相反的例子存在于宗教等实践：通过祷告、冥想，企图让自然语言转化为可执行的自然力（神迹）；这里需要一个编译过程，将自然语言转译为可执行的自然作用，如：物理、化学作用。

The opposite example exists in practices such as religion: through prayer and meditation, an attempt is made to transform natural language into executable natural forces (miracles); a compilation process is required to translate natural language into executable natural effects, such as: physics, Chemical action.

自然语言的不同语义会唤起不同的身-心体验，如：你是好人，你是坏人；多数人能够区别被唤起的身-心反应：愉快或气愤，这意味着自然语言被执行，这里应该有一个相应的执行过程（化学，物理等）。

The different semantics of natural language will evoke different body-mind experiences, such as: you are a good person, you are a bad person; most people can distinguish the evoked body-mind reaction: happy or angry, which means that natural language is executed, here should be There is a corresponding execution process (chemistry, physics, etc.)

如果自然语言能唤起经络反应，如：循经传感（Propagated sensation along the channels）或穴位反应，并能够被重复观察，自然语言与和弦语言之间的可编译性便可以确定，这个实验需要特殊观察者：经络体觉的自观察者，这是任何人都可以尝试的方法，也是某些东方宗教的方法。

If natural language can evoke meridian responses, such as: Propagated sensation along the channels or acupoint responses, and can be observed repeatedly, the compilability between natural language and chord language can be determined. This experiment requires special Observer: The self-observer of meridian somatosensory. This is a method that anyone can try, and it is also a method of certain Eastern religions.

部分命名符号是来自对和弦语义的编译，如：神，灵魂；这类命名对象无法在自身之外被观察，但又是生命的普遍需要。（参见：15、和弦生命）

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Some naming symbols are derived from the compilation of chord semantics, such as: god, soul; such named objects cannot be observed outside of themselves, but they are universal needs of life. (See: 15, Chord Life)

16-3.Observer | 观察者

人的认识来自两种观察者：和弦观察者和非和弦观察者；由此观察到两个世界：和弦世界，如：音乐、绘画、经络、宗教等；非和弦世界，如：科学、哲学等——前者服从和弦语义逻辑，后者服从符号语义逻辑。

Human cognition comes from two kinds of observers: chord observers and non-chord observers; thus two worlds are observed: chord worlds, such as music, painting, meridians, Religion, etc.; non-chord world, such as: science, philosophy, etc. - the former obeys chord semantic logic, the latter obeys symbolic semantic logic.

这里有几个典型案例：

Here are a few typical cases:

第一个典型案例是对声，光的观察：

The first typical case is the observation of sound and light:

物理学家对声、光的观察产生了声学，光学、相对论等；而音乐家，画家对声，光的观察产生了 2^*f , n^*f , H^*f , $H=1.05946$ (2^*f , n^*f , H^*f , $H=1.05946$)，音乐，绘画等；两者均有其观察基础，可定量，数学表达，但却是不同的逻辑系统。

The observation of sound and light by physicists has produced acoustics, optics, relativity, etc.; while the observation of sound and light by musicians and painters has produced Temperament and Harmonics, music, painting, etc; Both have their observational basis, which can be quantitatively and mathematically expressed, but they have completely different results.

另一典型案例是在生命领域：

Another typical case is in the field of life:

人体存在一个和弦控制系统，由自观察（内观察）发现，表现形式为：经络（脉轮）系统；十二经络具有受激反应特征频率，分布为：十二平均律（Equal Temperament），可用和弦数学表达；与音乐、绘画在数学上同构。

There is a chord control system in the human body. It is found by self-observation (internal observation) that the manifestation is: the meridian (chakra) system; the twelve meridians have the characteristic frequency of stimulated response, and the distribution is: Equal Temperament, available Mathematical expression of chords; mathematically isomorphic with music and painting.

非和弦观察者屏蔽了调性语义，只能观察到对象的无调性信息，如：形态，位置，运动等，并只能在无调性条件下被验证，如：现有的科学方法。

The non-chord observer shields the chord semantics, can only observe the non-chord information of the object, such as: morphology, position, motion, etc., and can only be verified under non-chord conditions, such as: the existing scientific method.

和弦观察者可观察调性的语法，语义作用及自然法则，由此产生了和弦知识体系，如：音乐，绘画，经络等，并只能在调性条件下被验证。

Chord observers observe the grammar, semantic action, and natural laws of chords (tonality), which give rise to chord knowledge systems such as music, painting, meridians, etc., which can only be verified under chord conditions.

最常见的范例是和声学，它来自和弦观察者对自己身-心的和弦作用的观察，它需要特殊的观察者——具有音乐禀赋的音乐家；大量的特殊观察者从和弦观察中得到重复的观察结果，逐渐形成了和弦语言的定量-数学表达形式：和声学，并且只能被和弦观察者所验证，这与科学方法是非常不同的。

The most common paradigm is harmony, which comes from the chord observer's observation of the chord action of his own body-mind, which requires special observers - musicians with musical endowments; a large number of special observers learn from membrane chords. Repeated observations from observation gradually formed a quantitative-mathematical form of chord language: harmonics, and can only be verified by chord observers, which is very different from the scientific method.

我们看到一个什么样宇宙，这与观察者有关，非和弦观察者存在调性盲区，这是人类认识自身与宇宙的基本障碍。

What kind of universe we see is related to the observer, and the non-chord observer has a chord blind spot, which is the basic obstacle for human beings to understand themselves and the universe.

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圣经-新约

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Brief Summary; 小结

和弦是自然的基础结构与统一框架。

Chords are the basic structure and unifying framework of nature.

人类知识的形成源自两种观察者：

Human knowledge is formed from two kinds of observers:

和弦观察者：对和弦作用的观察，如：音乐（时间的表达）、绘画（空间的表达）、经络（生命的表达）。

Chord Observer: Observation of the effects of chords, such as music (expression of time), painting (expression of space), meridians (expression of life).

非和弦观察者：屏蔽了和弦的作用，其观察产生了物理学、生物学等体系。

Non-chord observer: blocks the effect of chords, and its observation produces systems such as physics and biology.

尽管这两种观察者探索的领域似乎不同，它们实际上都涉及相同的主题：时空与生命。

Although the two observers seem to explore different areas, they actually deal with the same themes: space- time and life.

认识的边界即观察者的边界。和弦场（音乐、绘画、经络等）是非和弦观察者的盲区，这产生了一个问题：两种观察者对时空与生命的描述为何不同？谁的视角更接近真相？

The boundary of cognition is the boundary of the observer. The chord field (music, painting, meridians, etc.) is the blind spot of non-chord observers, which raises a question: Why do the two observers describe time, space and life differently? Whose perspective is closer to the truth?

本书将持续探索这些问题，基于观察结果进行修正与更新。您的关注与批评是我们不断进步的动力。

This book will continue to explore these issues and make revisions and updates based on the observations. Your attention and criticism are the driving force for our continuous progress.

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