



Reminiscences on Chromesthetic Painting

Craig Graci

Craig Graci

Craig Graci

Part 1

A Very Small Sampling of the Paintings

The slides in this part of the presentation are lifted directly from "CG's Chromesthetic Paintings," a slide show representing most of the works in roughly the order in which they were painted.

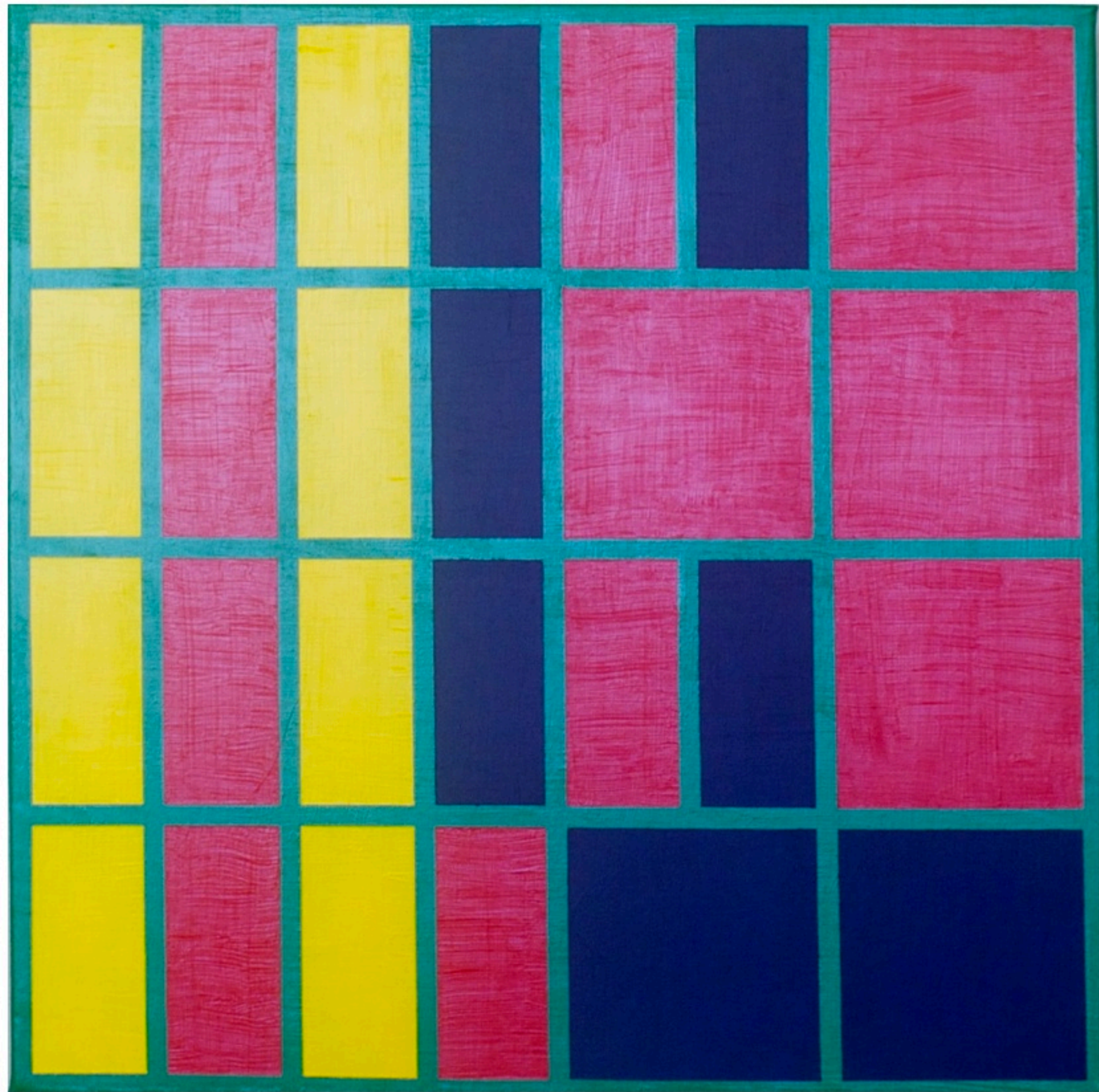
Little Tune

Little Tune, the first of the chromesthetic paintings, is a three note melody composed by Dmitry Kabalevsky.

The palette was chosen to correspond to the four colors featured in the Simon memory game, which are red, green, blue, yellow.

The painting is in the personal collection of RB.

Sound on the image: Piano

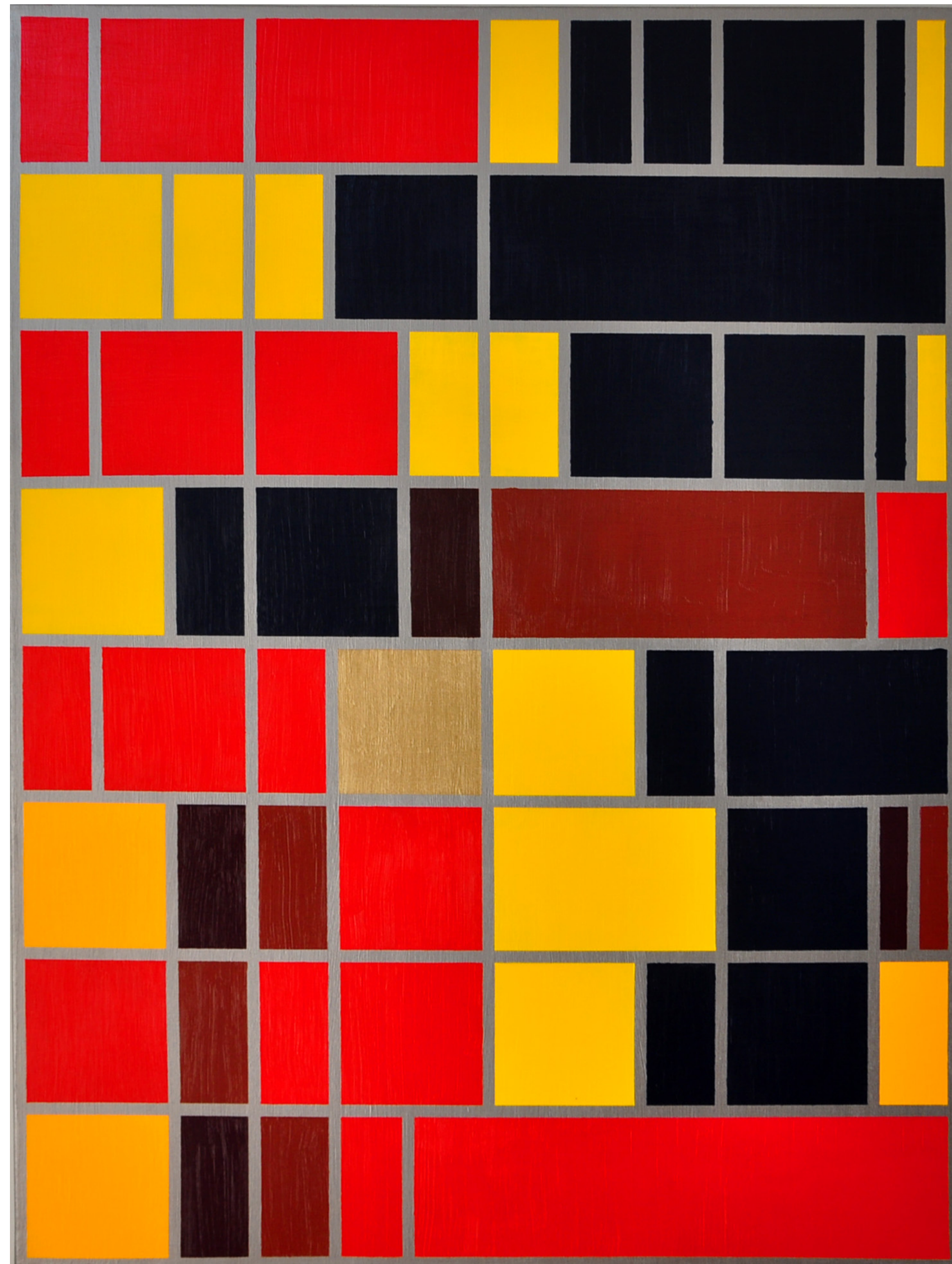


Crimson Flames

The Crimson Flames painting represents Bob Dylan's "My Back Pages."

The palette was inspired by the first bit of the lyric to the song: "**Crimson flames** tied through my ears ..."

Sound on the image: Bob Dylan

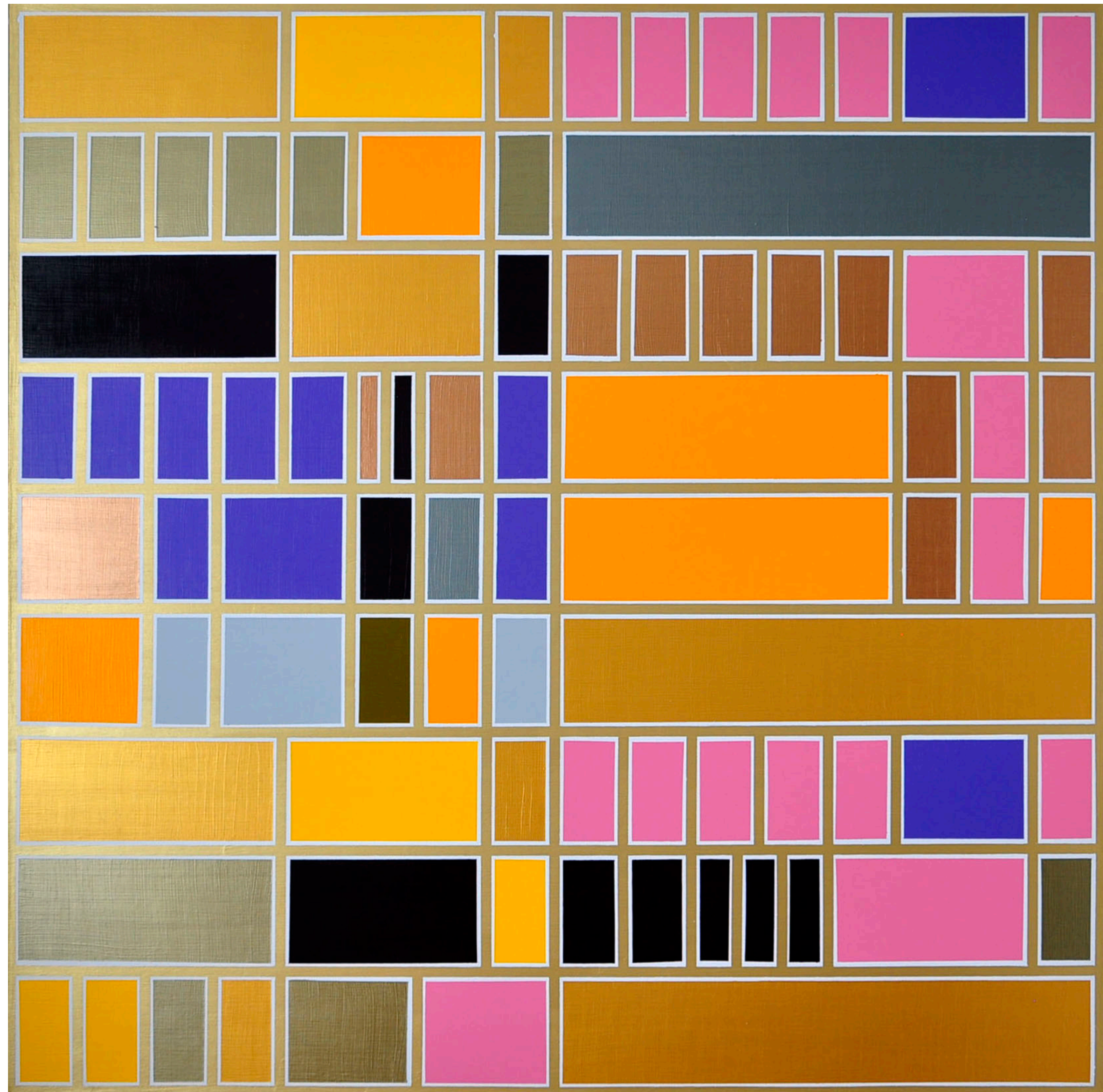


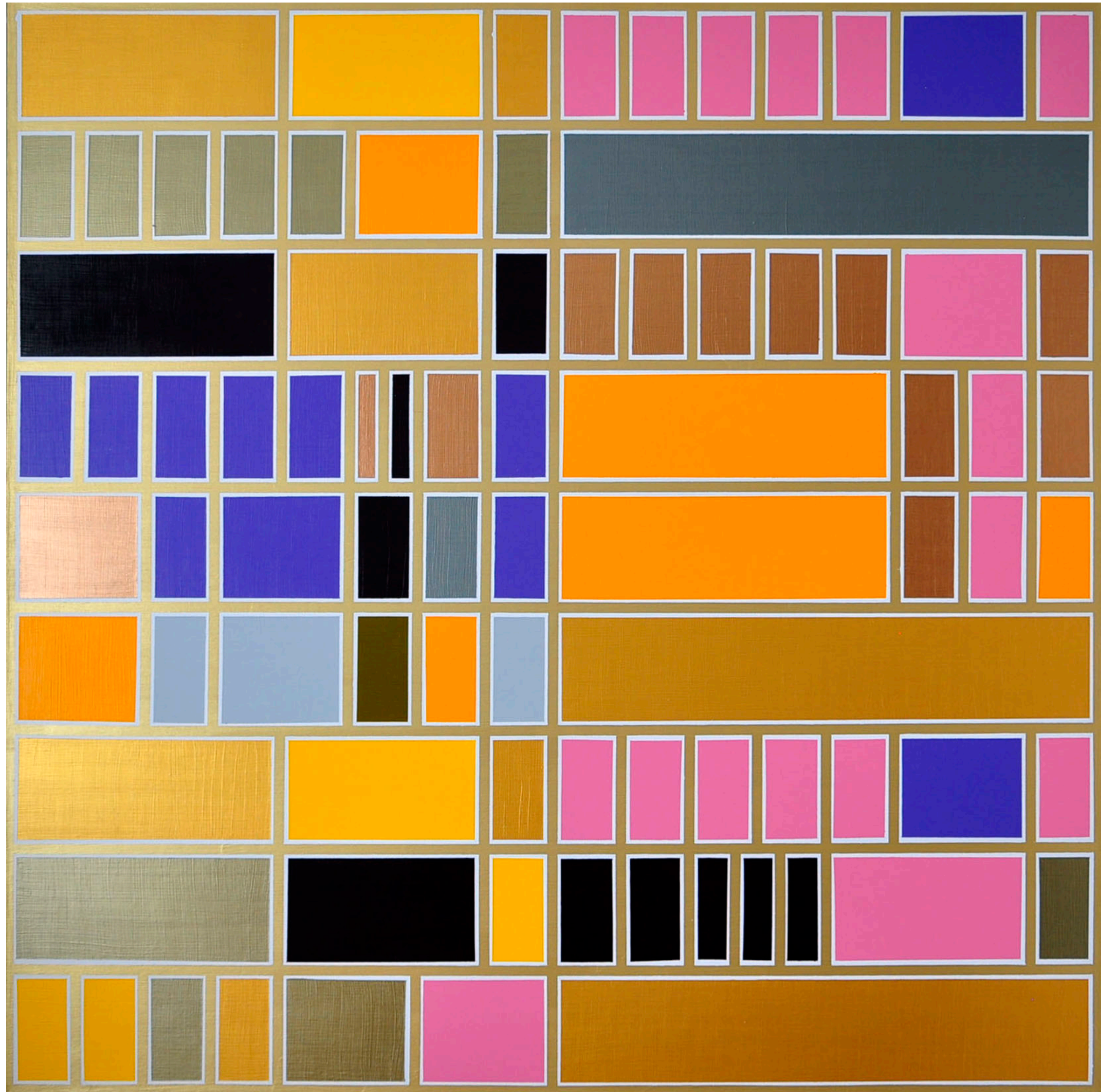
Angel Glow

The painting Angel Glow is something of a marriage between an exquisite tune composed by Jerome Kern, "All The Things You Are," and a palette inspired by a well-known painting by Gustav Klimt, "The Kiss."

Sound on the second image: Artie Shaw







Part 2

Synesthesia and Chromesthesia

Definitions/Examples

Sharing a root with anesthesia, which means “no sensation,” **synesthesia** means “joined or coupled sensation.” (“Synesthesia,” Cytowic, p. 2)

There are many types of synesthesia! For example ((adapted from “Synesthesia,” Cytowic, chapter 1, and “Wednesday is Indigo Blue,” Cytowic and Eagleman, chapter 6)):

- **grapheme** → **color** (e.g., A is red, B is yellow)
- **grapheme** → **gender and personality** (e.g., 5 is a fierce female, 7 is a thoughtful male).
- **phoneme** → **taste** (e.g. the “s” in “sapphire” may trigger the taste of tomato, the “l” in “locomotive” may trigger the taste of potato.)

Chromesthesia is a type of synesthesia in which sounds are seen as colors, or colors are heard as sounds. The former case, the more common of the two, is also referred to as **colored hearing**. For example: **pitch** → **color**.

Actual Synesthesia vs Artistic Synesthesia

Actual synesthesia is involuntary and biological, and is therefore an integral part of a person's way of perceiving the world at all times.

Artistic synesthesia is the deliberate construction of cross-sensory effects by artists who deploy perceptual blending as a means of communicating their vision.

It is important to respect the distinction between actual synesthesia and artistic synesthesia, and hence refrain from treating the two phenomena as though they are interchangeable.

((Adapted from "Synesthesia and the Arts," by Dani Cavallaro.))

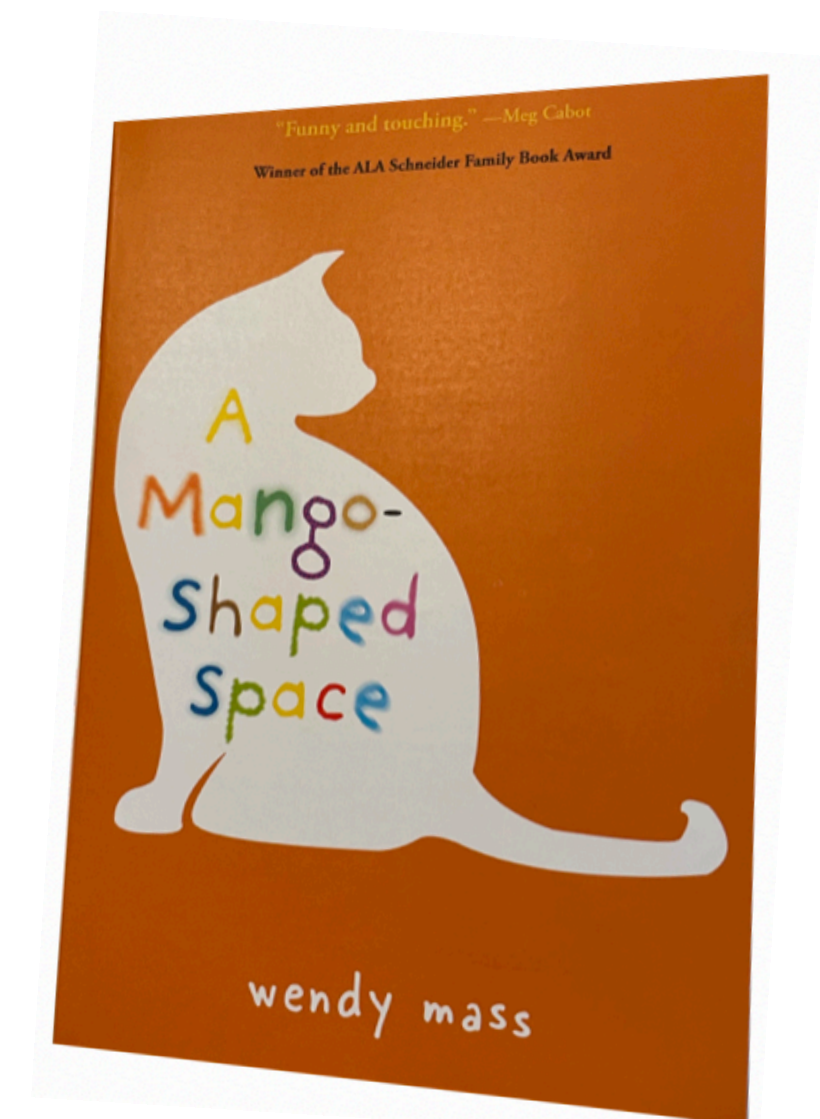
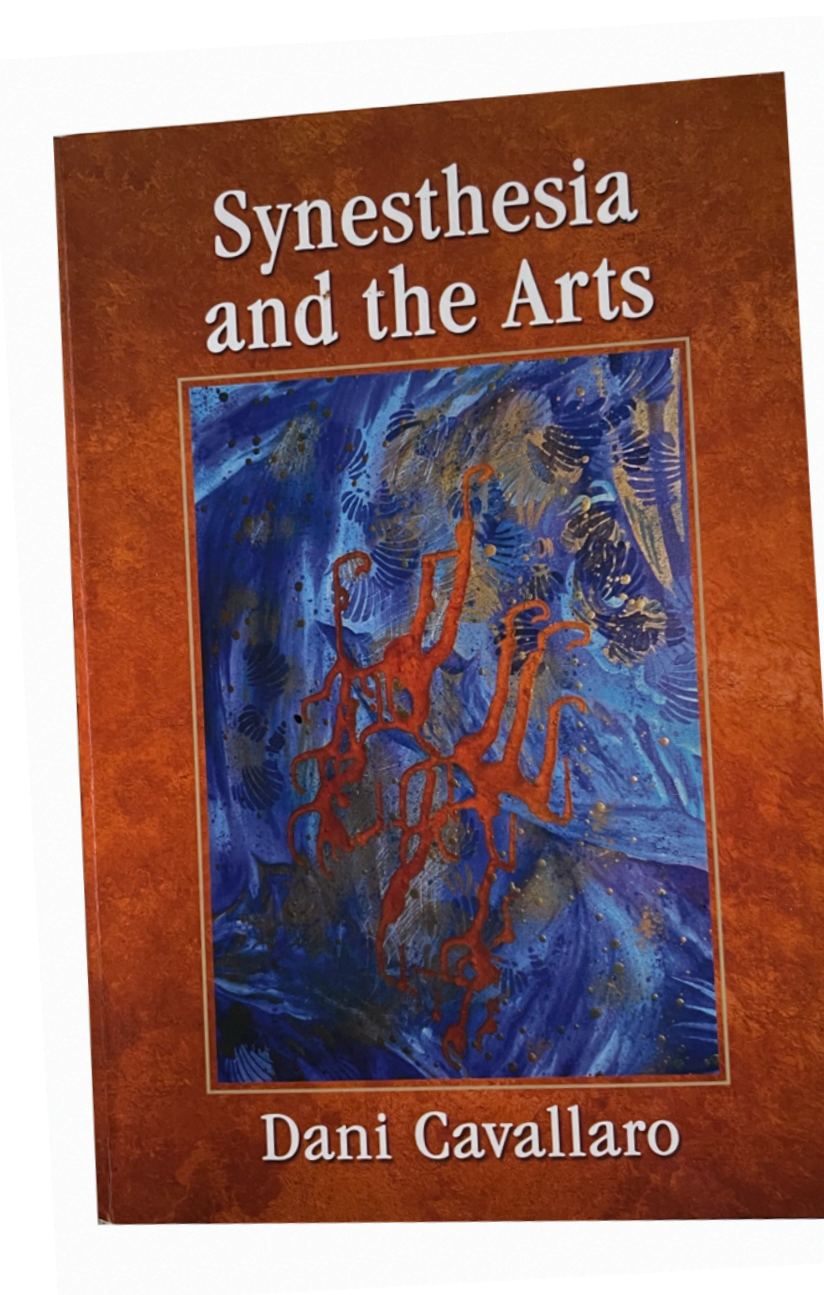
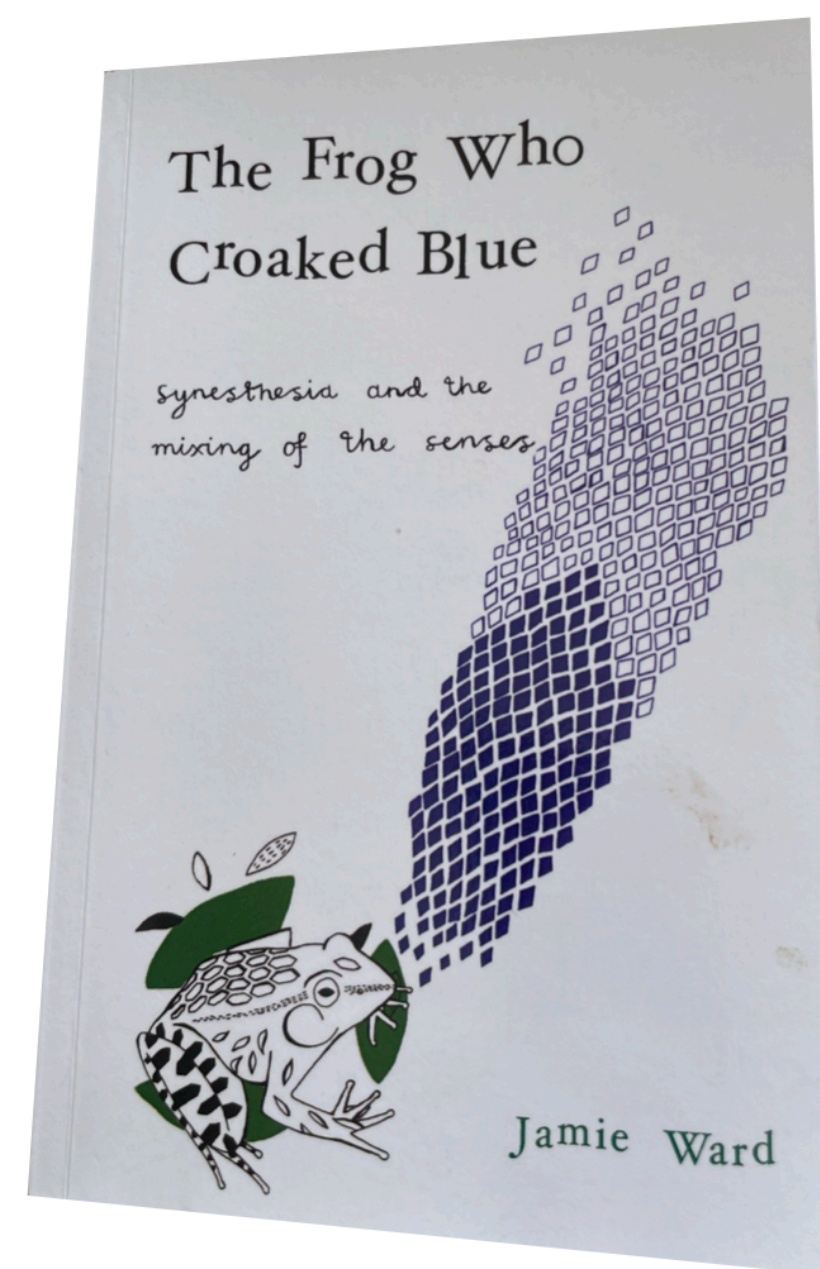
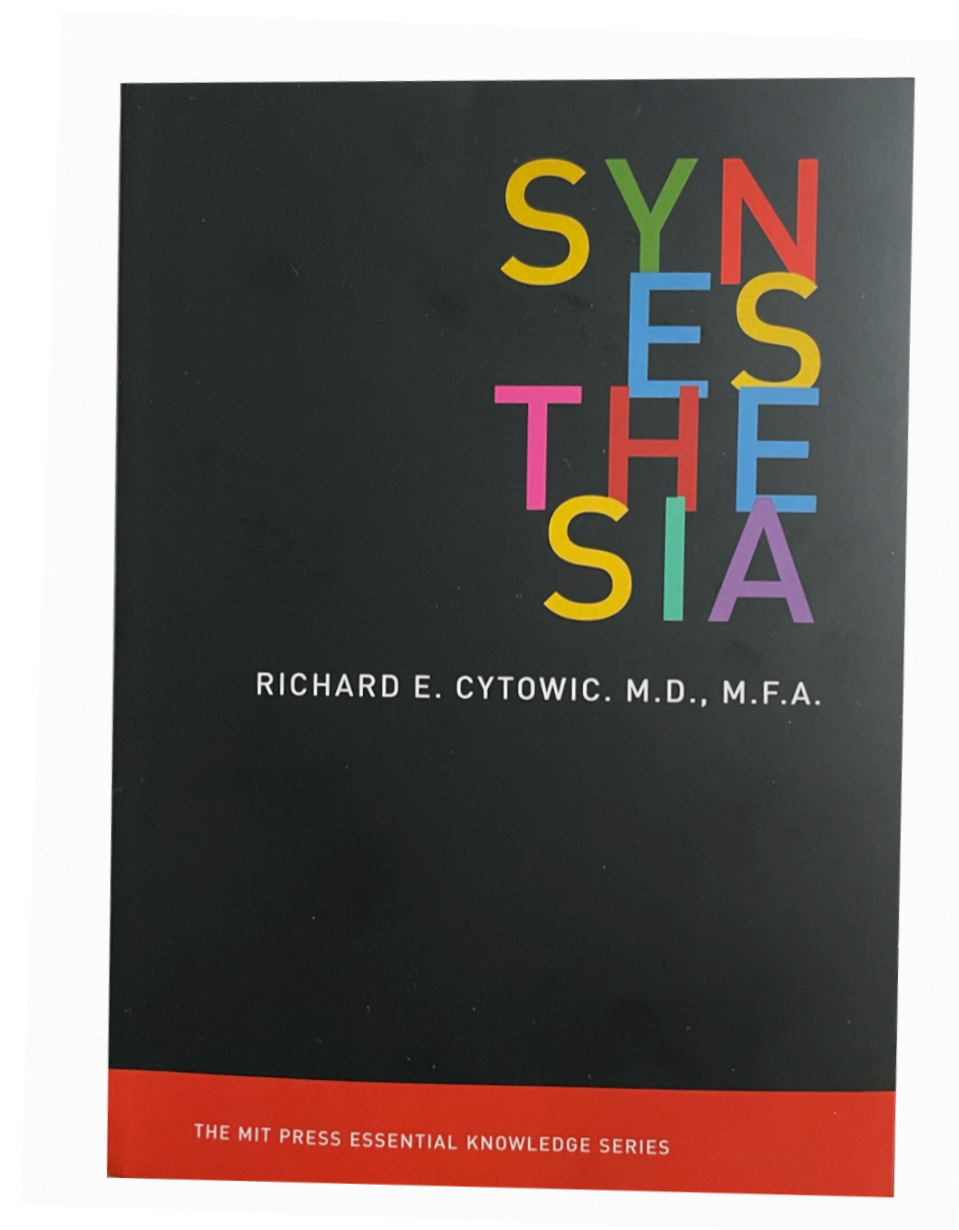
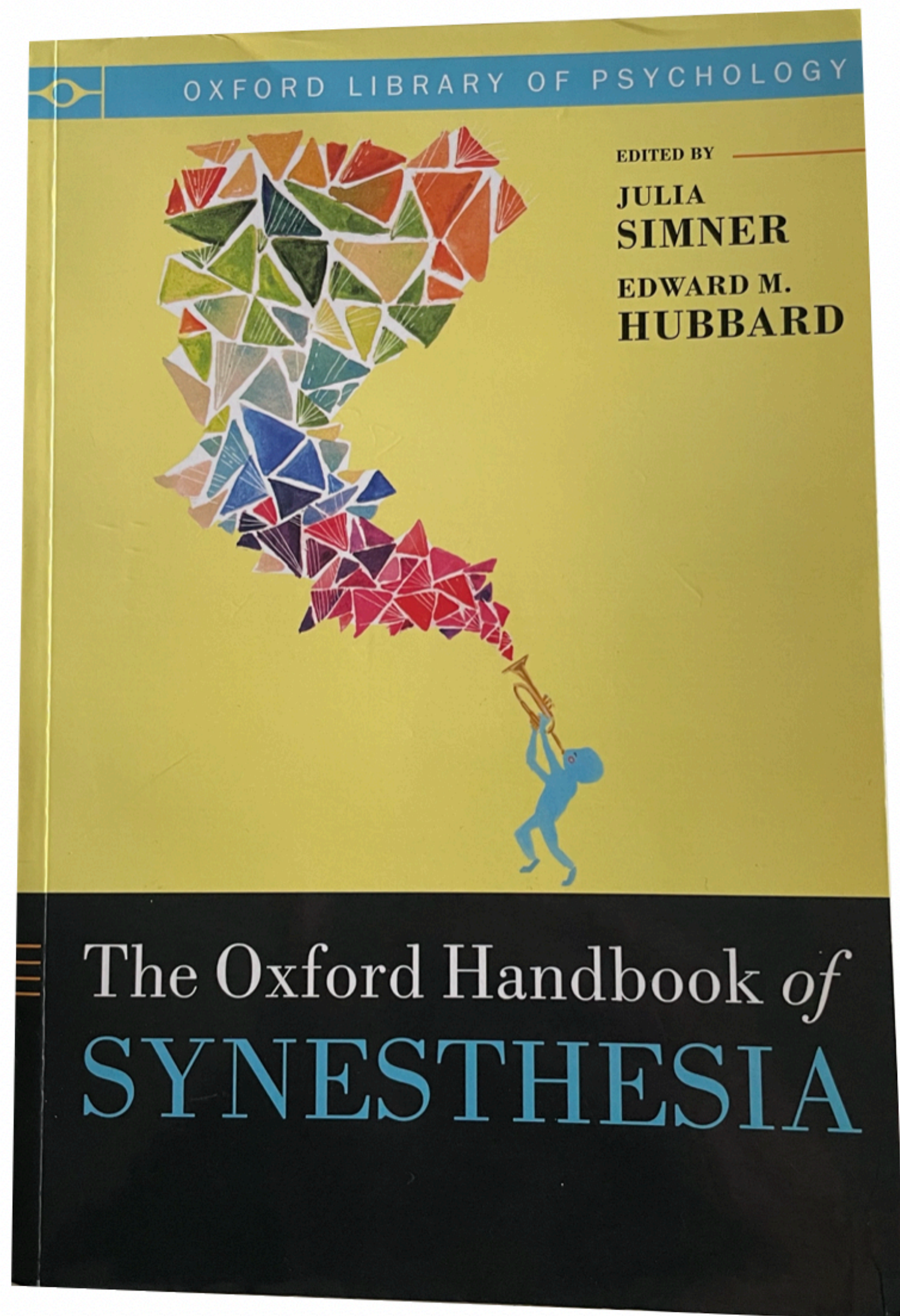
Example of Artistic Synesthesia

The first experiment ever made to try and evoke links between hearing and seeing appeared in the 16th century. The involved artist was **Giuseppe Arcimboldo**. He pasted colored pieces of paper on each key of a musical instrument similar to a keyboard. In this way, he wanted to stimulate the association between a tone and a specific color. He had become famous for his paintings in which he represented portrait heads made entirely of common objects, in particular food – fruits, vegetables, flower, and fish. You globally see a face, but you also perceive the edible details. Do you perceive the taste of peaches, grapes, or fish? If yes, he (involuntarily?) evoked weird synesthesia in you: the link between vision and taste!

dailyartmagazine.com/synesthesia-in-art/



Selected Texts on Synesthesia



A Note on Chromesthetic Manifestation

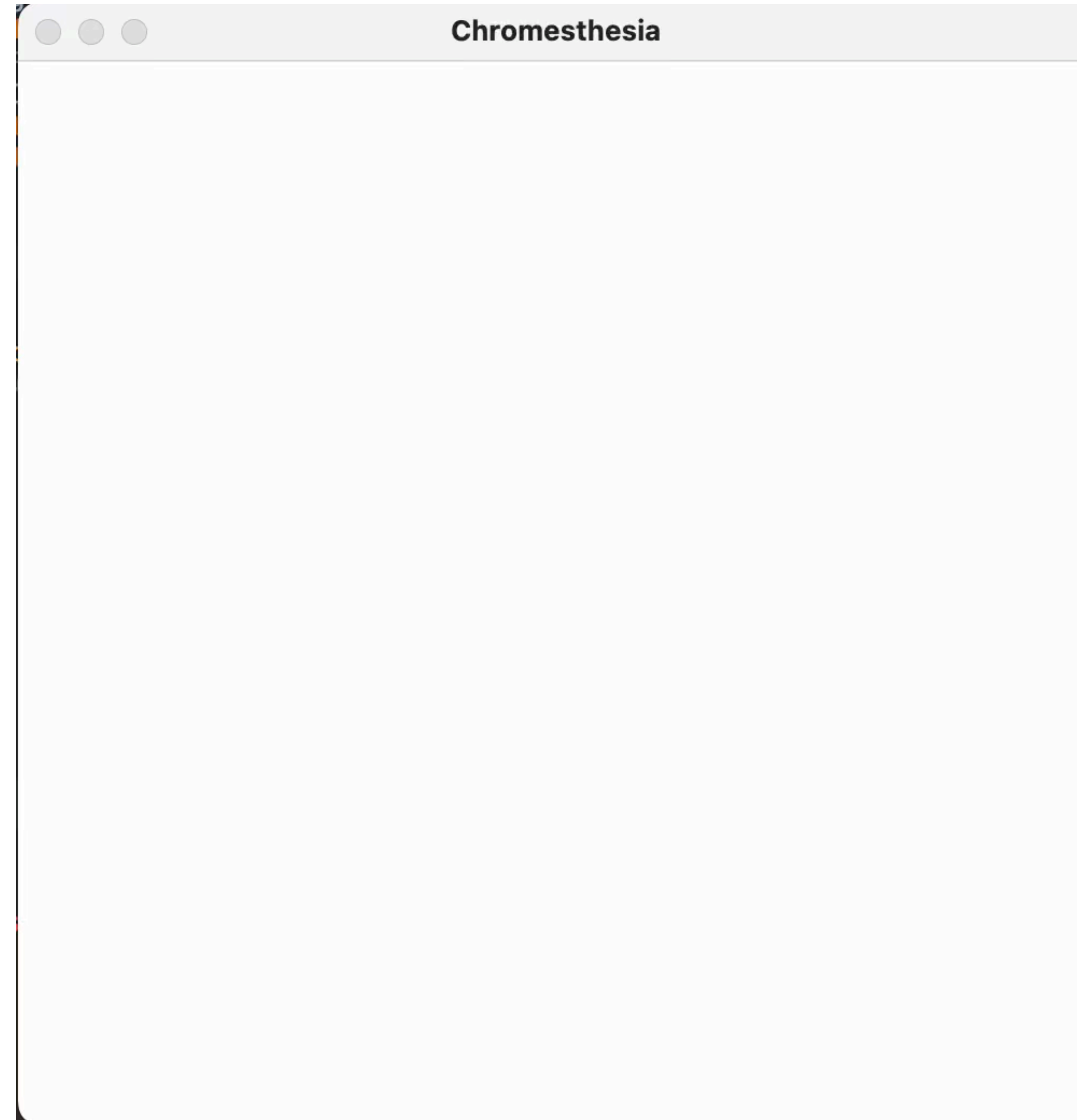
How might a chromesthete visualize musical notes?

There are lots of possibilities!

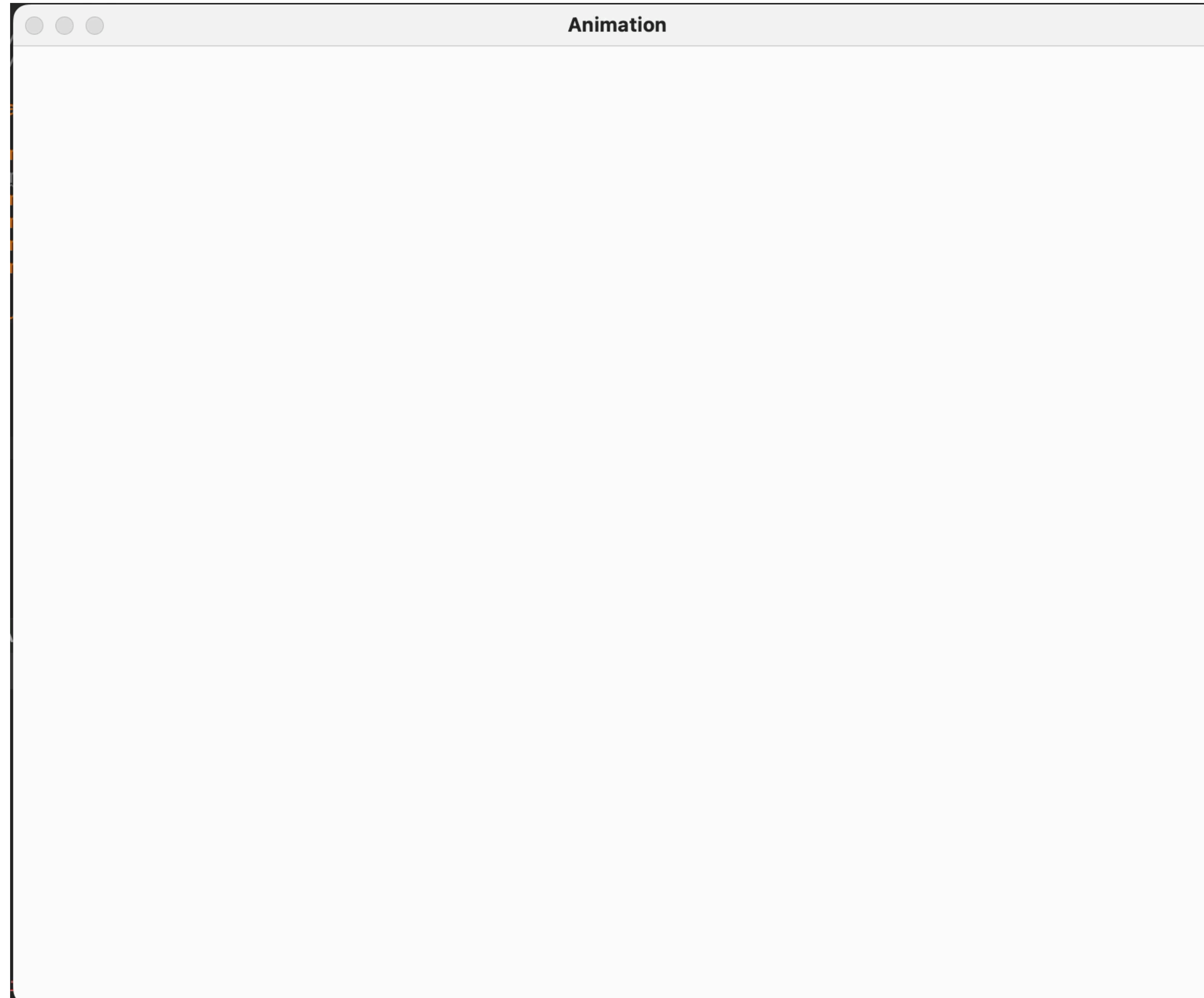
Two of the most common ways are ...

- Like fireworks, with fading images
- As solid shapes, projected here or there

Suggestive Visualization Based on a CS1 Lab



Animation of a Virtual Painting (Almost a CS1 Lab!)



Part 3

Art? Chromesthetic Paintings?

Some “Big” Questions

These questions are likely to run through at least some of our minds as the hour unfolds:

- The ubiquitous question: **But is it art?**
- The more relevant question: **But is it a chromesthetic painting?**

Some Related Questions

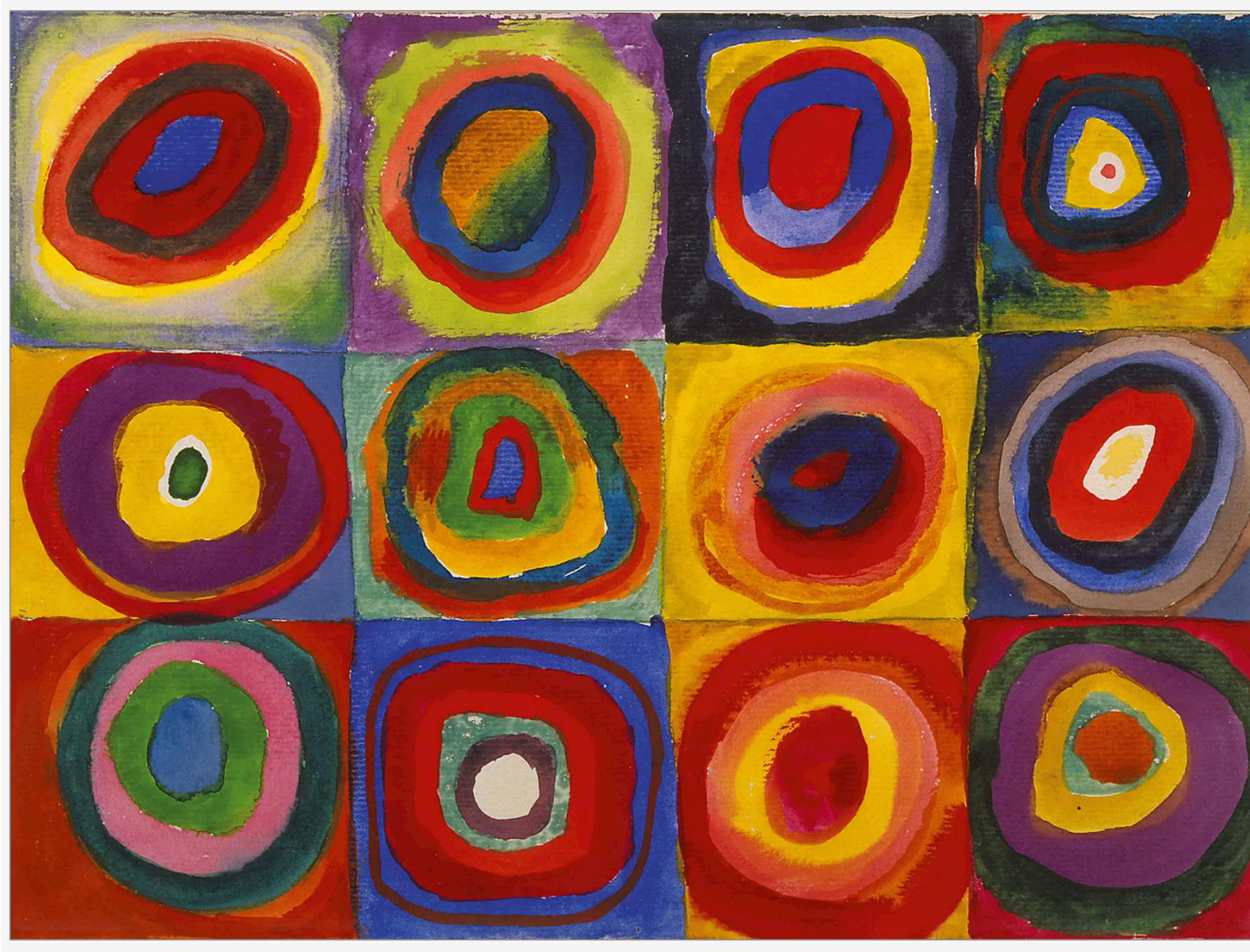
Among the questions that relate to the “big” questions:

- Are the answers to the “big” questions associated with the artist, perhaps relating to the **artist’s inclination or intention**?
- Do the answers to the “big” questions reside with the viewer / listener / reader (receiver), within what is sometimes referred to as the **beholder’s share**?
- To what degree are these two sides of an artifact involved in determining answers to the “big” questions?

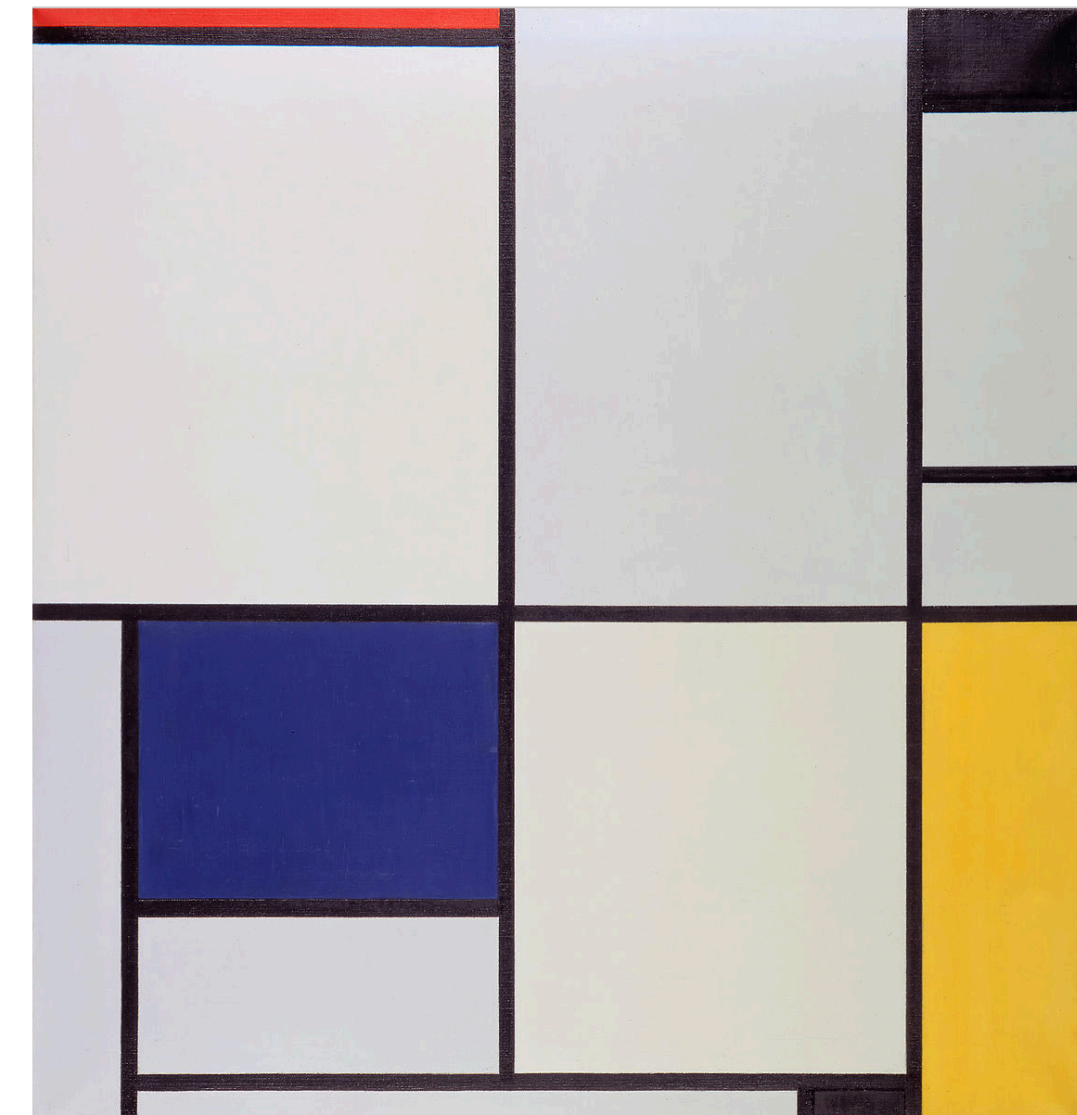
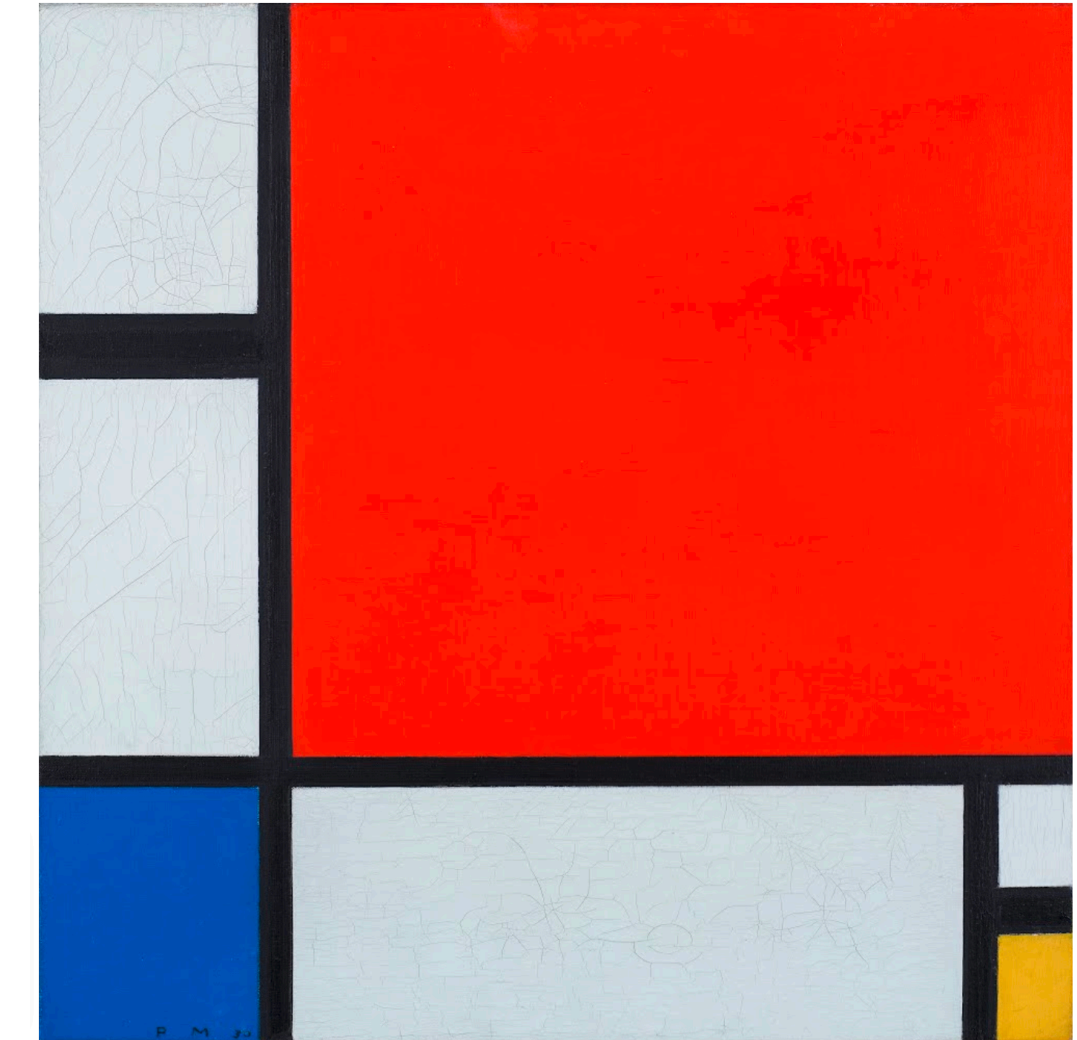
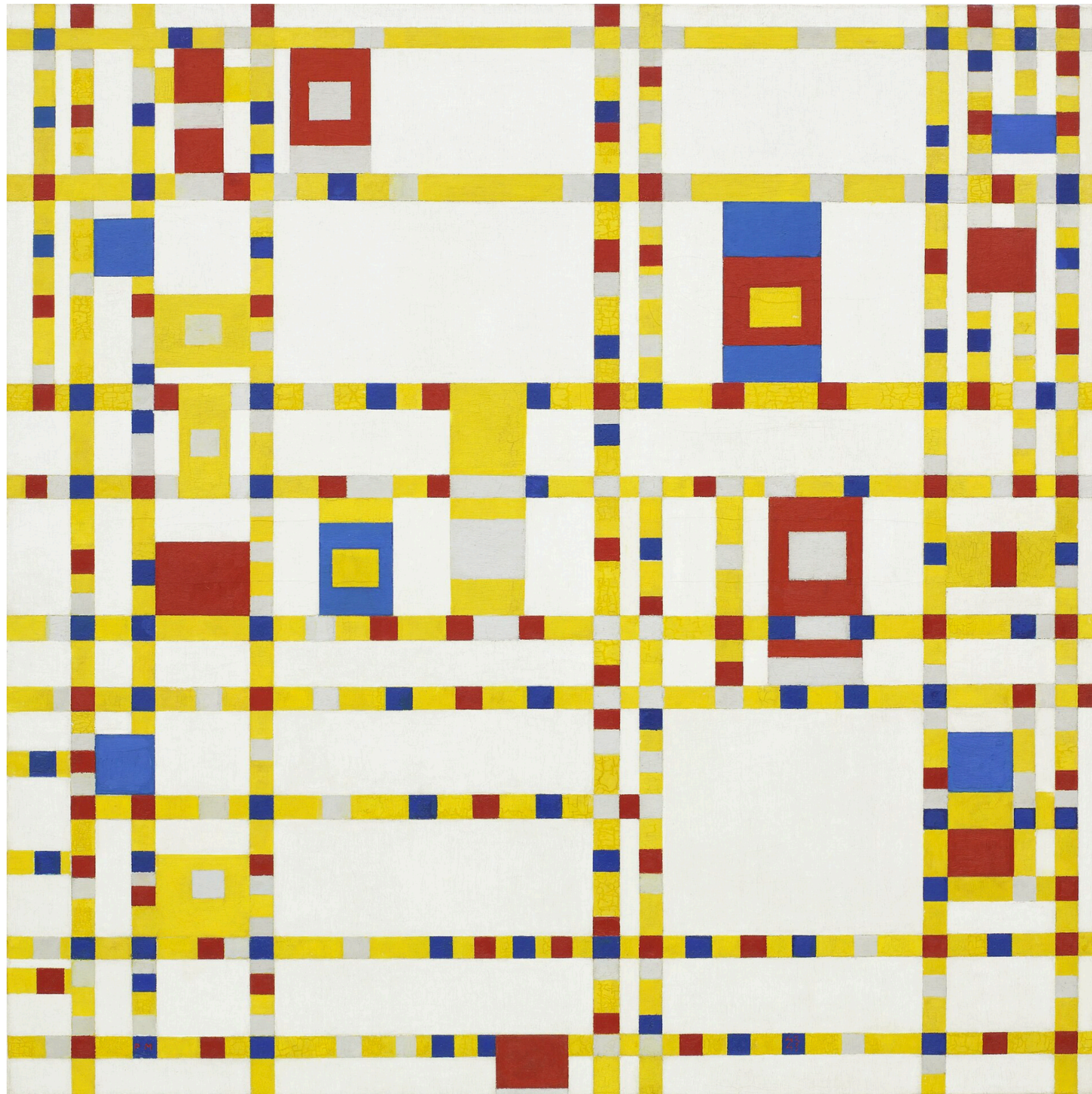
Part 4

Examples of Chromesthetic Paintings

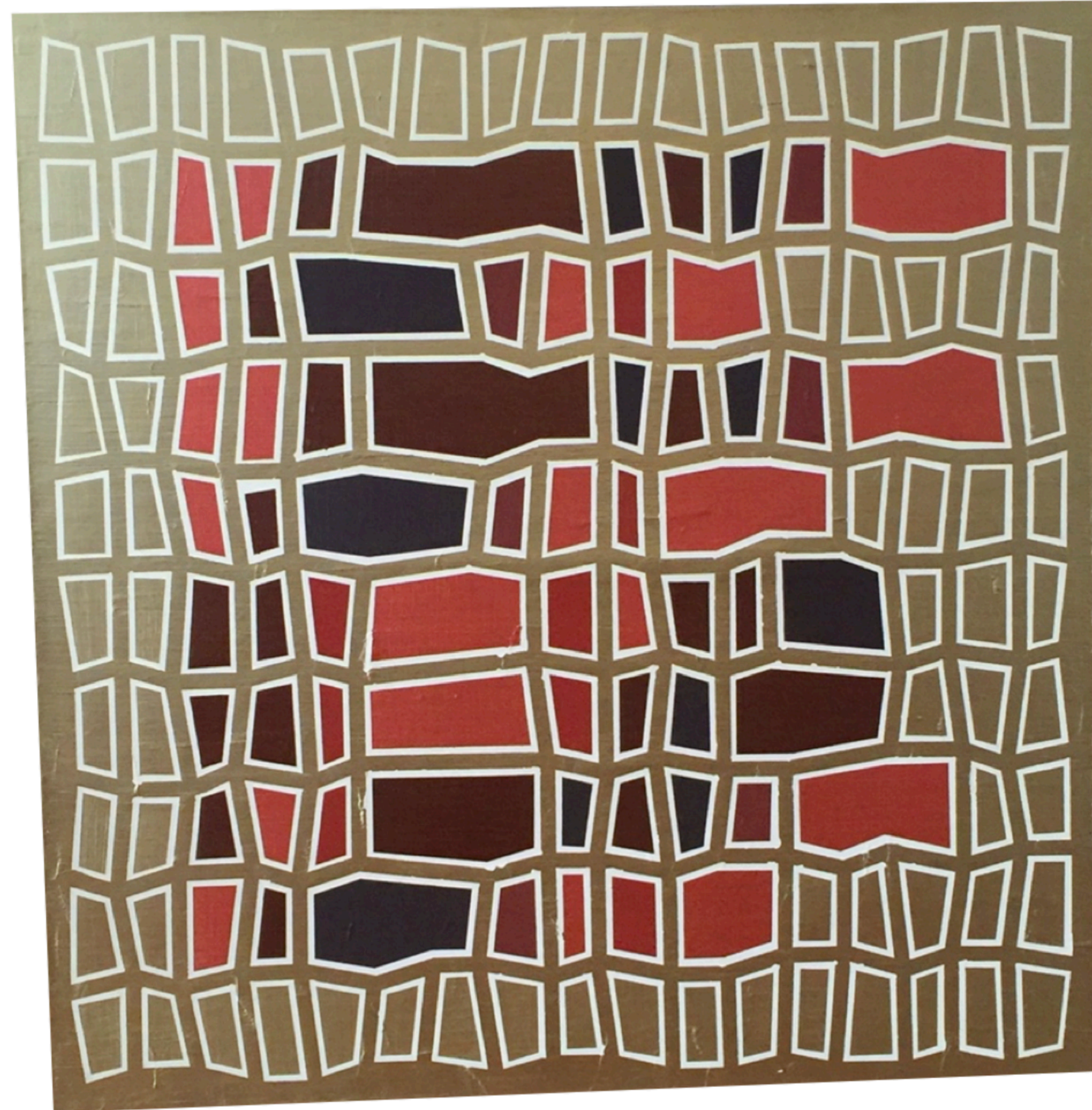
Wassily Kandinsky's "Concentric Circles"



Piet Mondrian's "Broadway Boogie Woogie"



Craig Graci's "Wayfaring Stranger"



Part 5

Pivotal Event #1 En Route to the Paintings

Interview: Wei Wang Interviewed Craig Graci (2014)

W: What inspired you to come up with this idea?

C: For a number years, I taught a computational problem solving course to quite a few students. One semester, I focused extensively on problems associated with the modeling of musical melody. But I had a deaf student in class, and I wanted her to be able to model melodies, and solve the musical problems that I posed.

Since she couldn't hear the melodies, I had to translate the problems from the sonic realm into the visual realm. I would present her with simple text files in which each line of the text file would represent a note. A number would correspond to a degree of a given scale, and some number of dashes would correspond to a duration. For example:

```
3  - - - - -  
2  - - - - -  
1  - - - - - - - - - -
```

Interview, Continued

With a simple symbolic language that I invented for modeling melody, my student was able to reproduce the visual output. As a side effect of running her program, hearing people could listen to the melody that she had coded to generate the textual image. Although deaf, this student was able to generate the music, the melody, from the textual image.

((Transcription of the interview.))

Sample Demo Featuring a few of Clay Primitives in MxM

```
Welcome to DrRacket, version 8.12 [cs].  
Language: racket, with debugging; memory limit: 128 MB.
```

```
> ( mxm )
```

```
Hi! MxM here ...
```

```
play
```

```
C4 - - - -
```

```
play rp play lp play play
```

```
C4 - - - -
```

```
D4 - - - -
```

```
C4 - - - -
```

```
C4 - - - -
```

```
rp:2 play lp play lp x2 play s2
```

```
E4 - - - -
```

```
D4 - - - -
```

```
C4 - - - - - - - -
```

```
eof
```


From Pitches and Dashes to Grids

Welcome to [DrRacket](#), version 8.12 [cs].
Language: racket, with debugging; memory limit: 128 MB.

```
> ( mxm )
```

```
Hi! MxM here ...
```

```
rp:2 play lp play lp x2 play s2
```

```
E4 - - - -
```

```
D4 - - - -
```

```
C4 - - - - - - - -
```

```
( to-f-mode )
```

```
rp:2 play lp play lp x2 play s2
```

3	2	1
---	---	---

```
( to-c-mode )
```

```
rp:2 play lp play lp x2 play s2
```

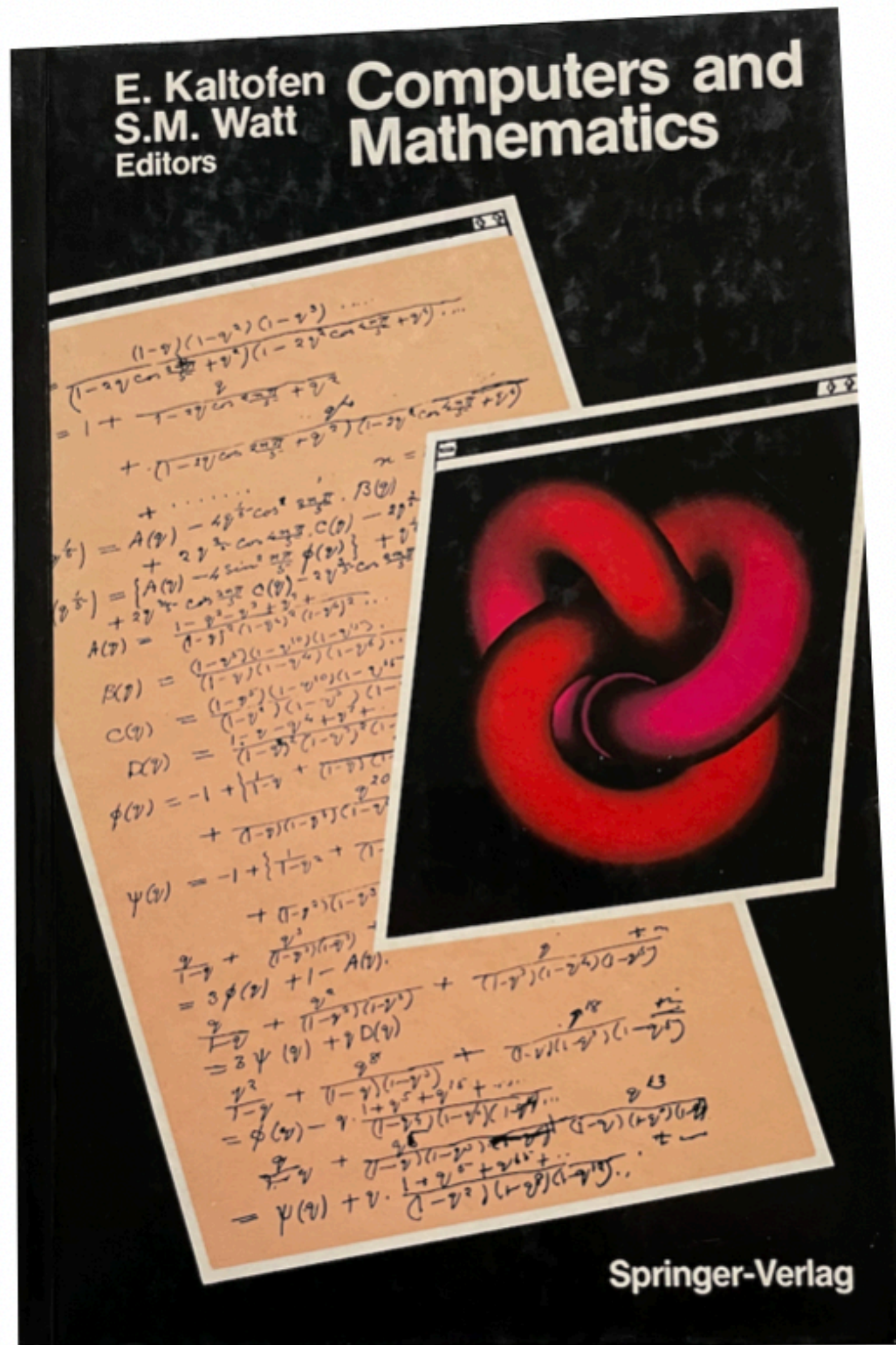
		
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eof

Part 6

Educational Microworlds

Bunny Numerics: A Number Theory Microworld



There are various *breeds* of bunnies, corresponding, in the main, to kinds of numbers. For example, there are odd bunnies, even bunnies, Fibonacci bunnies, and prime bunnies. A given breed of bunny is generally limited in terms of the islands that it can visit. A prime bunny, for example, can land only on the prime islands, the islands numbered 2, 3, 5, 7, 11, etc., and also on the Home island. A bunny knows never to set foot on an island which is not suited to its kind. All bunnies are comfortable at Home, which is also the birth place of all bunnies.

ODD BUNNIES KNOW THEY'RE NOT WANTED ON EVEN ISLANDS!

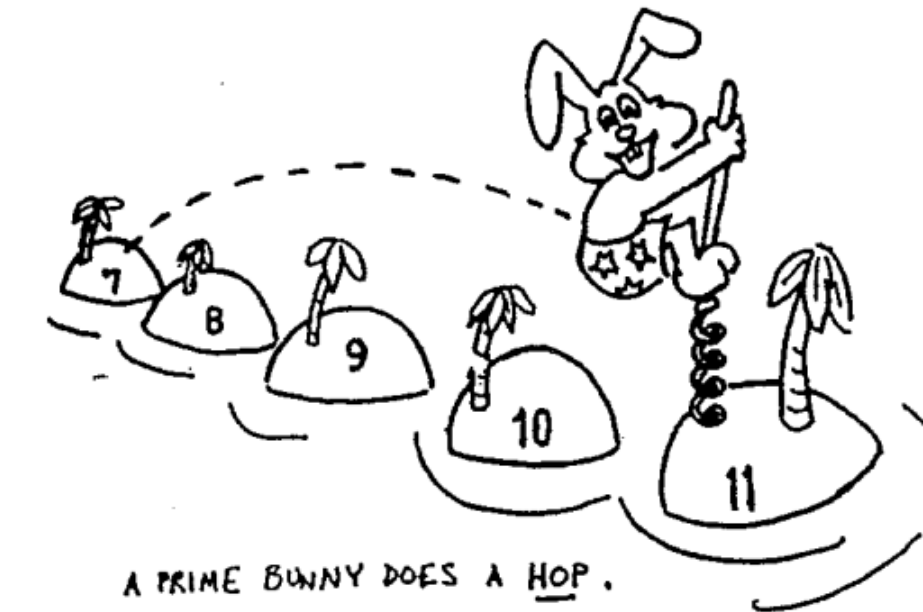


3. Basic Bunny Talk

Bunny talk is the set of Logo procedures one uses to communicate with bunnies. The most fundamental bunny talk procedures are: Hop, Location, Distance, HopAge, and HopHome. A brief description of each follows.

- Hop *bunny* (command)

The specified bunny moves to the next highest numbered island to which its kind is suited.

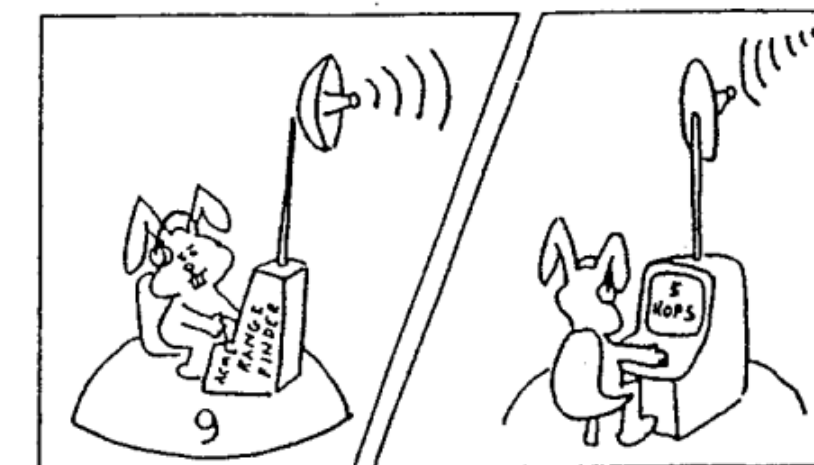


- Location *bunny* (operator)
Loc *bunny*

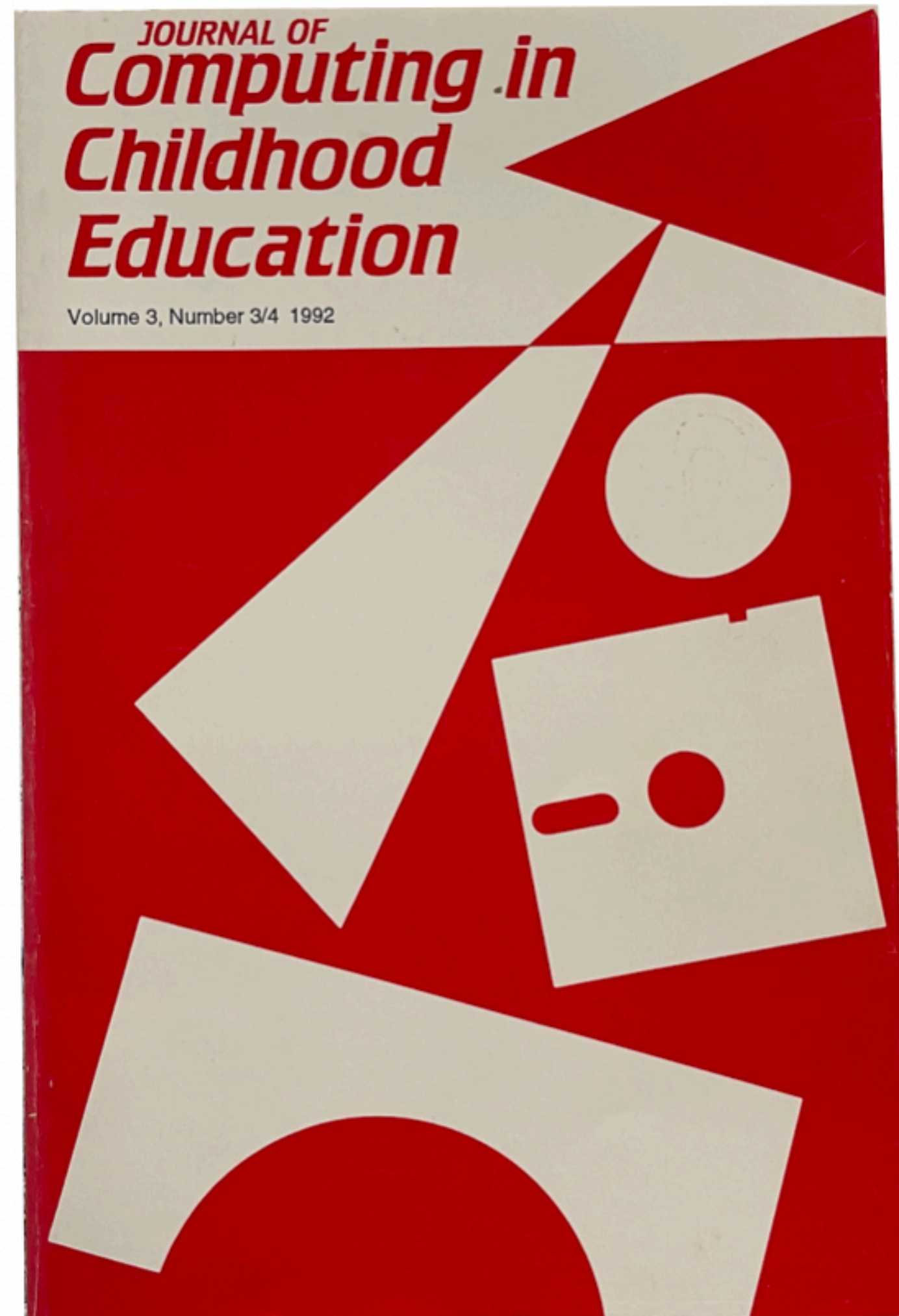
The "name" of the island on which the specified bunny is presently resting is returned.

- Distance *bunny* (operator)
Dis *bunny*

The number of hops that the specified bunny is from Home is returned.



Children, Chunking and Computing - and the QuArc World



It is important that the remaining boxes be absent, as their presence tends to dissipate the learners' attention by seducing them in too many directions at one time. *The significance of this phenomenon, which is generally acknowledged, may be greatly underestimated. Functionality hiding may be just as important to microworld educational practice as information hiding is to the field of software engineering.* Using just the functionality offered, the learner can construct circles, explore movements in right and left circular arcs, and do many other things. One exercise that children as young as four years old find very engaging is to trace, in a pretty color, simple figures, such as those shown below, which are provided to them in basic black. (Colors are selected by simply clicking on one of the boxes in the second row.)

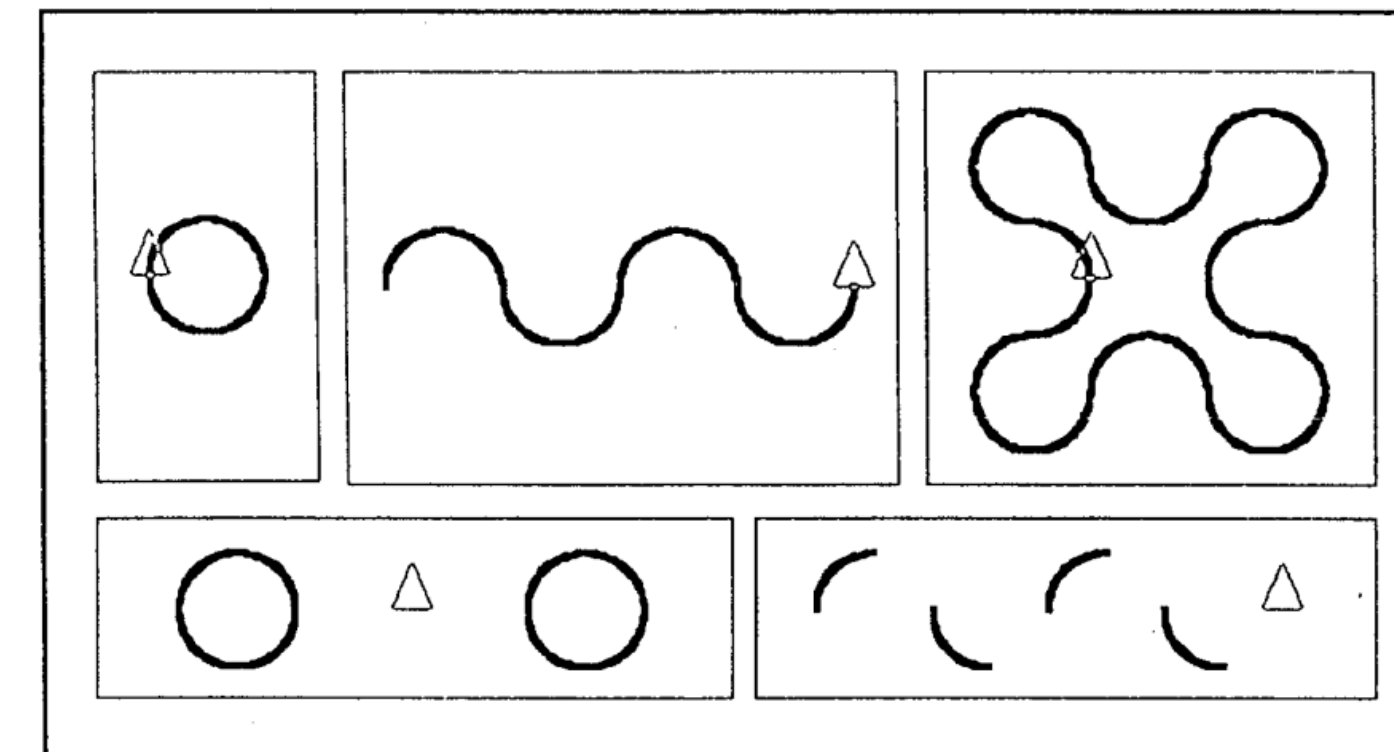


Figure 4. Exercises for exploration of introductory functionality

Soon experiences can be greatly enriched by adding the functionality associated with four additional boxes, as shown in Figure 5.

The drawing of figures such as those in Figure 6 proves to be a rewarding experience which acquaints the new user with the **turning** and **growth** commands, in their default mode.

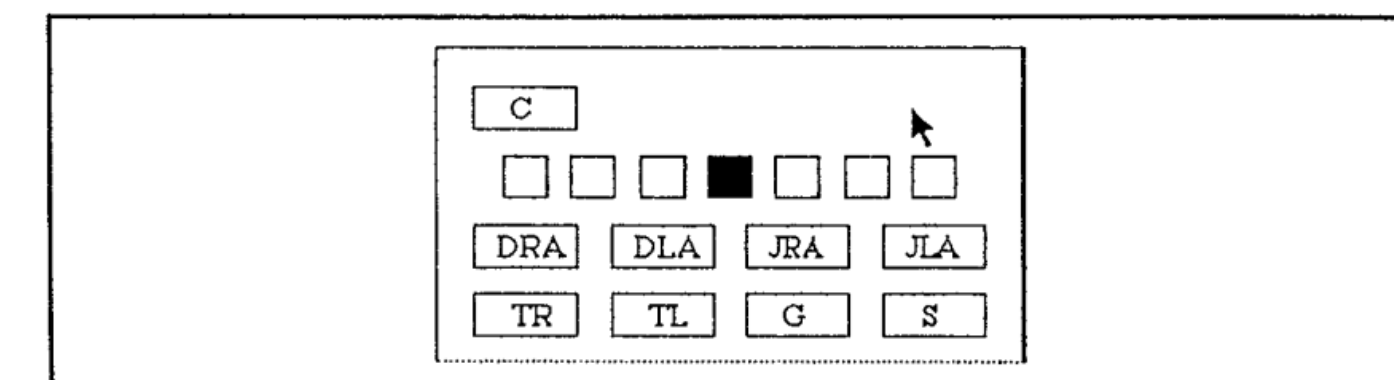


Figure 5. Level two functionality

The Music Exploration Microworld (MxM)

Special Edition: A Tribute to Jeanne Bamberger
Volume 20
January 2012

[Editorial](#)

Gena R. Greher and S. Alex Ruthmann, guest editors
University of Massachusetts Lowell

[Tribute to Jeanne Bamberger: Pre-eminent Student of Music in Our Time](#)

Howard Gardner
Harvard University

[On Chunking, Simples and Paradoxes: Why Jeanne Bamberger?](#)

Gena R. Greher and S. Alex Ruthmann
University of Massachusetts Lowell

[Experience Design and Interactive Software in Music Education](#)

Andrew Brown
Griffith University, Brisbane, Australia

[Building and Composing Upon Musical Knowledge](#)

Kimberly Lansinger Ankney
Northwestern University

[Composing Pieces for Peace: Using Impromptu](#)

Michael P. Downton
Indiana University
Kylie A. Pepler
Indiana University
Adena Portowitz
Bar-Ilan University, Ramat Gan, Israel
Jeanne Bamberger
University of California, Berkeley
Eric Lindsay
Indiana University

[Reminiscence on Studying with Jeanne Bamberger](#)

Jessica Krash
George Washington University

[Jean Bamberger – Vignettes from 1974-1976](#)

Joyce Kouffman
*Music Educator Director,
Point Reyes Music Center*

[Representations of Music – Neural Foundations and Mental Processes 1905](#)

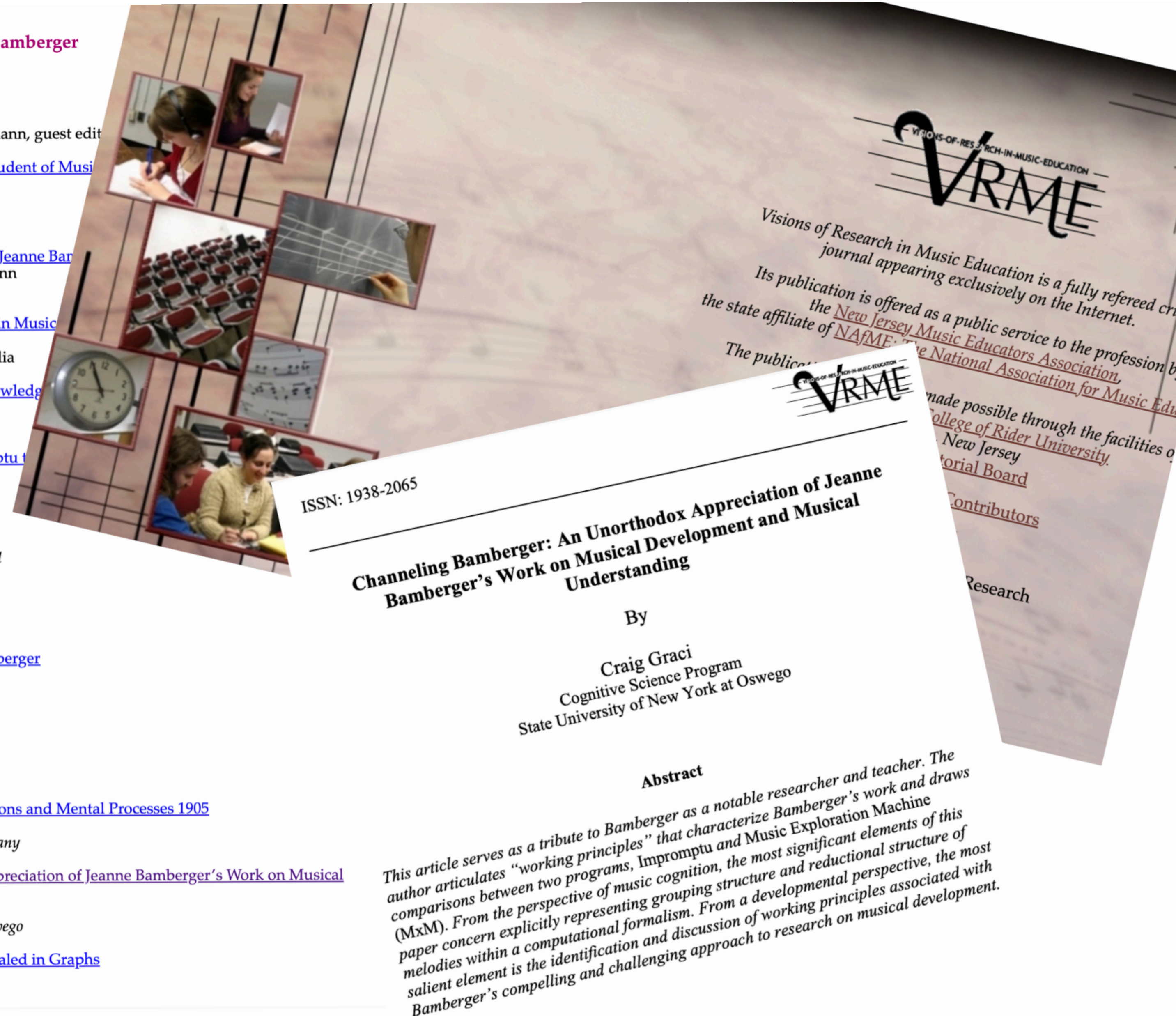
Wilfred Gruhn
University of Music, Freiburg, Germany

[Channeling Bamberger: An Unorthodox Appreciation of Jeanne Bamberger's Work on Musical Development and Musical Understanding](#)

Craig Graci
State University of New York at Oswego

[About Time: Strategies of Performance Revealed in Graphs](#)

Elaine Chew
Queen Mary, University of London



Part 7

Clay and MxM

On Music Knowledge Representation Languages

Once a melody is encoded in a “suitable” music knowledge representation language, one that is **executable** and that possesses a relatively high degree of **structural integrity**, the melody can readily be rendered in any number of ways.

For example:

- Sonically
- Textually - in any number of ways
- Visually - in any number of ways

Moreover, the melody can be processed in wildly interesting ways, particularly from the perspective of AI (artificial intelligence) and AC (algorithmic composition).

Clay

The music knowledge representation language that features most prominently in my **cognitive musicological research** is a variant of **Clay**, a modest little language that also serves as the computational framework for nearly all of my **educational microworld research**.

Variants of Clay were featured in the **Bunny Numerics** microworld, in the **QuArc** microworld, and in several other microworlds, as well, including **MxM**.

MxM

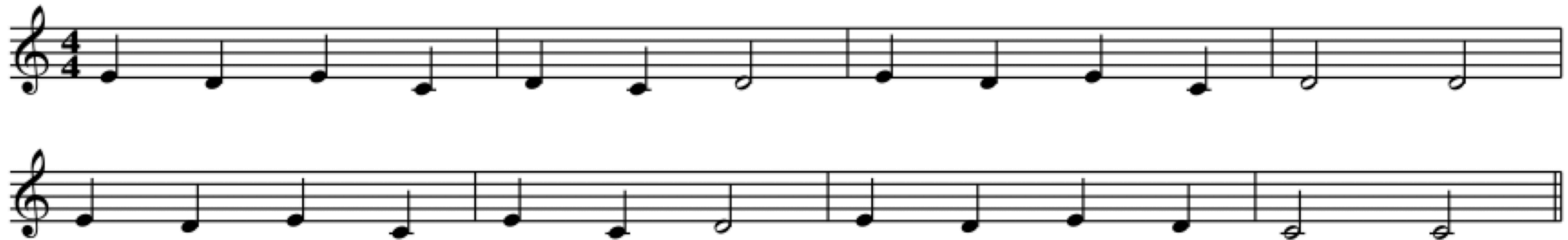
MxM is the name of a microworld infrastructure that supports one of my favorite approaches to modeling musical melodies, that of manipulating a single note which is comprised, most notably, of pitch, duration, amplitude, and timbre.

Dimitry Kabalevsky's "Little Tune"

My "Hello World" melody, the melody that I turn to when beginning any sort of research project pertaining to music cognition or cognitive musicology, is Dmitri Kabalevsky's 3 pitch tune called "Little Tune."

Little Tune

Dmitry Kabalevsky



Sample Session in a Skeletal MxM Microworld (First Bit)

Welcome to DrRacket, version 8.1 [cs].

Language: racket, with debugging; memory limit: 128 MB.

```
> ( mxm )
```

Hi! MxM here ...

Little Tune

Dmitry Kabalevsky

```
( display-program )
```

```
littletune = part1 part2
```

```
part1 = phrase1 phrase2
```

```
part2 = phrase1 phrase3
```

```
phrase1 = figure1 figure2 break
```

```
phrase2 = figure1 figure3 break
```

```
phrase3 = figure4 figure5 break
```

```
figure1 = rp:2 play lp play rp play lp:2 play
```

```
figure2 = rp play lp play rp x2 play s2 lp
```

```
figure3 = rp x2 play play s2 lp
```

```
figure4 = rp:2 play lp play rp play lp play lp
```

```
figure5 = x2 play play s2
```



Sample Session in a Skeletal MxM Microworld (Second Bit)

littletune

E4	-	-	-	-				
D4	-	-	-	-				
E4	-	-	-	-				
C4	-	-	-	-				
D4	-	-	-	-				
C4	-	-	-	-				
D4	-	-	-	-	-	-	-	-
E4	-	-	-	-				
D4	-	-	-	-				
E4	-	-	-	-				
C4	-	-	-	-				
D4	-	-	-	-	-	-	-	-
D4	-	-	-	-	-	-	-	-

• • •

Sample Session in a Skeletal MxM Microworld (Third Bit)

(to-f-mode)

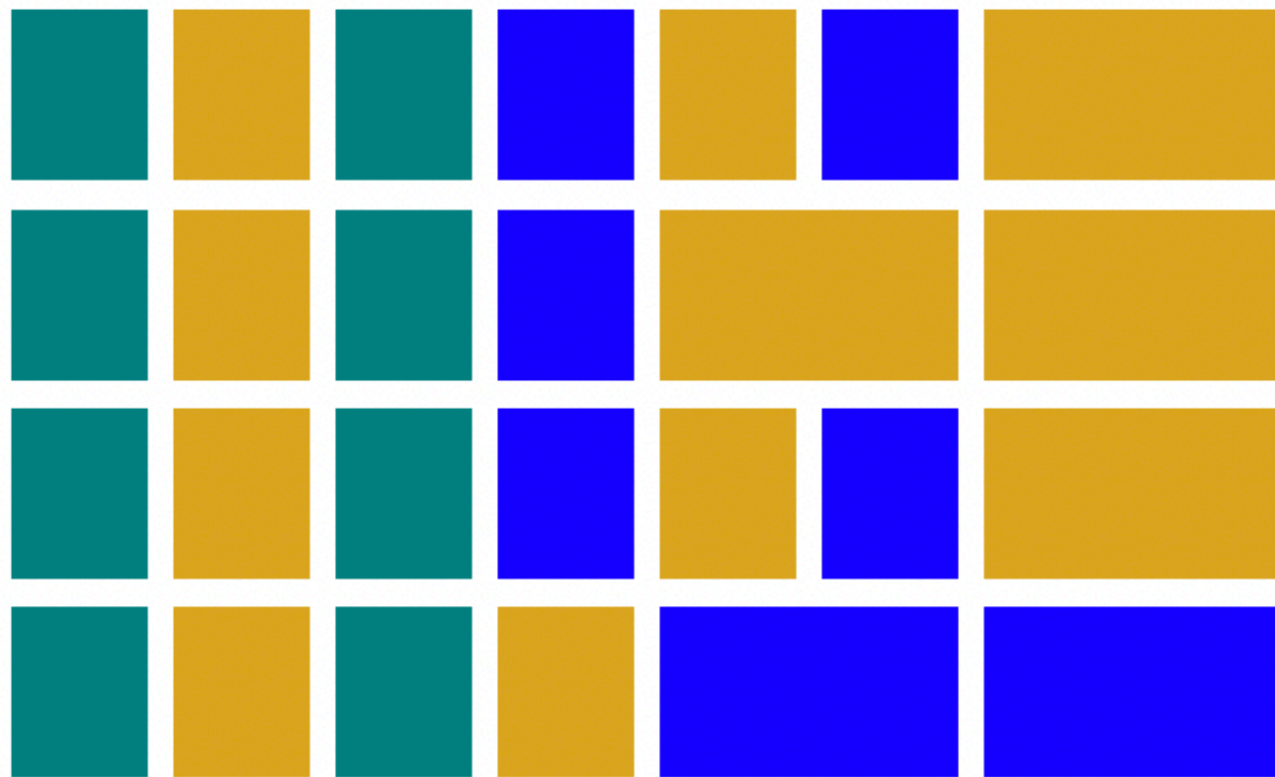
littletune

3	2	3	1	2	1	2
3	2	3	1	2		2
3	2	3	1	2	1	2
3	2	3	2	1		1

Sample Session in a Skeletal MxM Microworld (Fourth Bit)

(to-c-mode)

littletune



Part 8

Pivotal Event #2 En Route to the Paintings

Rick Back Makes a Save in the CLAS Dean's Office

More than a decade ago, Rick Back assumed the role of acting Dean of the College of Liberal Arts and Sciences.

At his first leadership meeting, he engaged those present in a "get acquainted" activity that involved making trades. To each chair/director he would offer up a token that he felt might have something to do with the department/program that they represented, and in exchange they were invited to respond with a token that somehow symbolized their domain of knowledge.

I was ambiguously representing both the computer science department and the cognitive science program at the leadership meetings, as I dutifully did for a couple of decades.

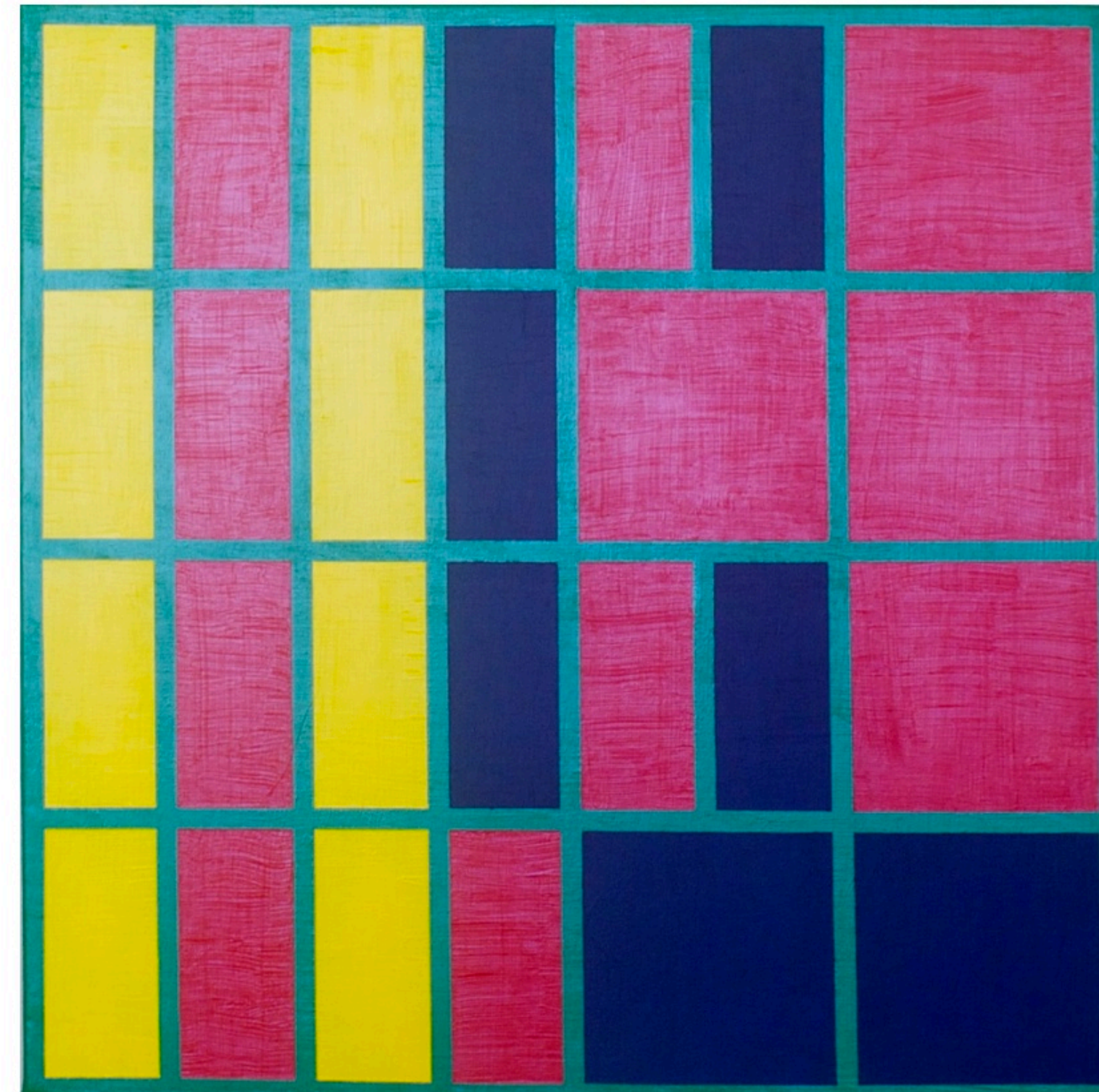
Rick's Token Offering to Cognitive Science

Rick offered me a **SIMON**, a memory game featuring four colors, red green blue yellow, which I think was directed towards my cognitive science hat.



Cognitive Science's Token Offering to Rick

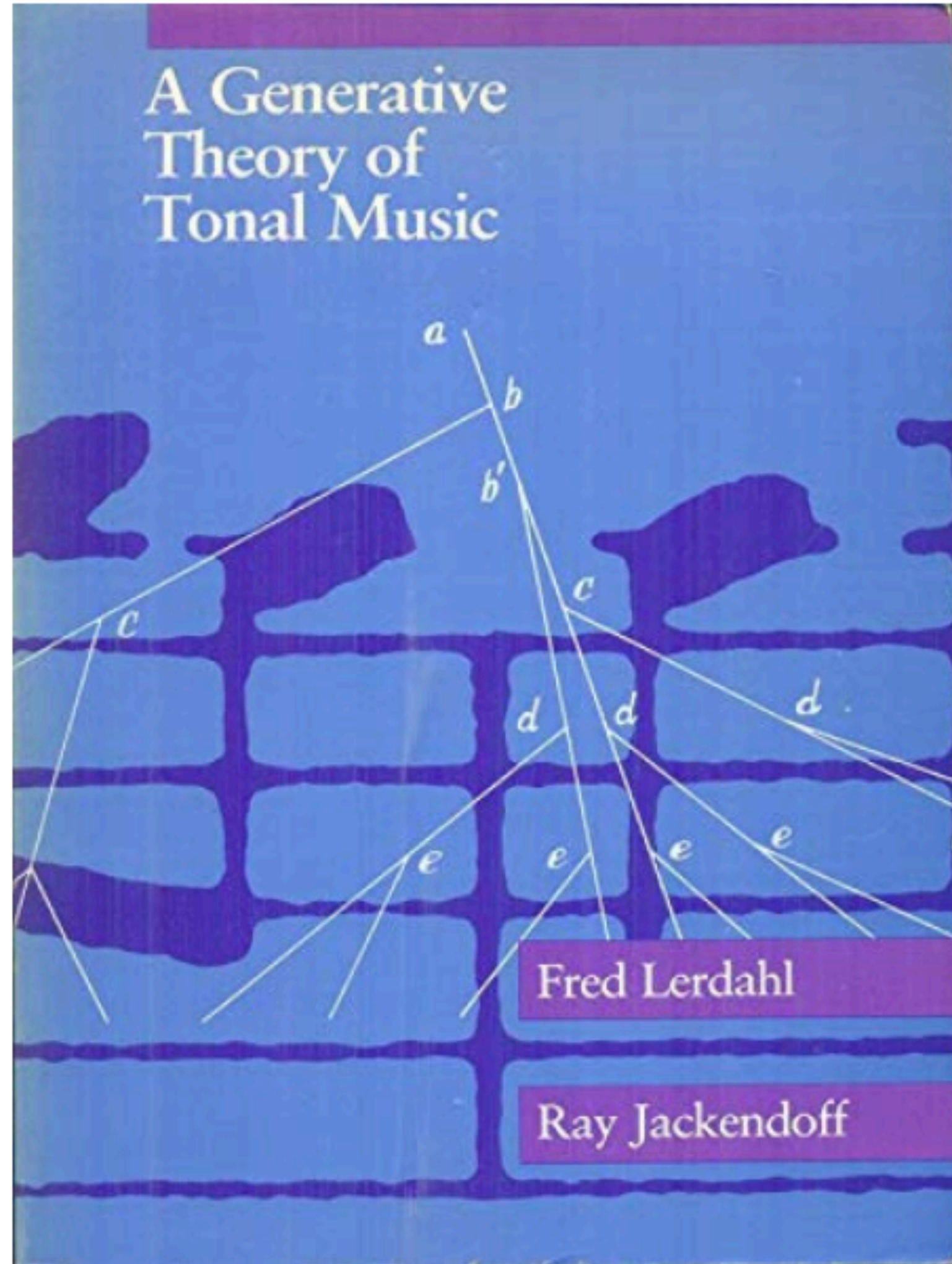
I did my best to ignore the charge. But in time I started to feel a bit too guilty for being the only one in the room that didn't seem to be playing along. Eventually, I painted "Little Tune," my first chromesthetic painting, and offered it to Rick as token of something that might be seen to have relevance to cognitive science.



Part 9

Cognitive Musicology Research Featuring Clay and/or MxM

Three Favorite Texts on Music Cognition



Psychological Review
1981, Vol. 88, No. 6, 503-522

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0033-295X/81/8806-0503\$00.75

The Internal Representation of Pitch Sequences in Tonal Music

Diana Deutsch
University of California, San Diego

John Feroe
Department of Mathematics
Vassar College

A model for the internal representation of pitch sequences in tonal music is advanced. This model assumes that pitch sequences are retained as hierarchical networks. At each level of the hierarchy, elements are organized as structural units in accordance with laws of figural goodness, such as proximity and good continuation. Further, elements that are present at each hierarchical level are elaborated by further elements so as to form structural units at the next-lower level, until the lowest level is reached. Processing advantages of the system are discussed.

It may generally be stated that we tend to encode and retain information in the form of hierarchies when given the opportunity to do so. For example, programs of behavior tend to be retained as hierarchies (Miller, Galanter, & Pribram, 1960) and goals in problem solving as hierarchies of subgoals (Ernst & Newell, 1969). Visual scenes appear to be encoded as hierarchies of sub-scenes (Hanson & Riseman, 1978; Navon, 1977; Palmer, 1977; Winston, 1973). The phrase structure of a sentence lends itself readily to hierarchical interpretations (Chomsky, 1963; Miller & Chomsky, 1963; Yngve, 1960). When presented with artificial serial patterns that may be hierarchically encoded, we readily form encodings that reflect pattern structure (Bjork, 1968; Kotovsky & Simon, 1973; Restle, 1970; Restle & Brown, 1970; Simon & Kotovsky, 1963; Vitz & Todd, 1967, 1969).

In considering how we form hierarchies, however, theories have generally been constrained by the nature of the stimulus material under consideration. For example, visually perceived objects are naturally formed out of parts and subparts. The hierarchical structure of language must necessarily be constrained by the logical structure of events in the world. The attainment of a goal is

generally arrived at by an optimal system of subgoals, and so on.

An analogous situation exists for theories based on experiments utilizing serial patterns that were devised by the experimenter. To take a concrete example, Restle's (1970) theory of hierarchical representation of serial patterns evolved from findings based on the following experimental paradigm. Subjects were presented with a row of six lights, which turned on and off in repetitive sequence, and they were required on each trial to predict which light would come on next. The sequences were structured as hierarchies of operators. For instance, given the basic sequence $X = (1, 2)$, the operation R ("repeat of X ") produces the sequence 1 2 1 2; the operation M ("mirror-image of X ") produces the sequence 1 2 6 5, and the operation T ("transposition +1 of X ") produces the sequence 1 2 2 3. Through recursive application of such operations, long sequences can be produced that have compact structural descriptions. Thus $M(T(R(T(1))))$ describes the sequence 1 2 1 2 2 3 2 3 6 5 6 5 5 4 5 4. Restle and Brown (1970), using sequences constructed in this fashion, found compelling evidence that subjects were encoding these patterns in accordance with their hierarchical structure. However, each pattern was constructed so as to allow for only one parsimonious interpretation. Thus it is difficult to estimate the generalizability of this model to situations where alternative hierarchical realizations are possible.

Preparation of this paper was supported by United States Public Health Service Grant MH-21001. Requests for reprints should be sent to Diana Deutsch, Department of Psychology, C-009, University of California, San Diego, La Jolla, California 92093.

OXFORD PSYCHOLOGY SERIES • 17

Cognitive Foundations of Musical Pitch

CAROL L. KRUMHANSL

Three Favorite Cognitive Musicology Presentations

Of the half dozen or so talks that I have given on topics that fall within the realm of cognitive musicology, these are probably the three that I found to be the most fun, and also the most satisfying:

- “A Quantitative Measure of Melodic Structure: Computational Infrastructure and Cognitive Implications,” Empirical Musicology Conference (Sponsored by SEMPRES), University of London, 2008
- “A Genetic Programming Approach to Determining Grouping Structure in Tonal Music,” Music Cognition Symposium, Eastman School of Music, Rochester NY, 2008
- “A Procedural Take on the Deutsch/Feroe Formalism: Cognitive Motivation and Computational Realization,” Society for Music Perception and Cognition (SMPC) Conference, Indiana University–Purdue University Indianapolis (IUPUI), 2009

The research that I did in these years on musical structure (particularly grouping structure and reductional structure), kindled my desire to do all sorts of things pertaining to the representation and processing of music, one of which turned out to be the **chromesthetic painting**.

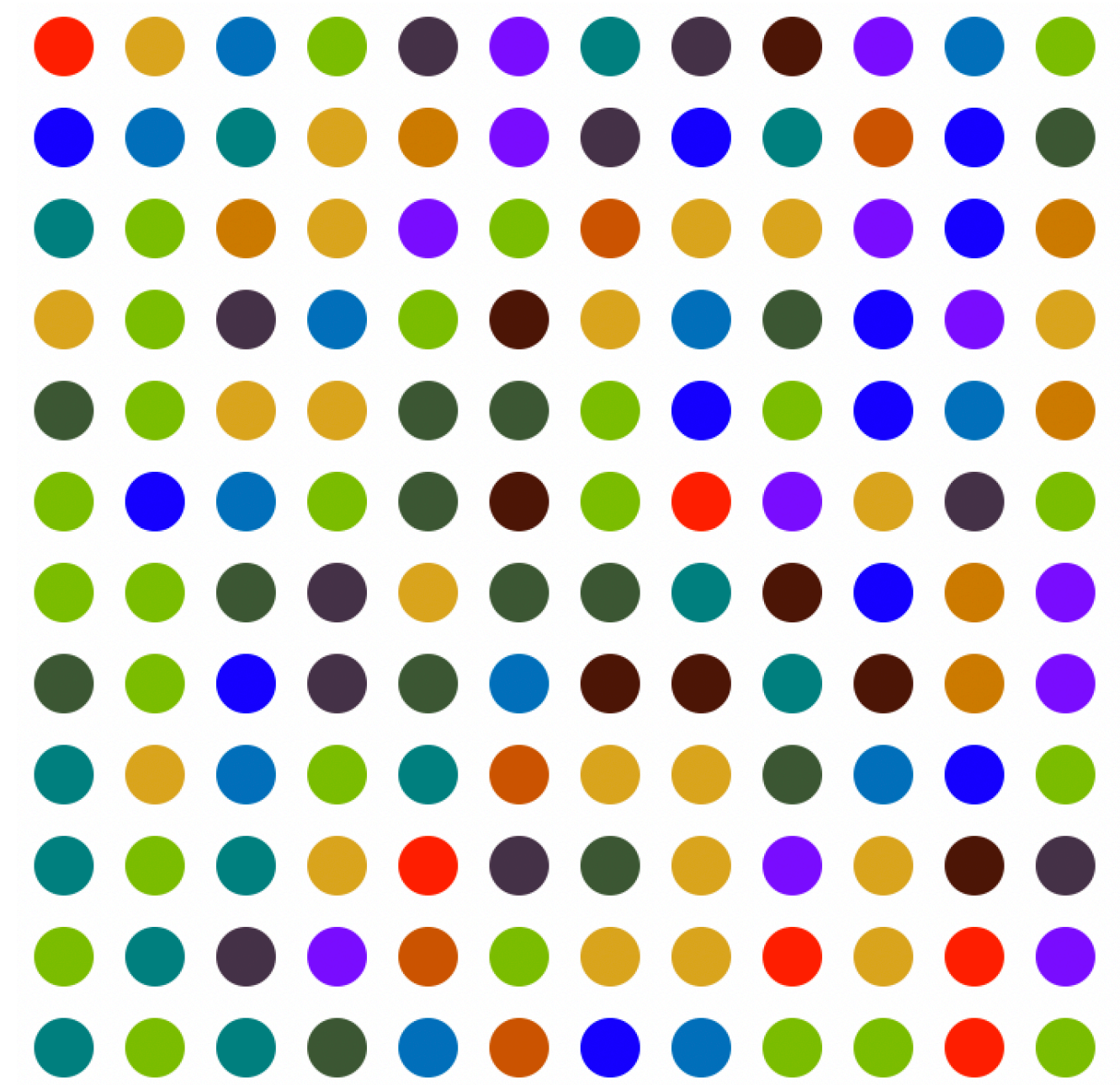
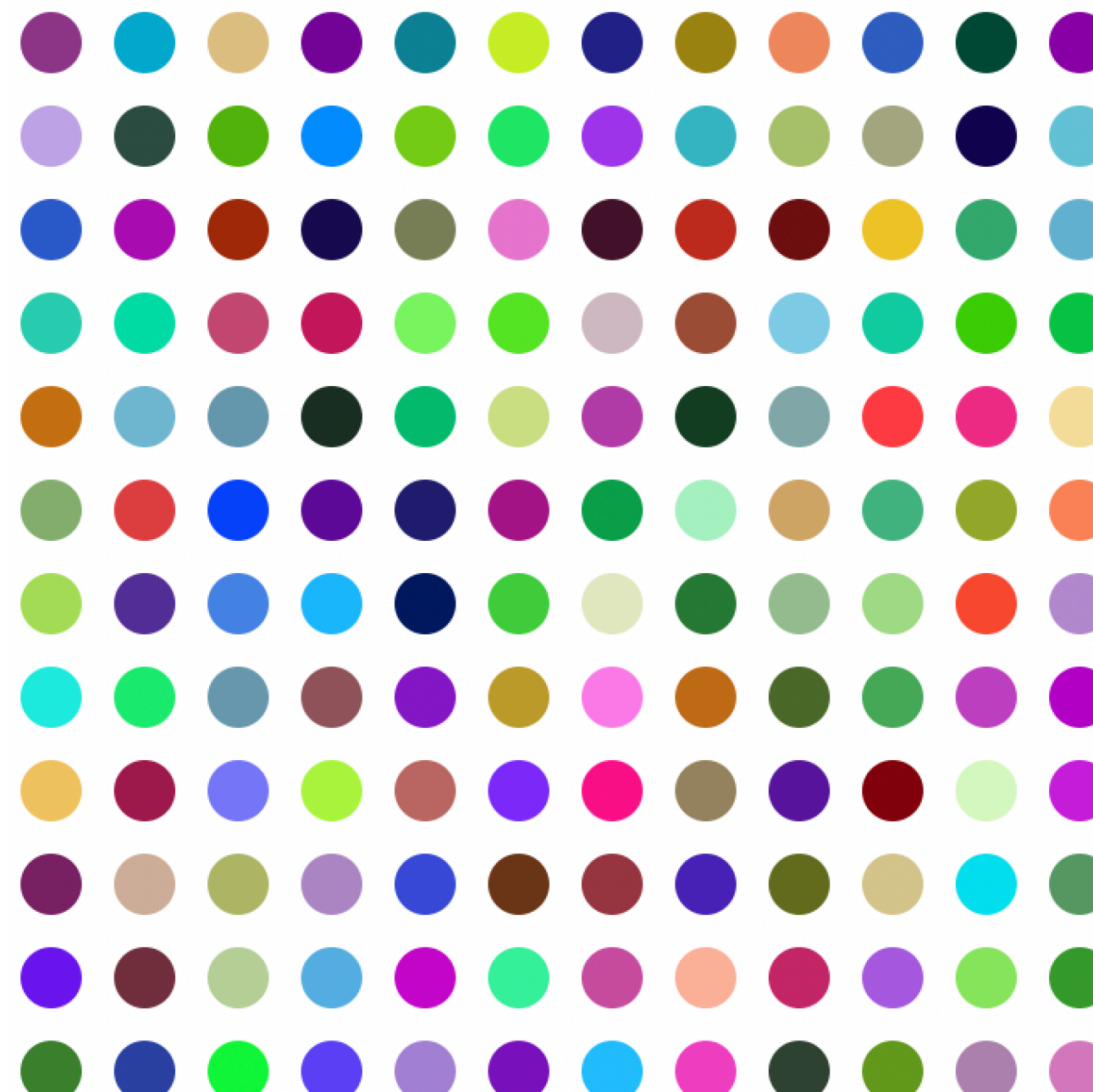
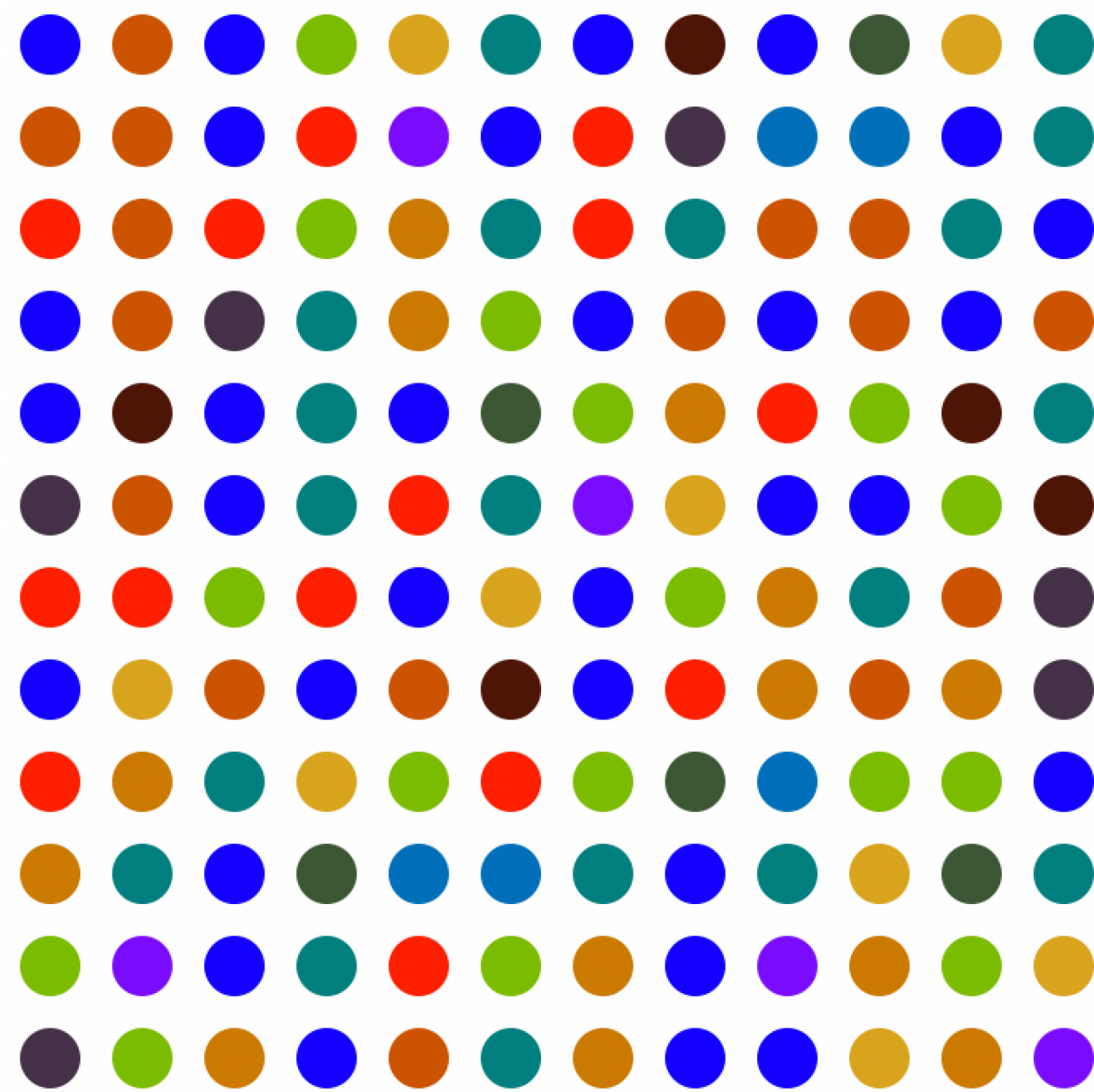
Bonus Bit on “Research Inspired Chromesthetic Painting”

There are any number of ideas that can form the basis of chromesthetic paintings.

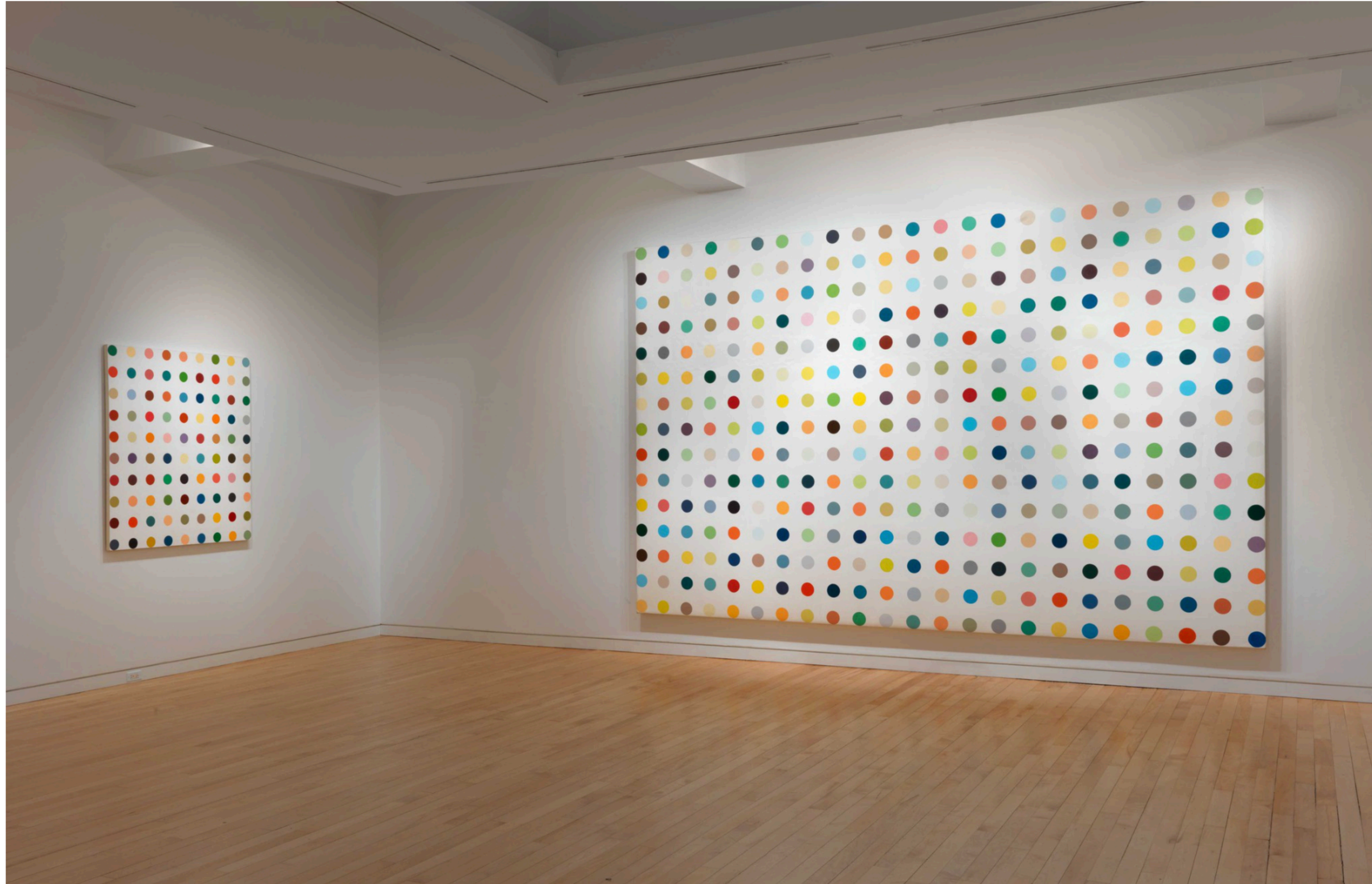
Most of my paintings are based on just one simple idea (notes represented by shapes of certain colors and dimensions, layed out in some sort of grid).

The next few slides are intended to suggest, by means of a modest example, how ideas for chromesthetic paintings might arise from actual research into the nature of music.

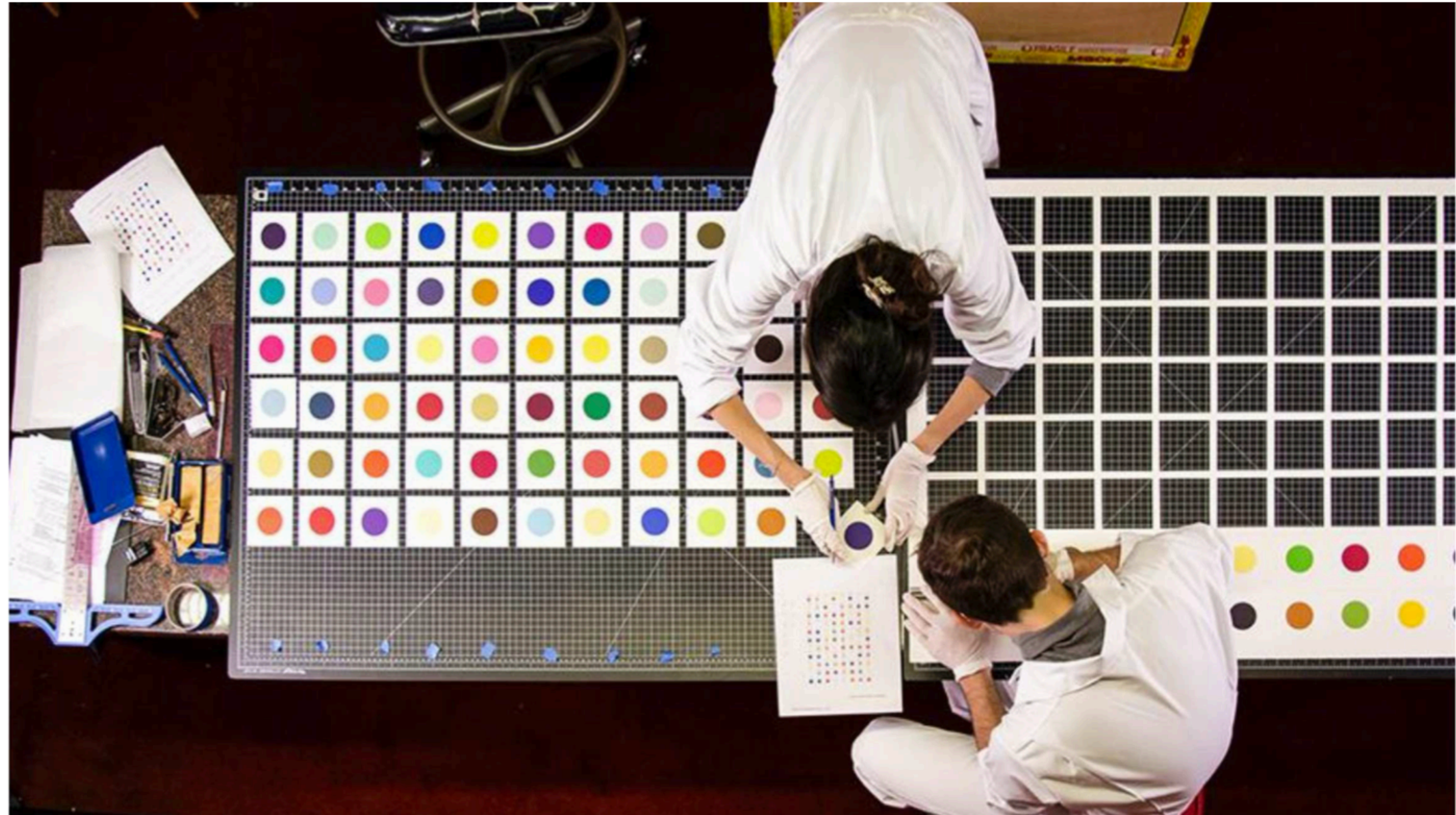
Which of these is (most interestingly) not like the others?



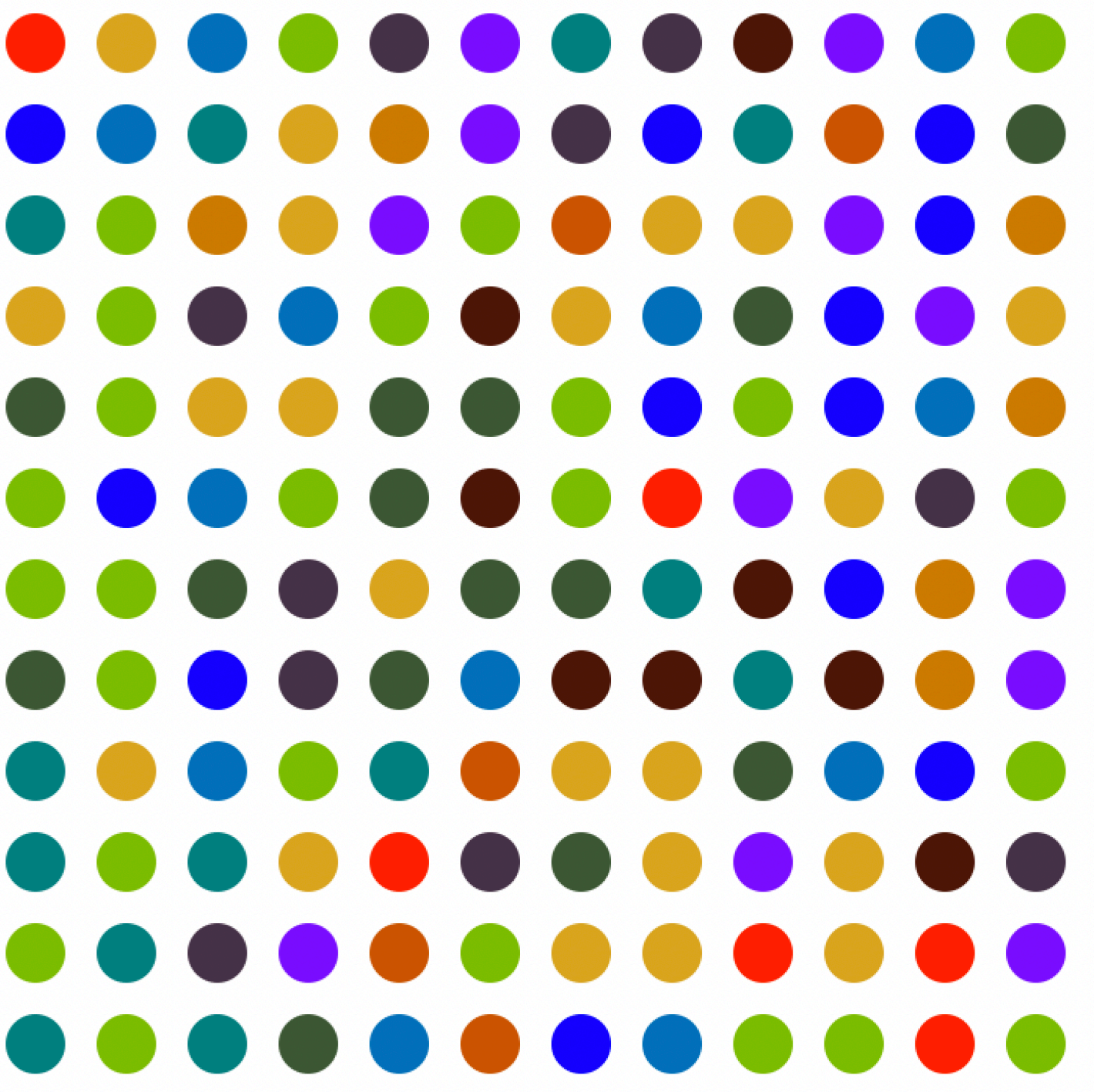
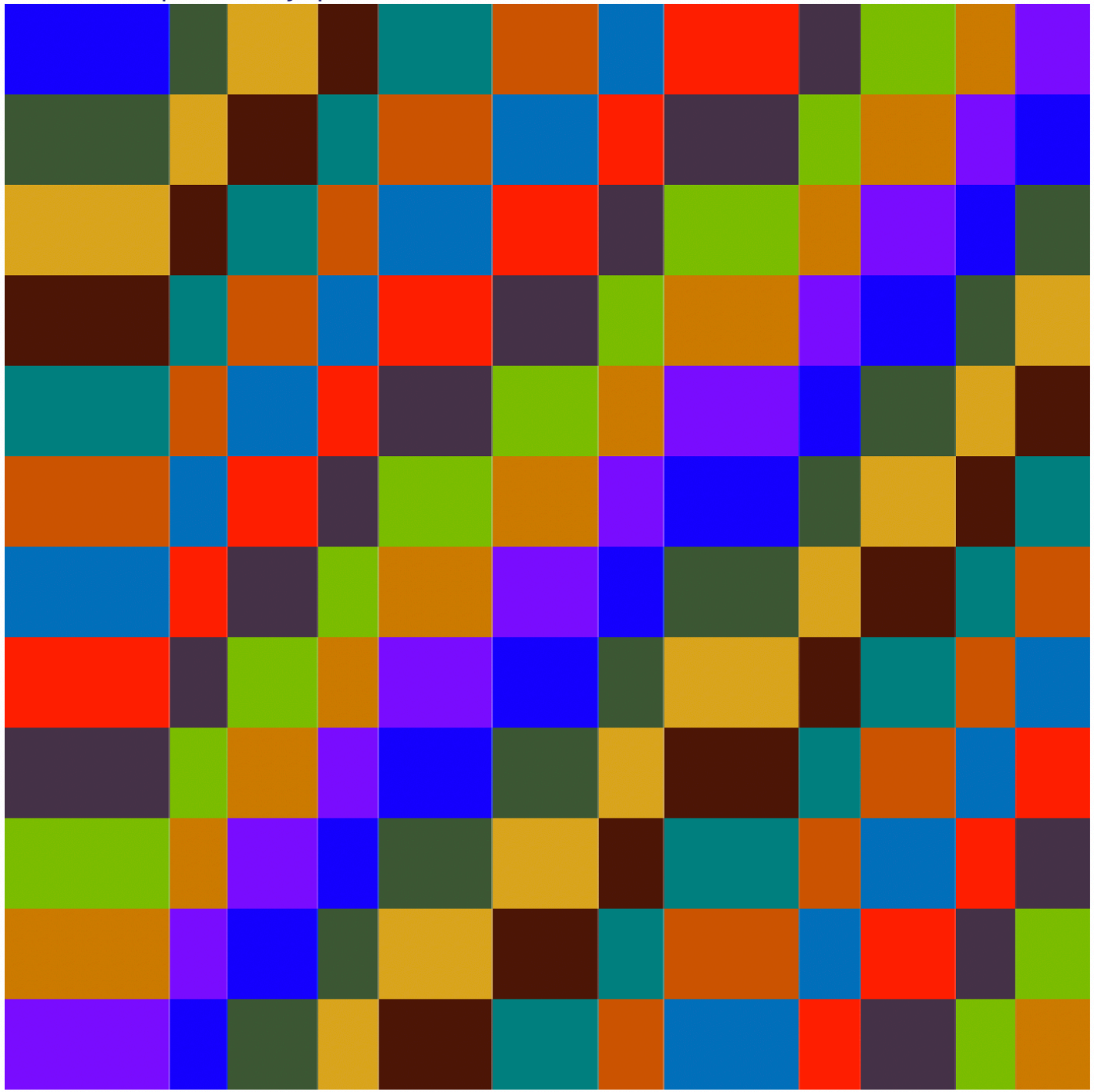
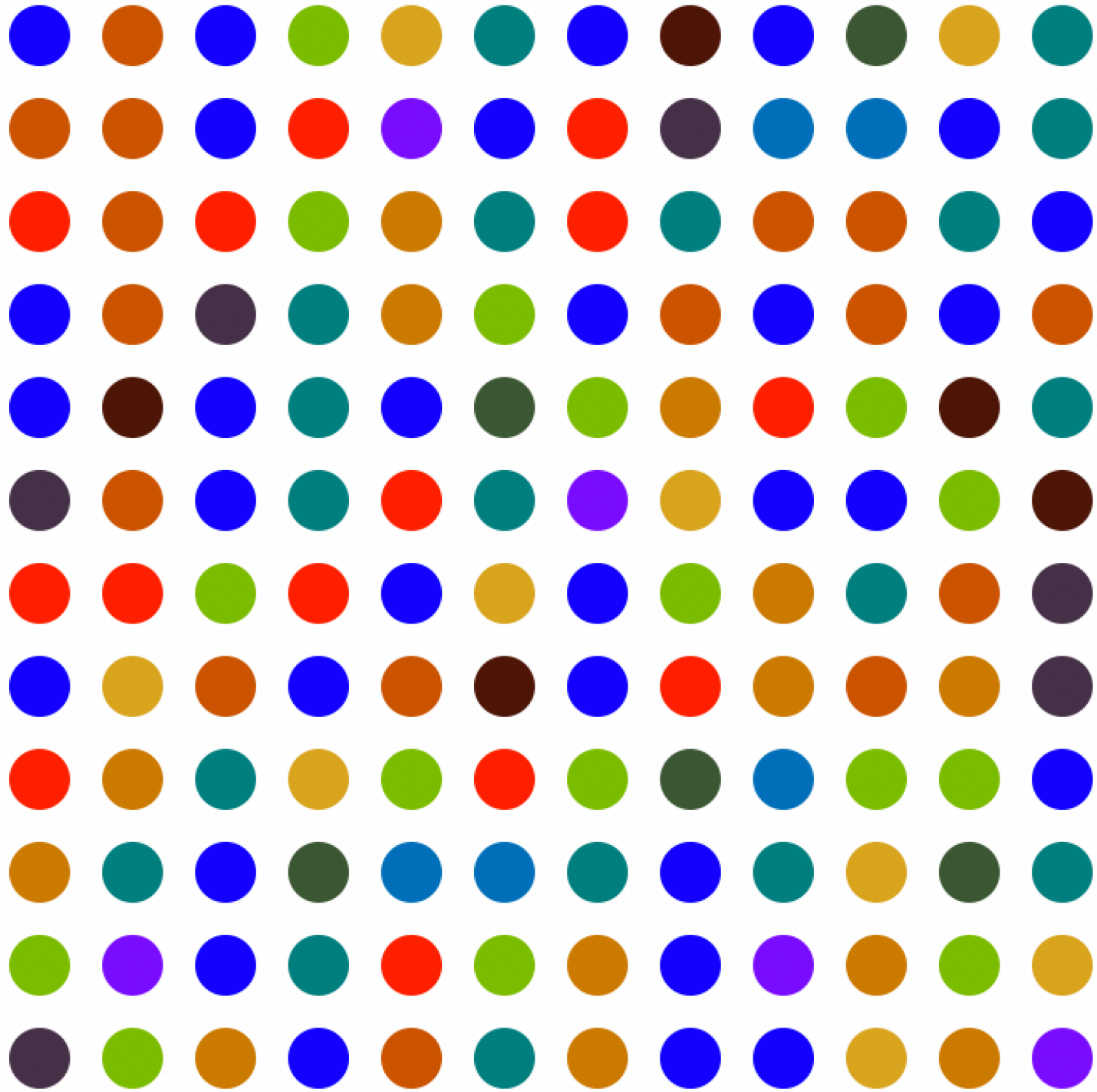
Hirst Dots on Display



The Hirst "Dots Factory"



Some Chromesthetic Images



Key Finding Algorithms

Three very different sorts of key finding algorithms:

- **Declarative algorithms** - based on comparing the pitch profile of a piece with the 24 key profiles, and selecting the best fit. **Krumhansl's algorithm** is the classic. **Pitches** are featured aspect of the music.
- **Procedural algorithms** - based on generating the piece within each key, and selecting the key for which the number of transitions outside of the key to reach a note is minimized. **Intervals** are the featured in this algorithm.
- **Chromesthetic algorithms** - based on comparing the colors associated with the pitches of a piece with the distributions of colors associated with the keys, and selecting the best fit. **Colors** are featured in this algorithm.

Part 10

Local "Value" of the Paintings

Conversation Starter for CogSci/HCI Recruitment

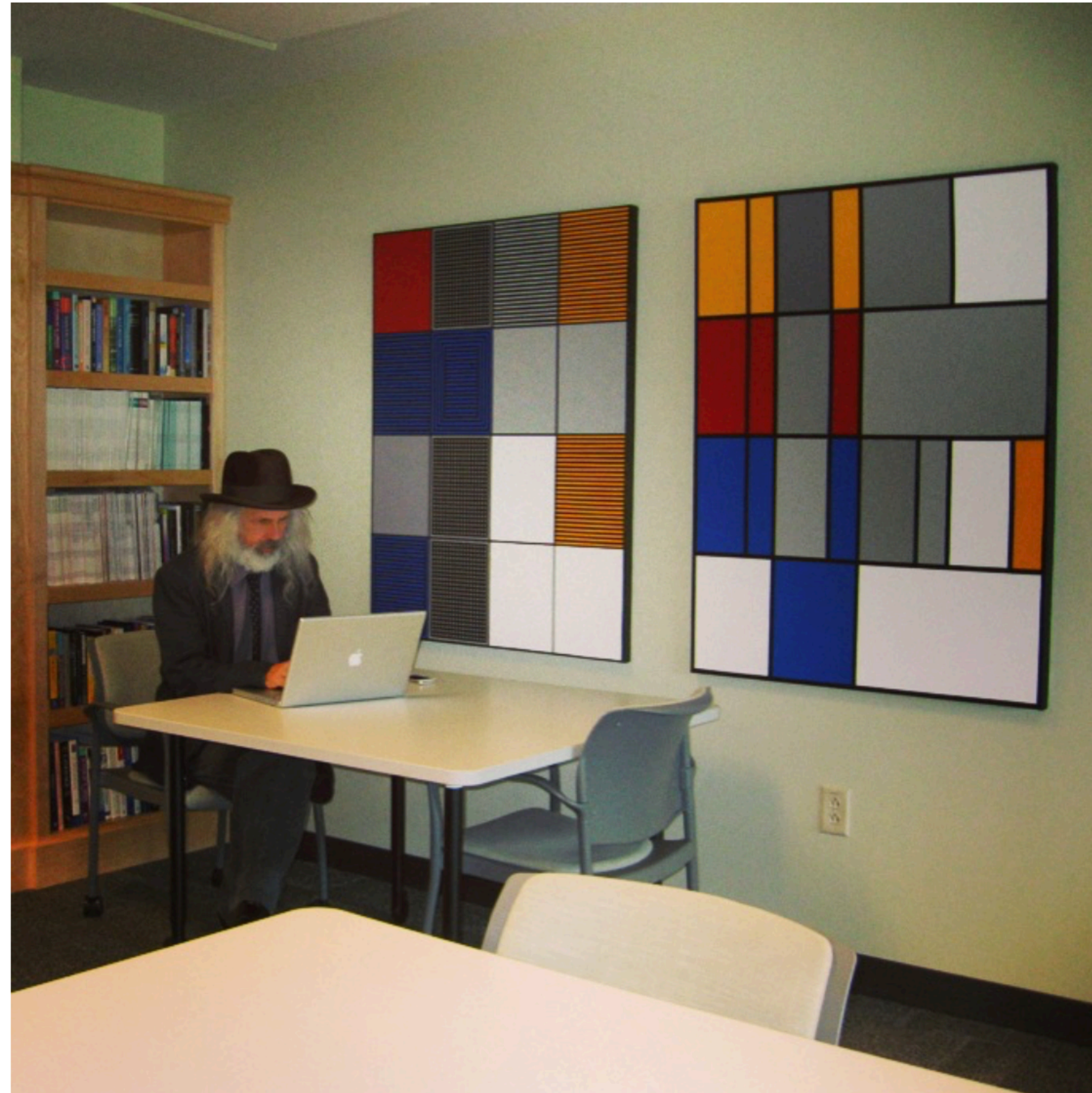
The paintings have quite served well as ice breakers for initial interactions with with prospective CogSci/HCI **students** (and sometimes their parents).

They have served a similar purpose with respect to candidates for **faculty** positions in Cognitive Science or HCI.

In either case, the paintings afford opportunities for relaxed conversation about phenomena associated with both CogSci and HCI, and suggest clear paths to discussion about relevant topics of study and research.

For a number of years we would meet with prospective students and faculty candidates in **IPAC**, where chromesthetic paintings lined the conference room walls. Once the **Chromesthetic Gallery** was installed in the 4th floor of Shineman Hall, we would sometimes meet up with prospective students and faculty candidates in the gallery.

The "Echo" Dyptic in IPAC



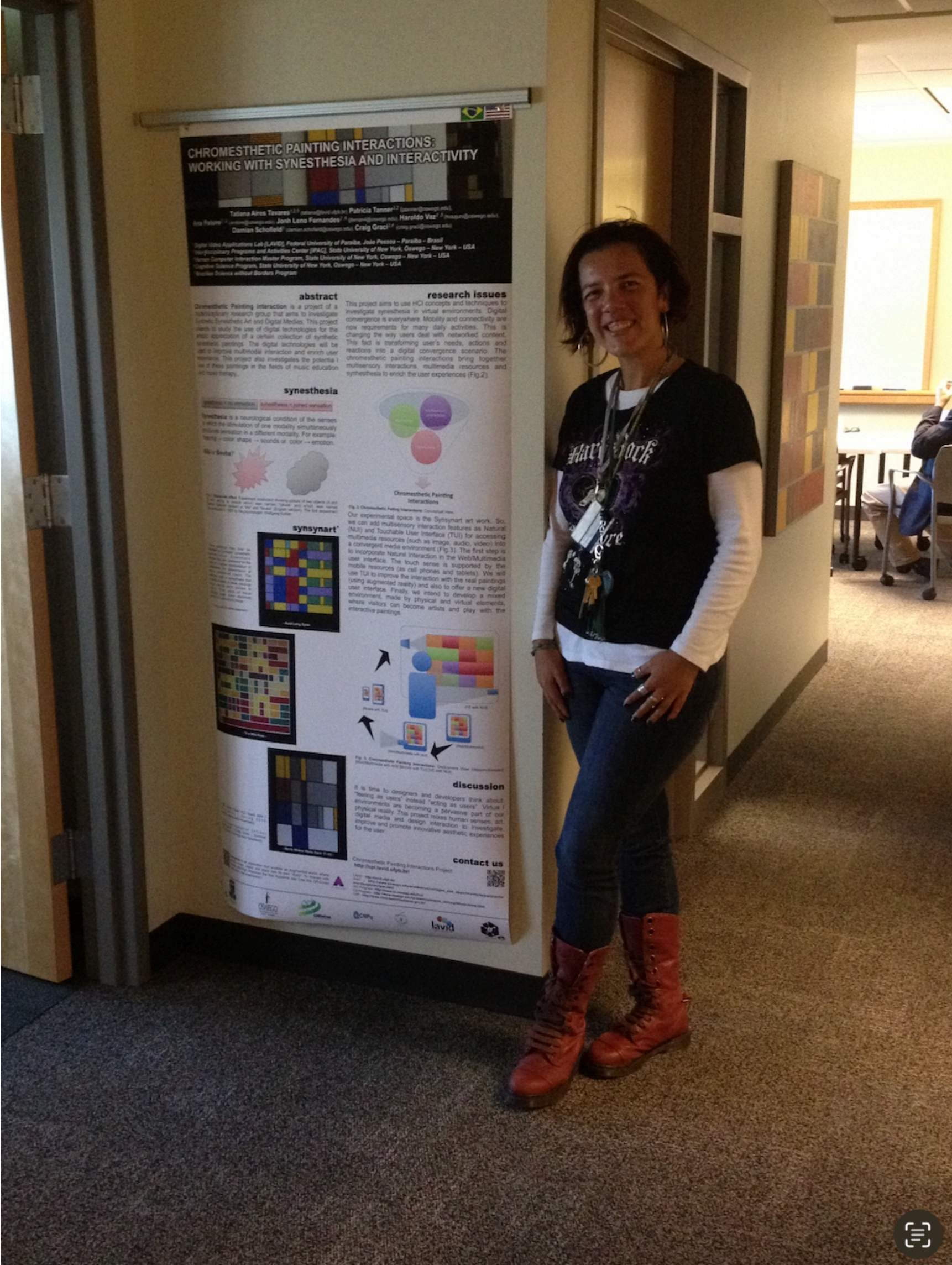
Champagne and Star in the Chromesthetic Gallery




HCI Research on the Paintings

- When I was directing IPAC, I arranged for **Tatiana Tavares**, who was visiting Oswego in conjunction with a grant from the Brazilian Science Without Borders Program, to spend a year as an IPAC Visiting Fellow. During that year, she and a number of her students from Brazil engaged in research relating to the paintings, which resulted in presentations at a number of conferences.
- **Wei Wang** built a collection of resources around the paintings, including a nice Web site, and a survey pertaining to the site and the paintings. She and a photographer friend of hers took the only really good pictures of my paintings.
- **Patricia Turner** did a variety of research pertaining to the paintings that involved the construction of digital devices for processing them in various interactive ways, and assessments of the digital devices.


Tatiana – IPAC in Oswego / Chromesthetic Lab in Brazil




 **Tatiana Aires Tavares**
15 hrs · Edited · Allowed on Timeline

Chromesthetic Gallery of Oz - Brazilian Edition — with Glauco Sousa, Trish Elaine, Damian Schofield and Craig Graci at Barra De Mamanguape, Paraiba.


Like · Comment · Stop Notifications · Share

 Damian Schofield and 3 others like this.


 **Craig Graci** Love it! A local (to CNY) artist (Scott Bennett) defines the content of a painting (in contrast to the substance of a painting) as "that complex feeling that the initiated viewer has when the physical facts of the work of art are translated, synaesthetically, into a unified response." I do like the way that you are using the Aurasma App to INITIATE the viewer to the code of the paintings, and the way that you are helping the viewer with the TRANSLATION. I get such a kick out of the fact that the chromesthetic paintings afford a literal interpretation of Bennett's metaphorical use of the concept of SYNESTHESIA that is featured in his definition!

6 mins · Like · 1

Write a comment...

Sponsored  [Create Ad](#)

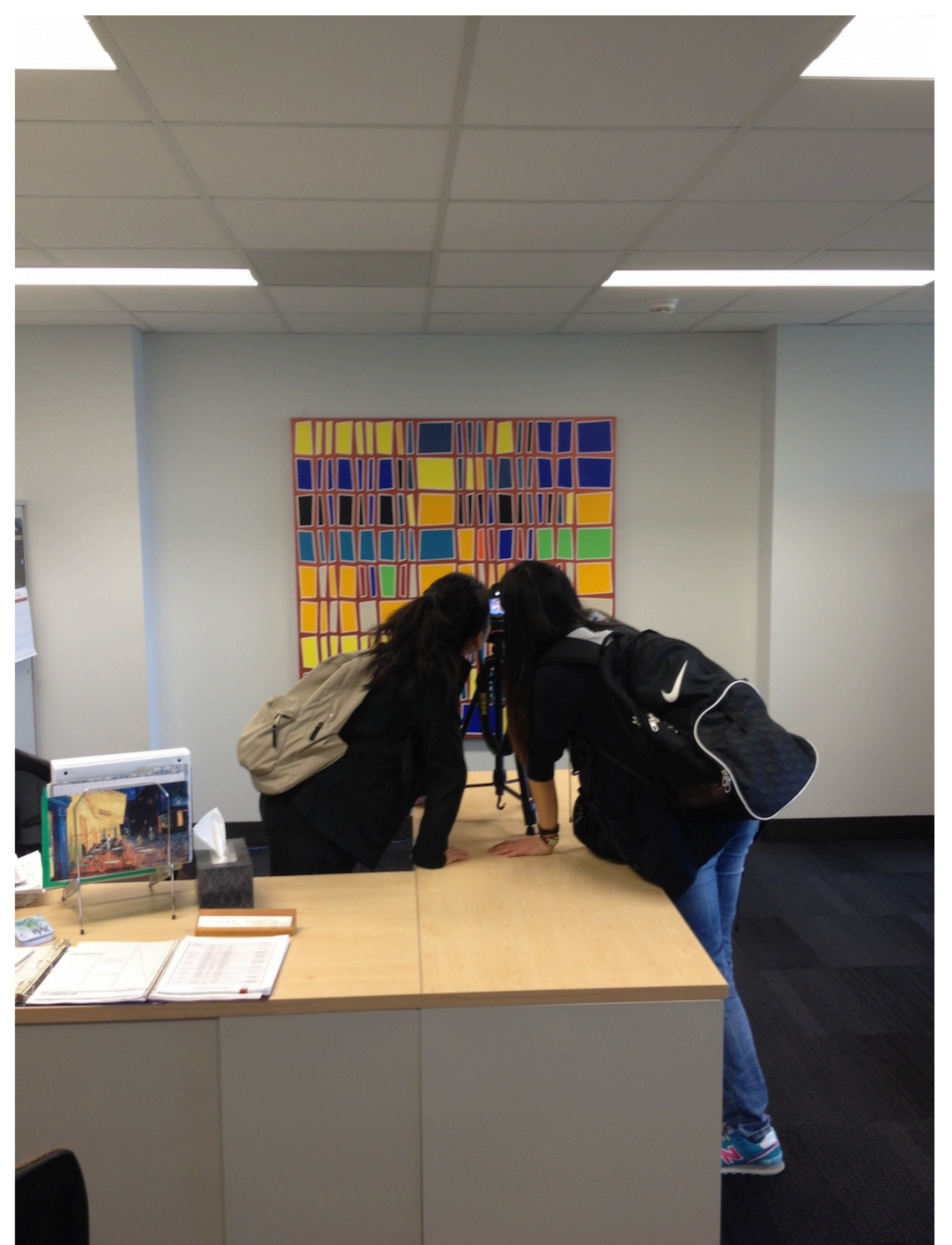
BARENA
yoox.com

 BARENA Blazer \$125.00 - SHOP NOW on yoox.com

Wei and Photographer Friend

Wei is on the left in the picture. Here they are photographing "Fairy Tale" in the CS Department office, the palette of which was inspired by the Van Gogh image that can be seen on the desk.

These two spent two full days taking pictures on and off campus in support of the products that Wei was constructing to profile the paintings.



Pat Tanner – IPAC / The Then Soon-To-Be Chromesthetic Gallery



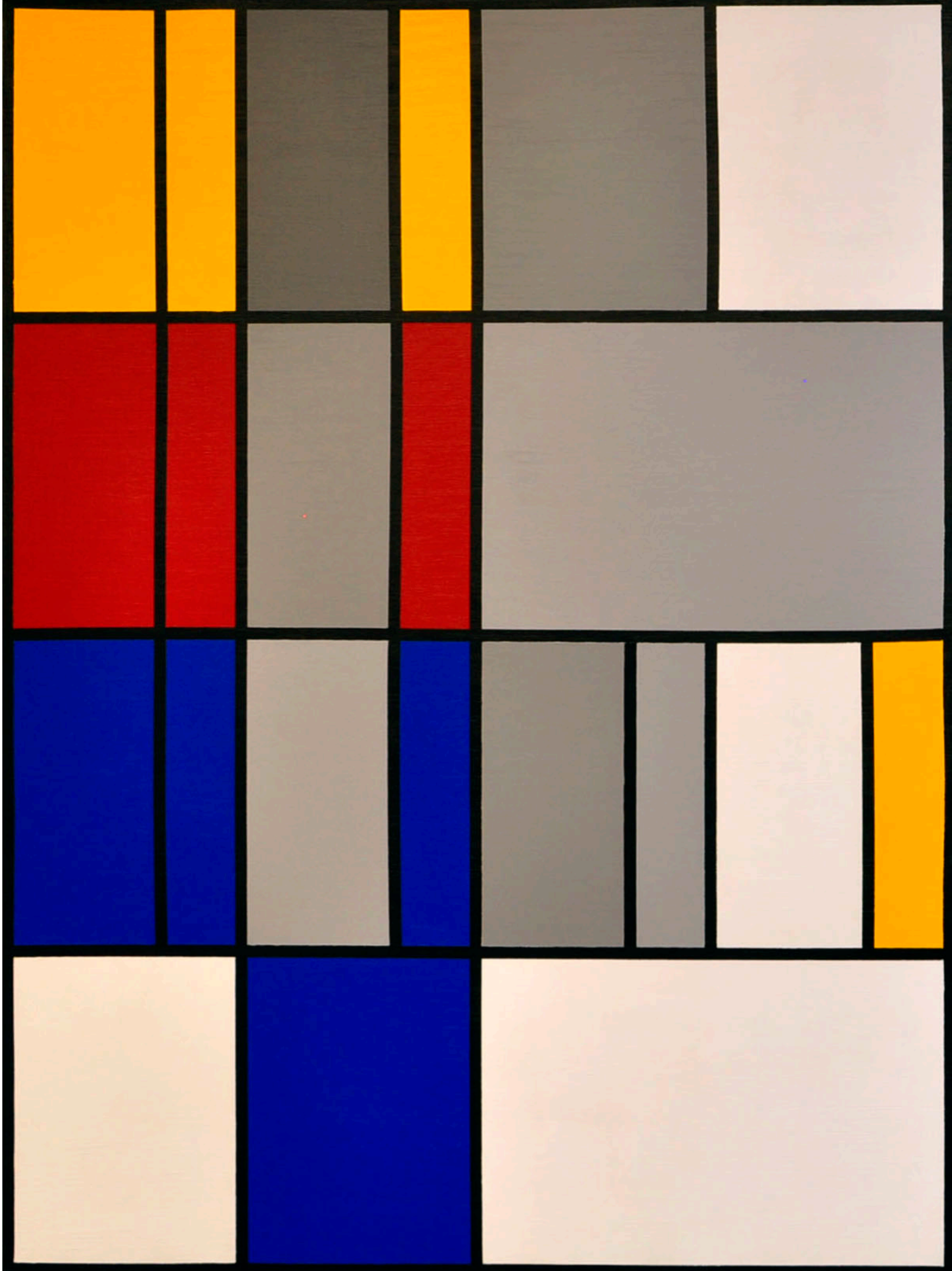
Influences of Chromesthetic Work in the Classroom

- **Csc212**, our CS1 course at Oswego, has long incorporated a musical microworld and a painter microworld via the MMW (modular melodic world) class and the nrp (nonrepresentational painter) class, and mixed their functionality up in chromesthetic ways.
- Semiotic analyses of the chromesthetic paintings have been featured in our cognitive semiotics course, **Cog444**, not just the numerous times that I taught the course, but in guest lectures that I gave for Professor Vampola on a number of occasions.
- Musical and graphical microworlds have featured in the rendering of fractal sets in the formal systems course, **Cog356**. Rendering a given fractal in both sonic and visual terms manifests as an interesting sort of chromesthesia.
- A number of students in **Csc416** and **Csc466**, the AI courses at Oswego, have incorporated aspects research associated with various musical microworlds into their projects, particularly those pertaining to algorithmic composition.
- Lectures and projects relating to keyfinding, algorithmic composition, and other topics used to be liberally incorporated into **Cog316**, the cognitive musicology course.

Part 11

A Chromesthetic Interpretation of Harmony

Echo 1



Interpretation of Harmony as Colors and Patterns

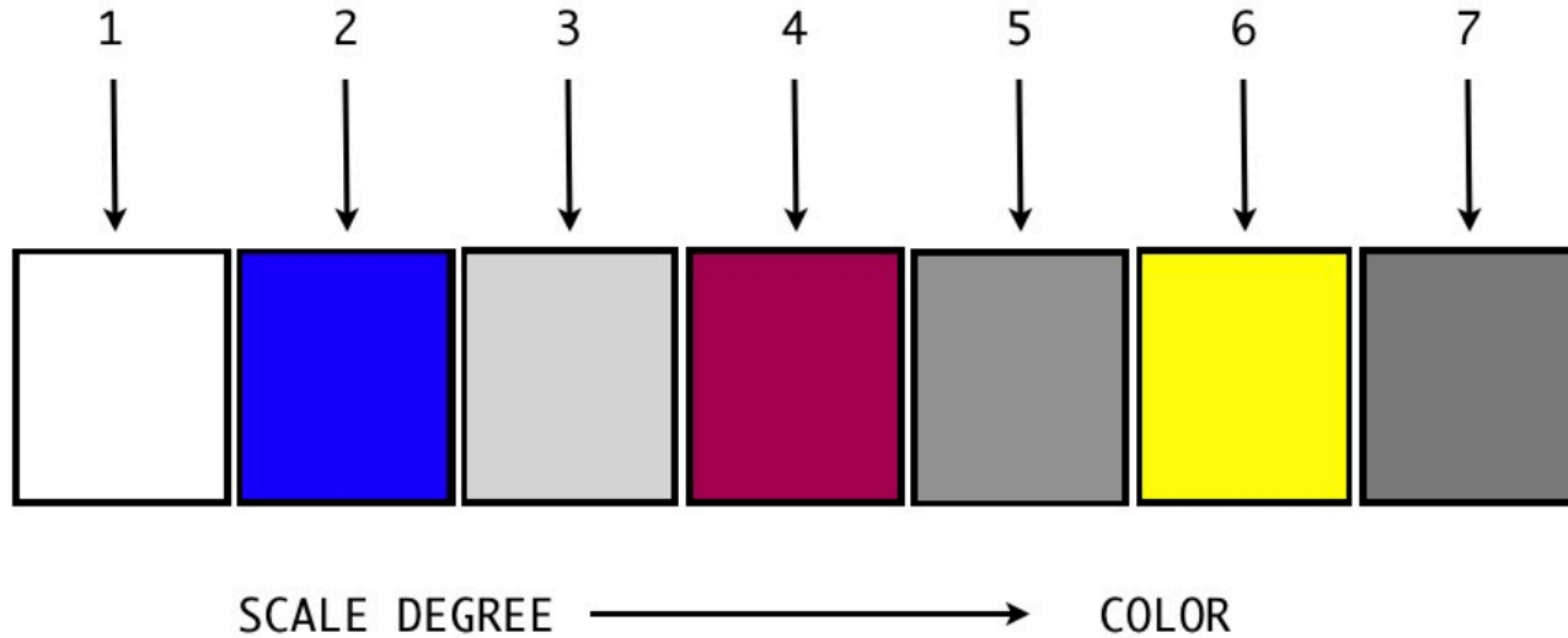
One possibility for representing harmony would be to represent chords as integrations of visual representations of chord **roots** and chord **qualities**.

Chord **roots** might be represented by **color**.

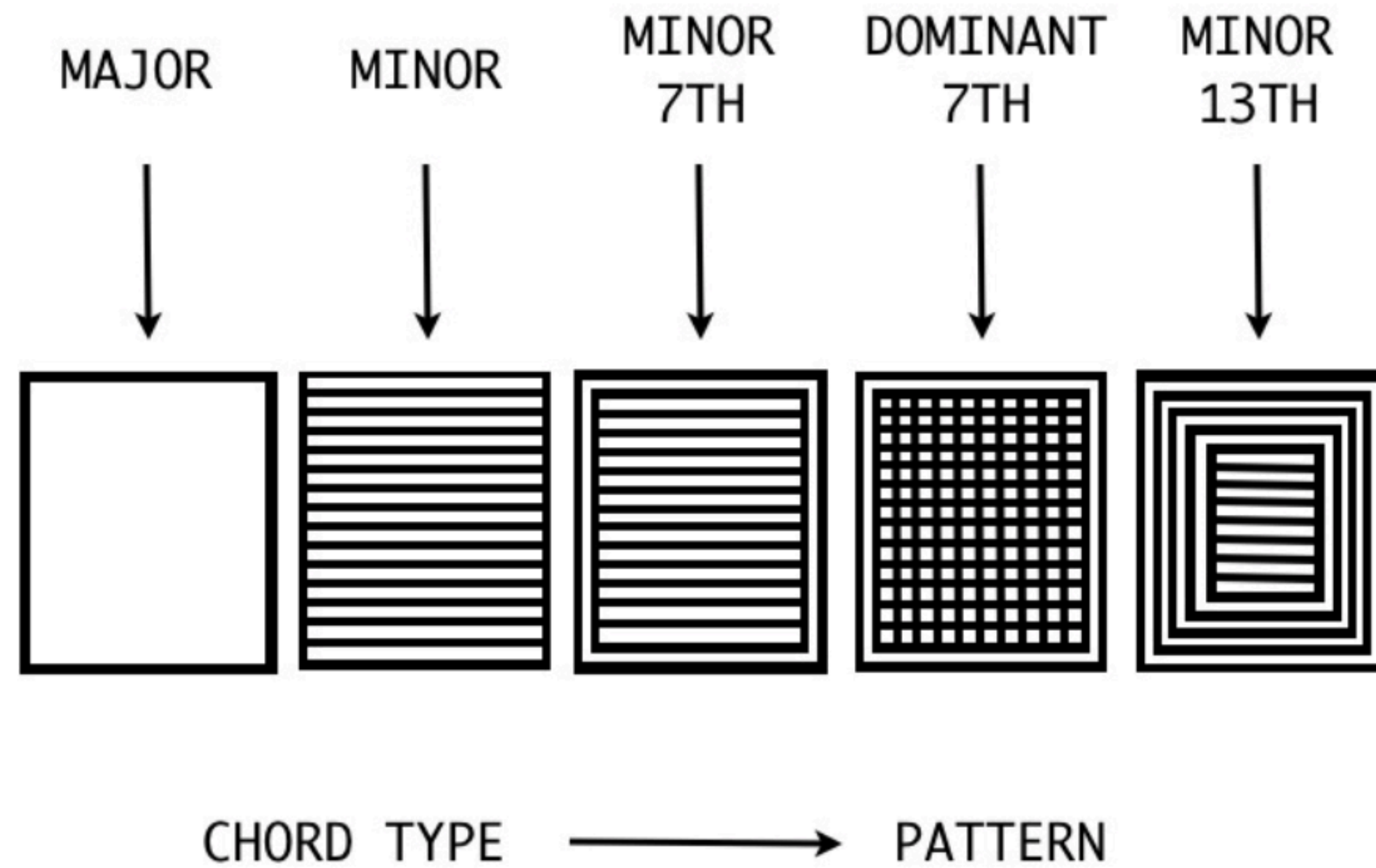
Chord **qualities** might be represented by **patterns**.

Just such an approach was used in painting the harmonic variant of the **Echo 1** painting, **Echo 2**.

A Root Mapping



A Quality Mapping



The Root Mapping in Context

4	5	3	6
2	2	3	3
5	5	1	6
2	5	1	1



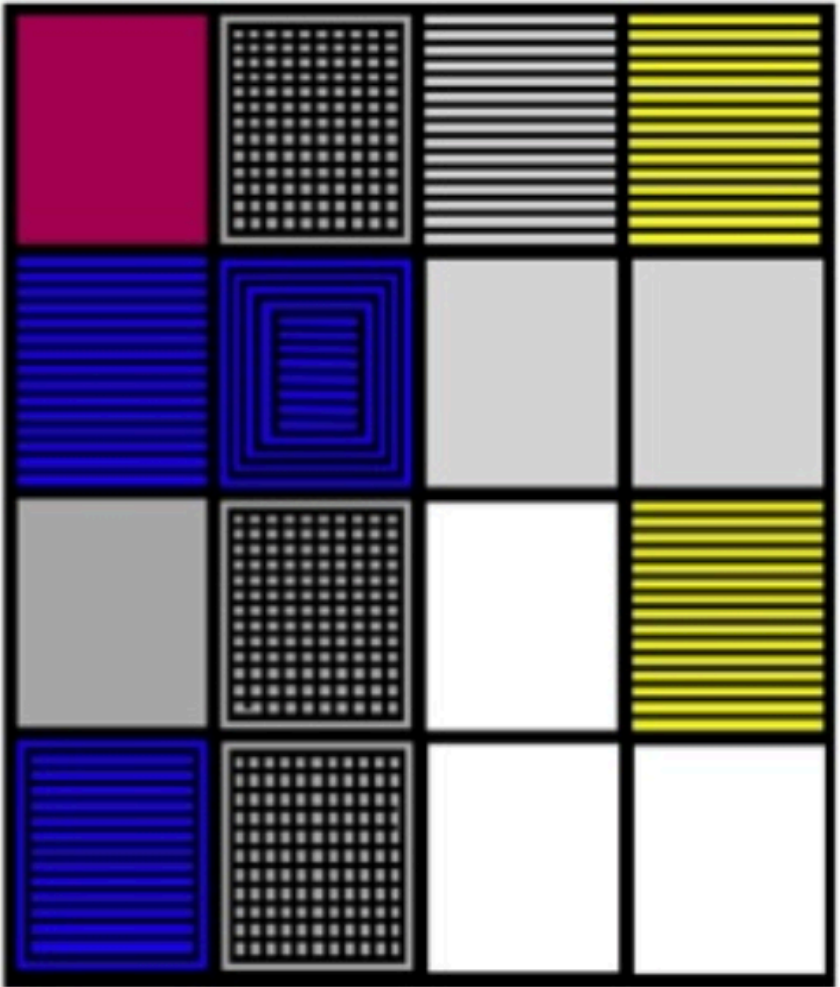
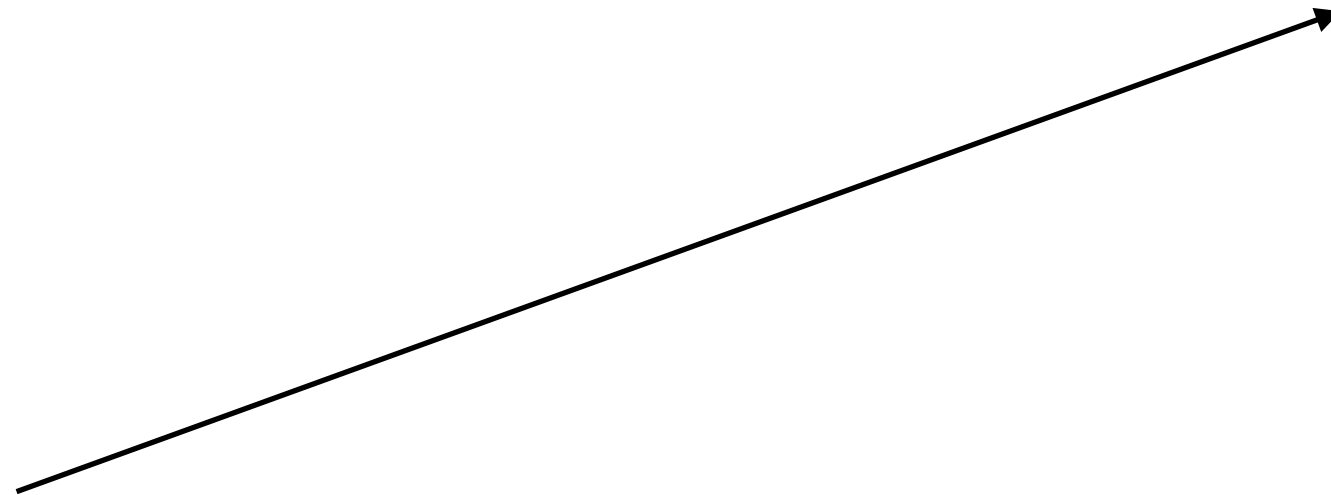
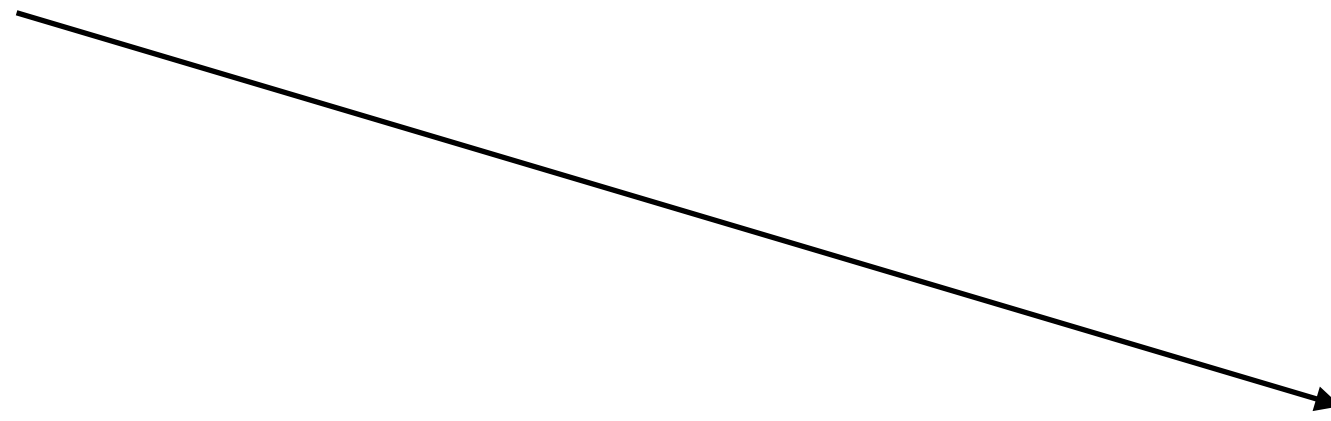
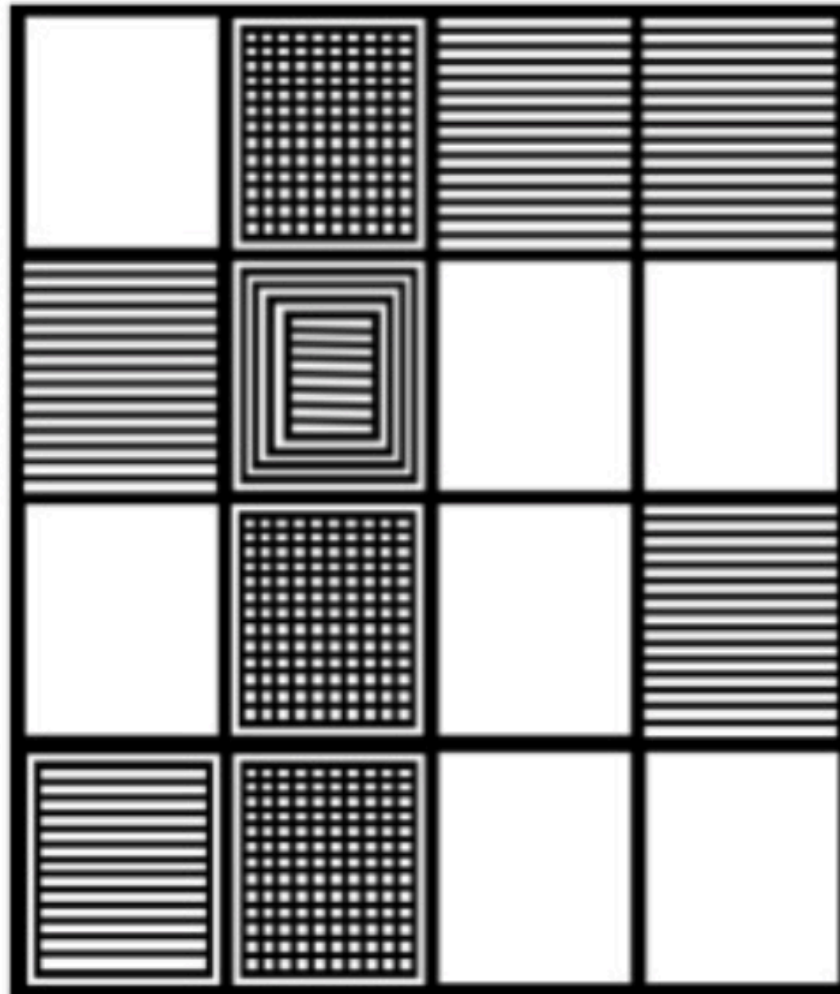
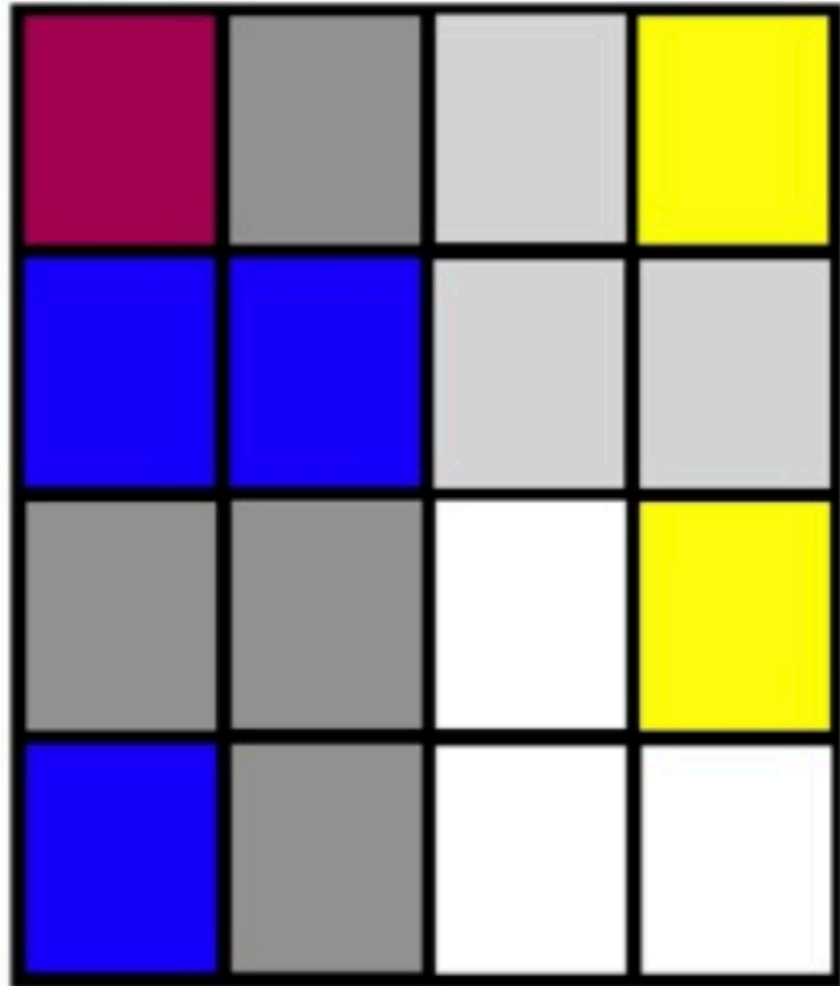
Dark Red	Dark Gray	Light Gray	Yellow
Blue	Blue	Light Gray	Light Gray
Dark Gray	Dark Gray	White	Yellow
Blue	Dark Gray	White	White

The Quality Mapping in Context

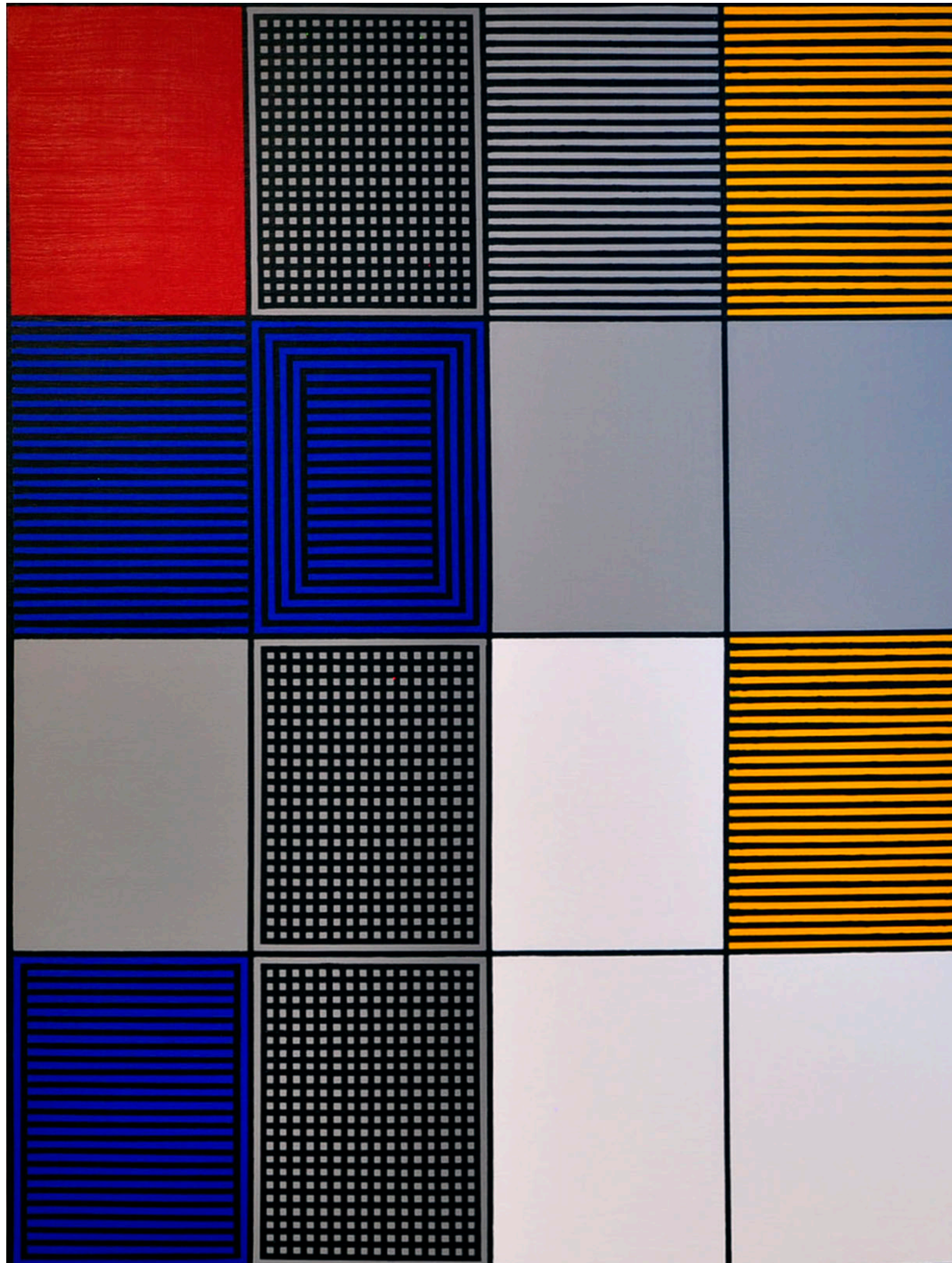
Maj	Dom7	Min	Min
Min	Min13	Maj	Maj
Maj	Dom7	Maj	Min
Min7	Dom7	Maj	Maj



The Integration of the Two Mappings

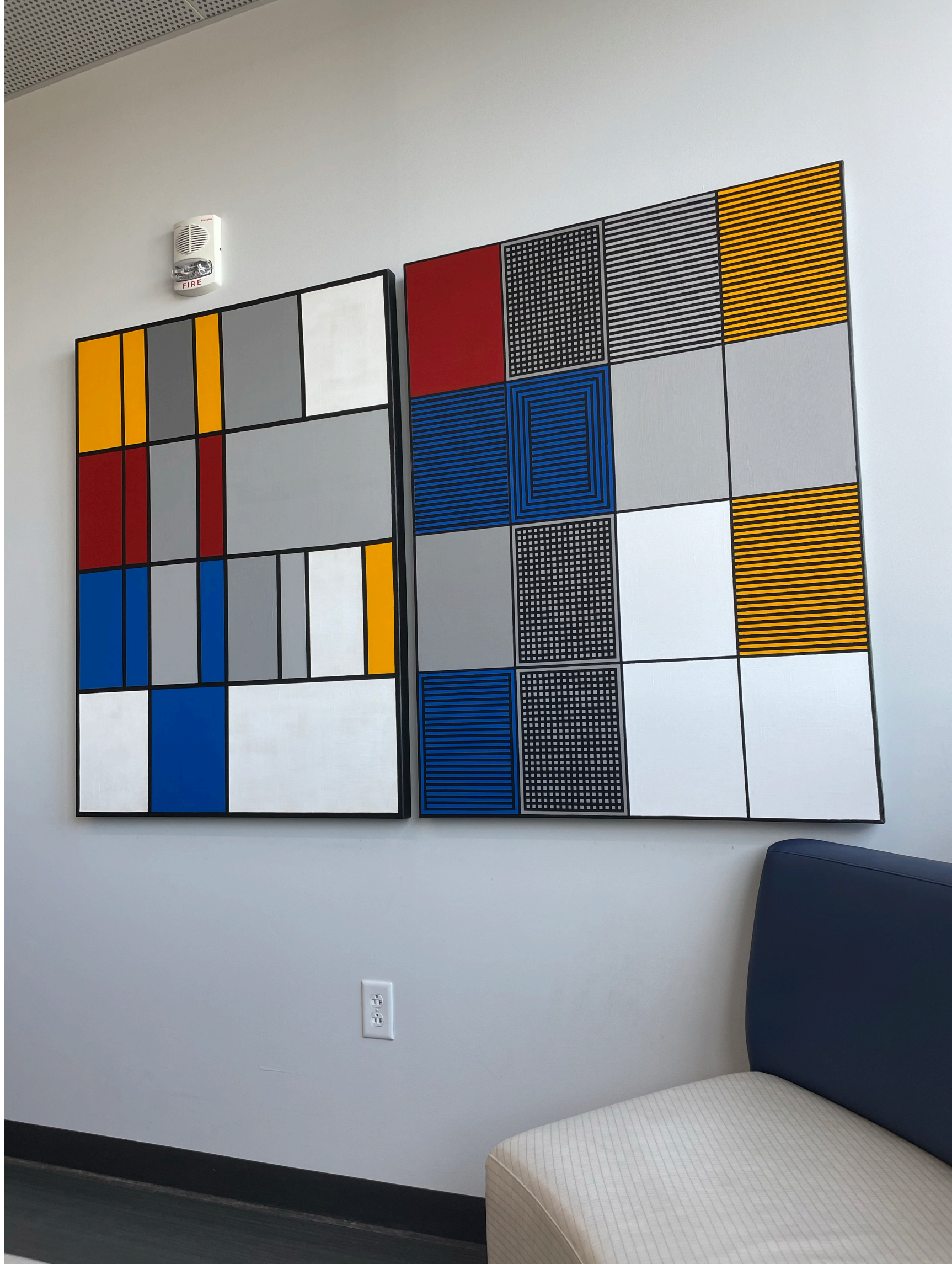


Echo 2



Maj	Dom7	Min	Min
Min	Min13	Maj	Maj
Maj	Dom7	Maj	Min
Min7	Dom7	Maj	Maj

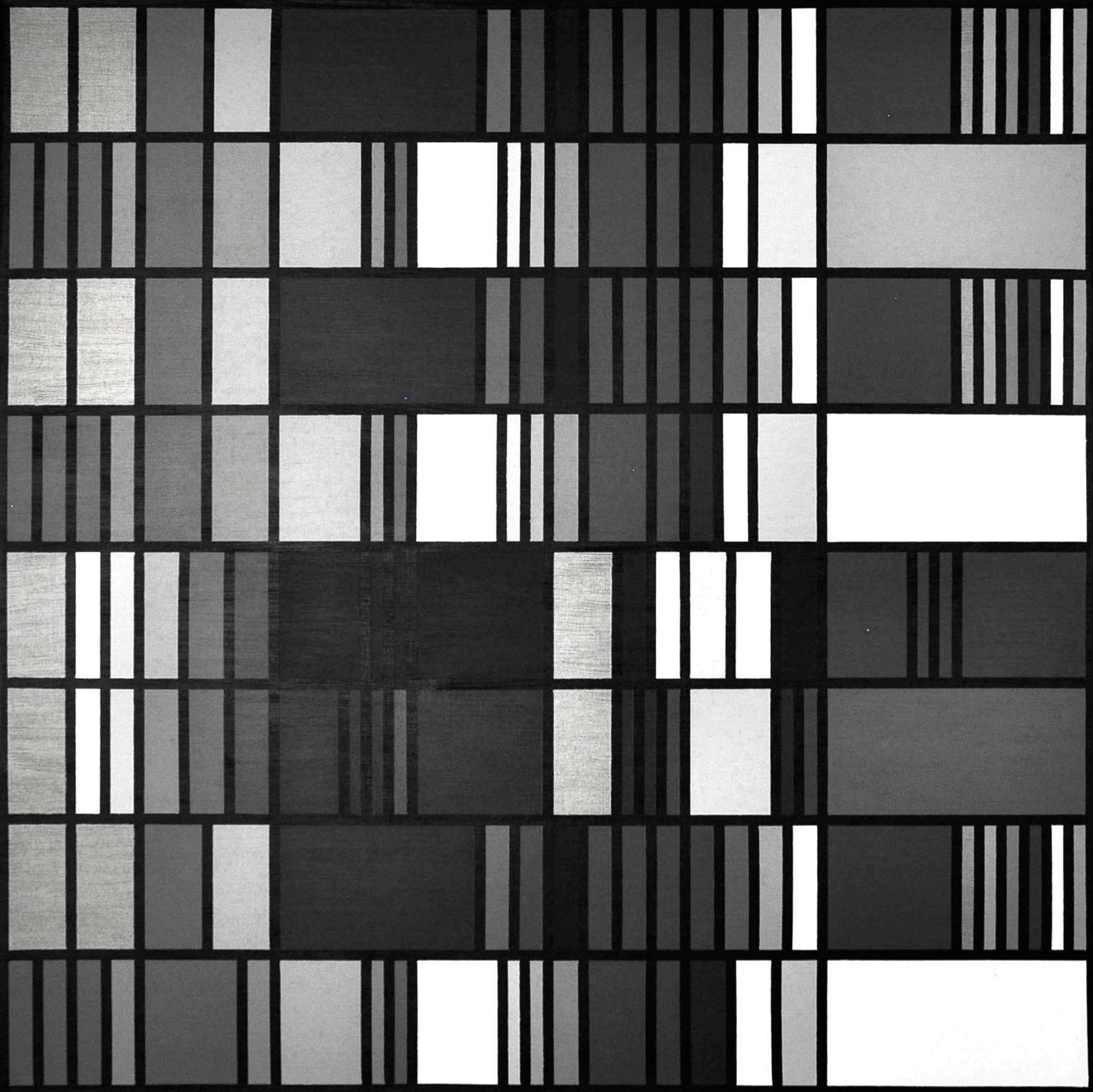
Echo Dyptich in the Chromesthetic Gallery



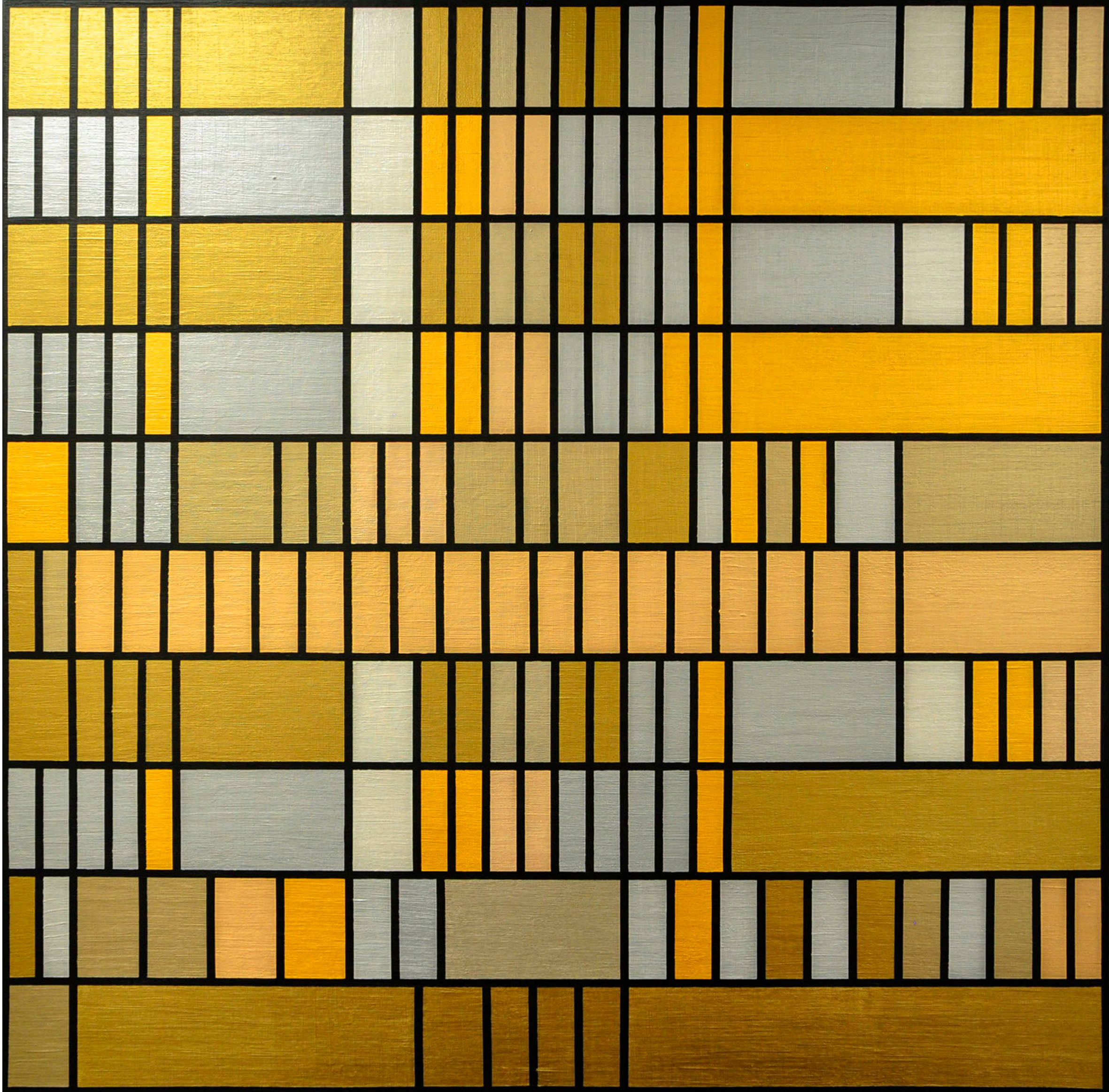
Part 12

Some Monochromatic Paintings

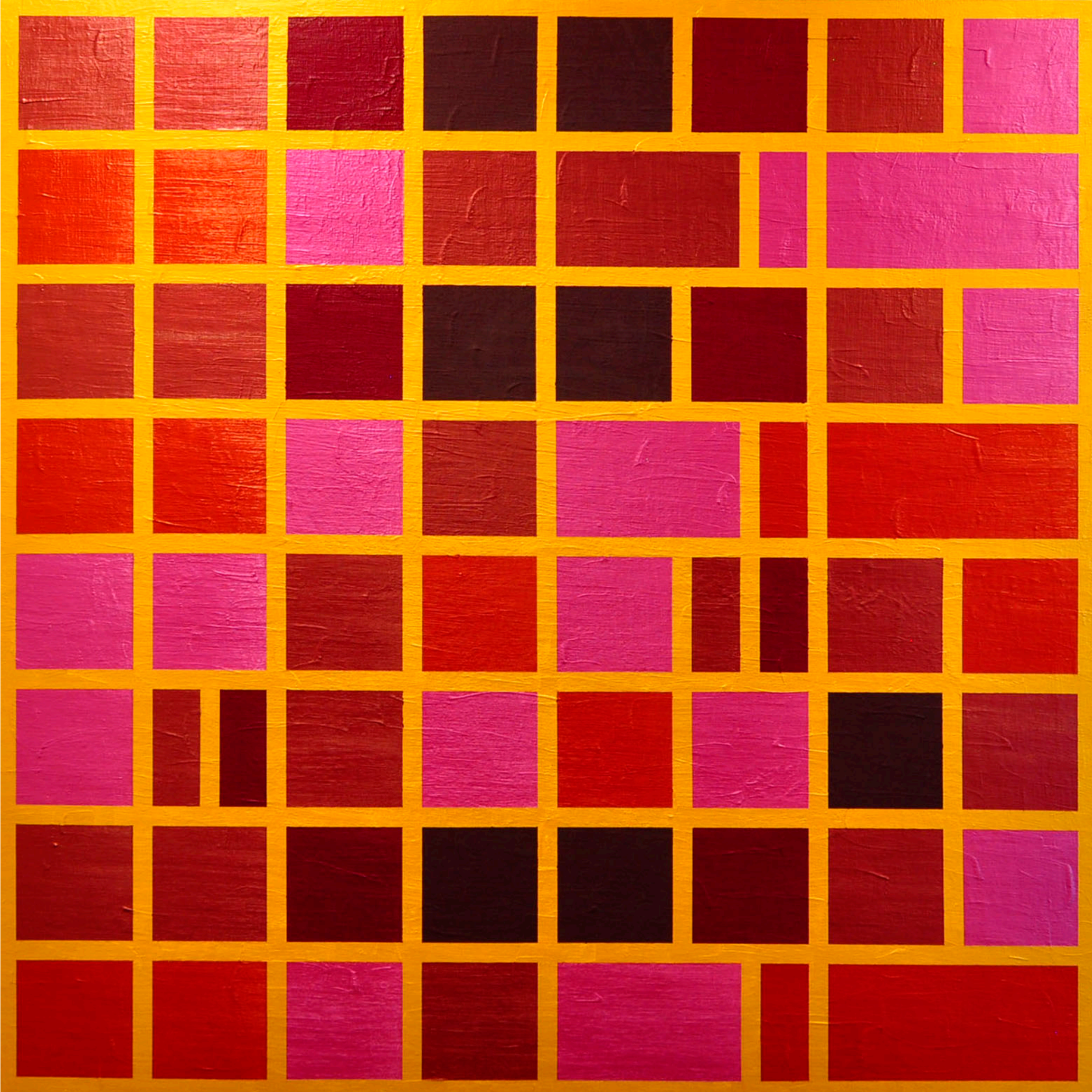
Misty (aka Shades of Gray) - For a "Color Blind Chromesthete"



Champaigne (aka You Go To My Head)



Study in Metallic Magentas (aka Joy)



Part 13

Painting Pachebal's Canon

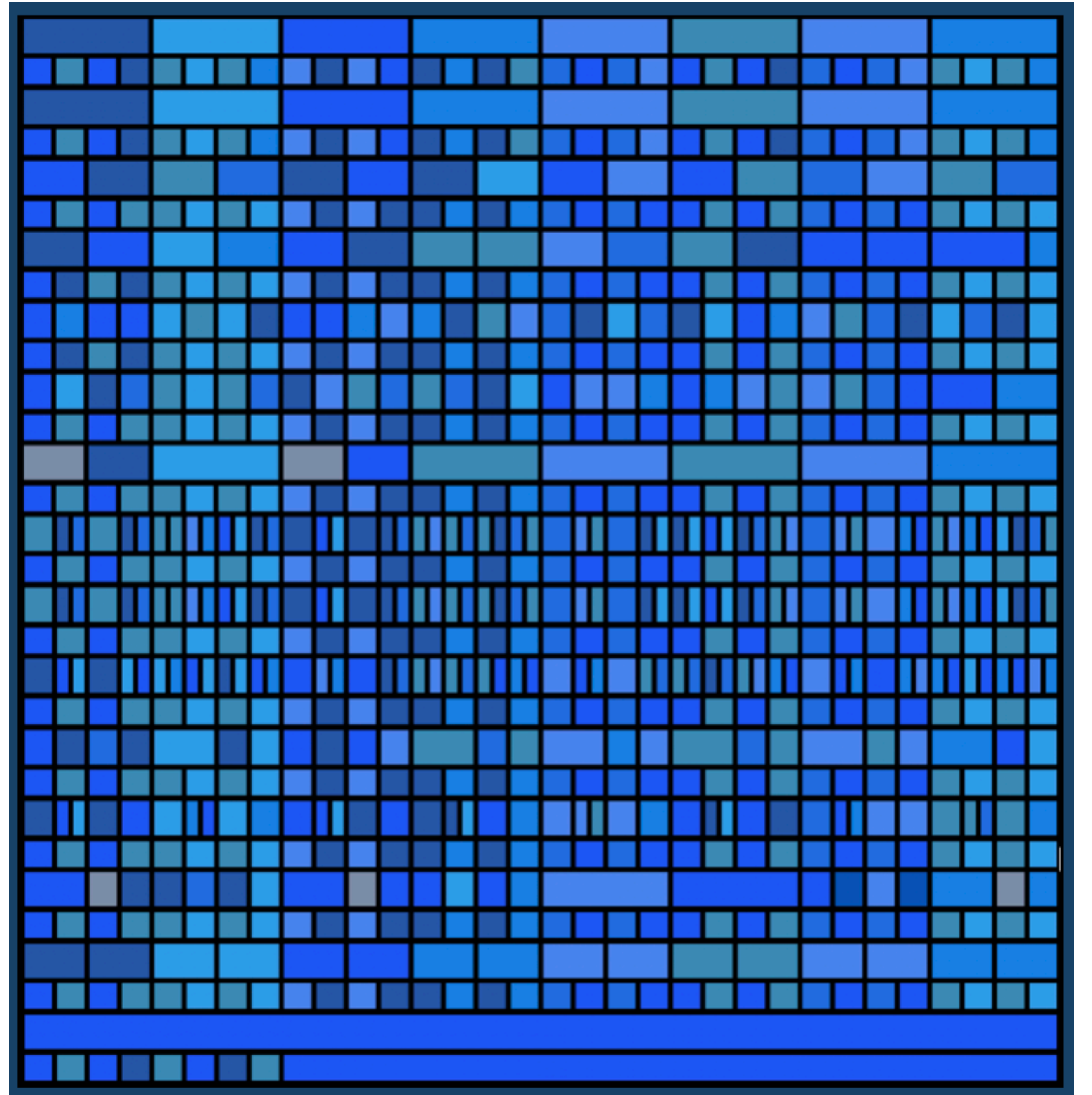
Layout of the Paining

3				2				1				7				6				5				6				7																											
1	5	1	3	5	2	5	7	6	3	6	1	3	7	3	5	4	1	4	6	1	5	1	3	4	1	4	6	5	2	5	7																								
3				2				1				7				6				5				6				7																											
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1	7	1	1	2	5	2	3	1	1	7	6	7	3	5	6	4	3	2	4	3	2	1	7	6	5	4	3	2	4	3	2																								
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5	3	4	5	3	4	5	5	6	7	1	2	3	4	3	1	2	3	3	4	5	6	5	4	5	3	4	5	4	6	5	4	3	2	3	2	1	2	3	4	5	6	4	6	5	6	7	1	5	6	7	1	2	3	4	5
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5	3	4	5	3	4	5	5	6	7	1	2	3	4	3	1	2	3	3	4	5	6	5	4	5	3	4	5	4	6	5	4	3	2	3	2	1	2	3	4	5	6	4	6	5	6	7	1	5	6	7	1	2	3	4	5
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1	5	1	5	5	2	5	2	6	3	6	3	3	7	3	7	4	1	4	1	1	5	1	5	4	1	4	1	5	2	5	2																								
3	1	2	3	1	2	7	1	2	7	1	1	2	3	1	3	3	2	1	7	6	6	5	6	7	1	3	2	1	3	4	1	7	6	6	5	5	4	5	7																
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1																																																							
1	5	1	3	5	1	3	5	1																																															

Palette for the Painting



Canon with "Acrylic" Blues and Frame



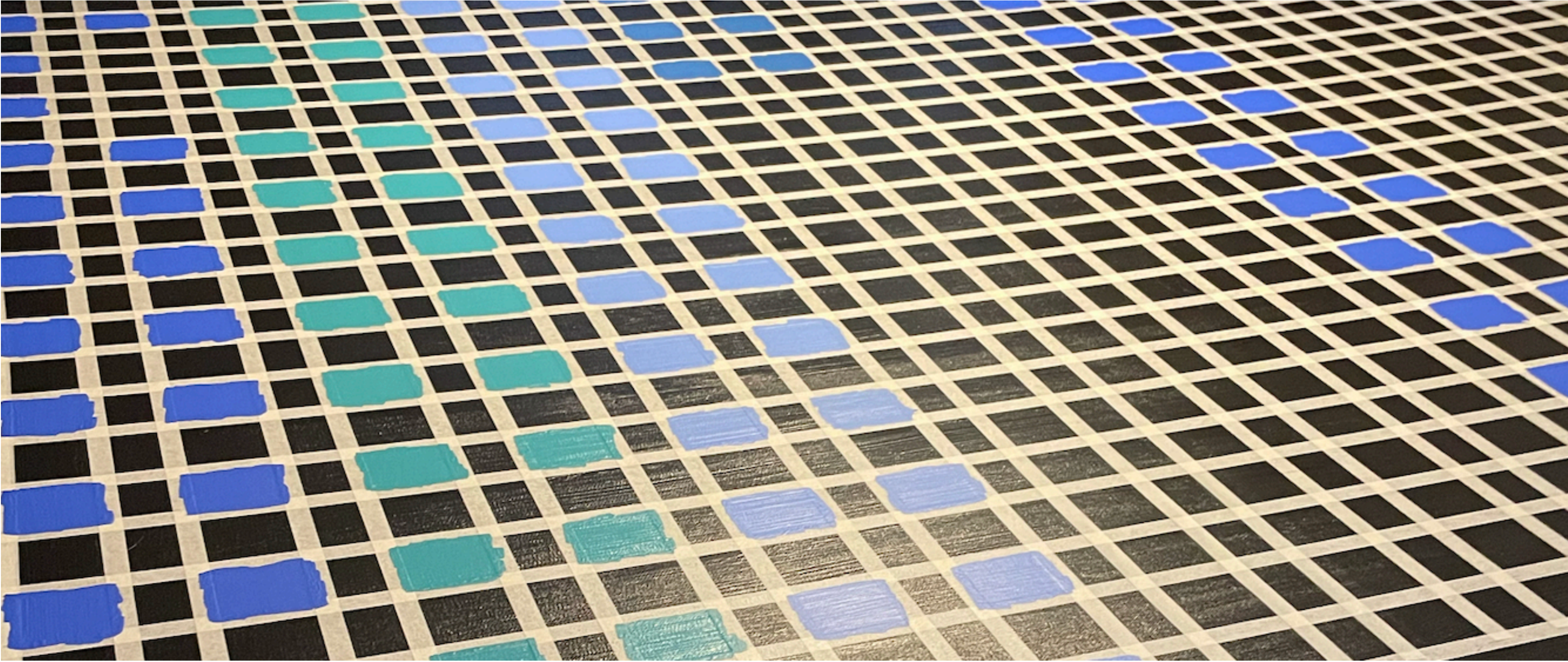
Paint it Black



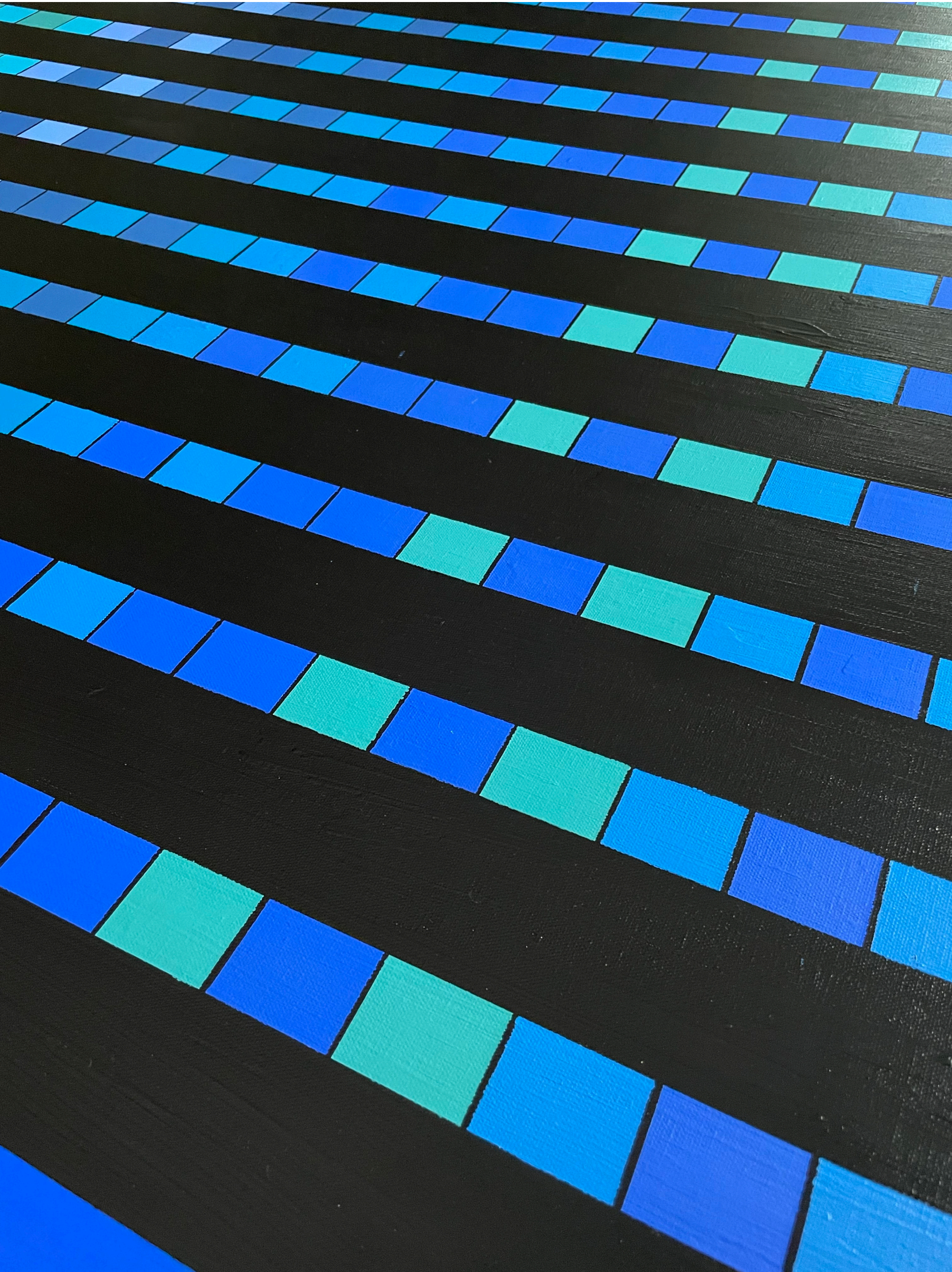
Initial Taping



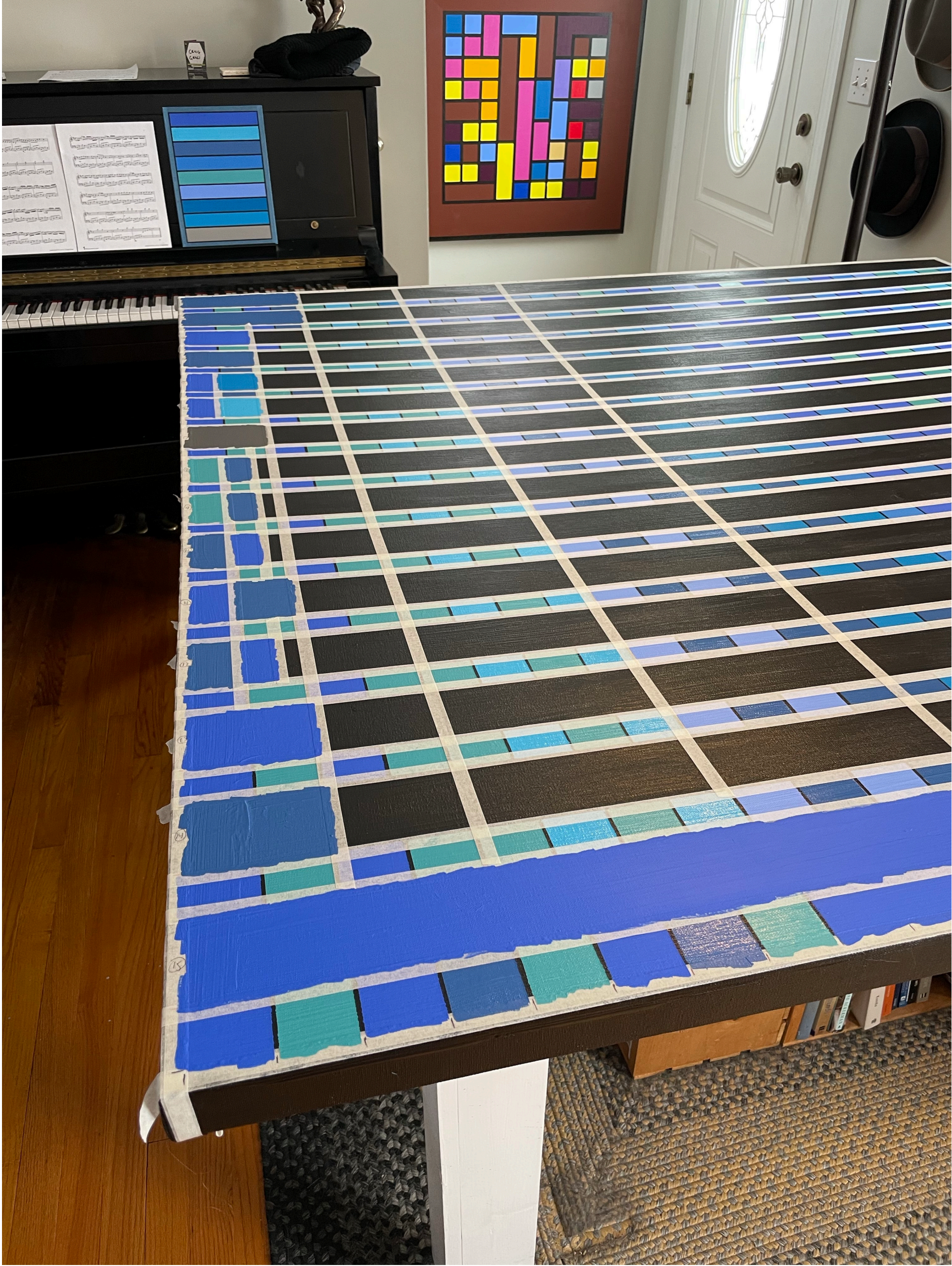
In the Process of Painting Half of the Harmonic Notes



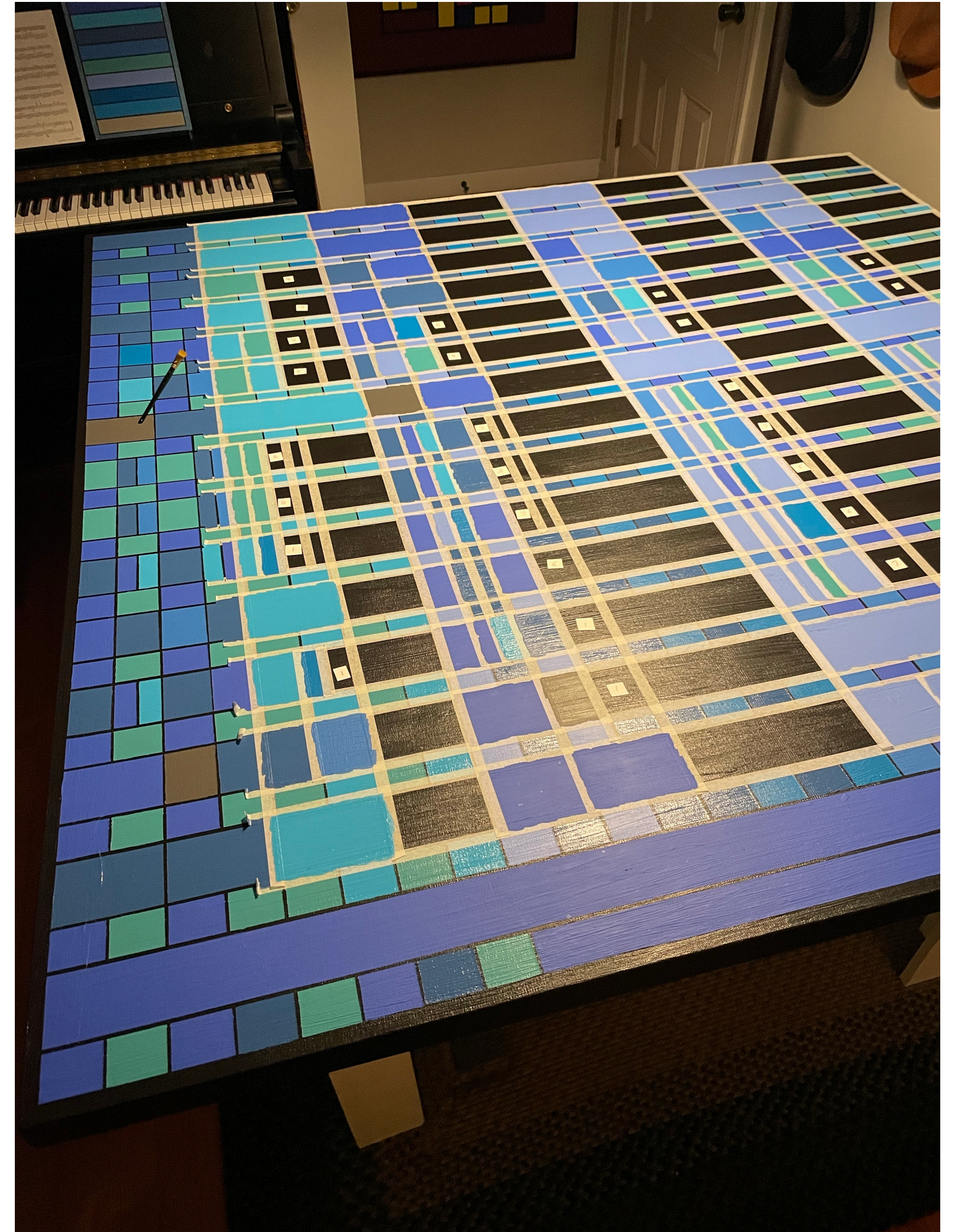
The Canvas, after Painting the rest of the Harmonic Notes



Getting Started Painting the Melodic parts



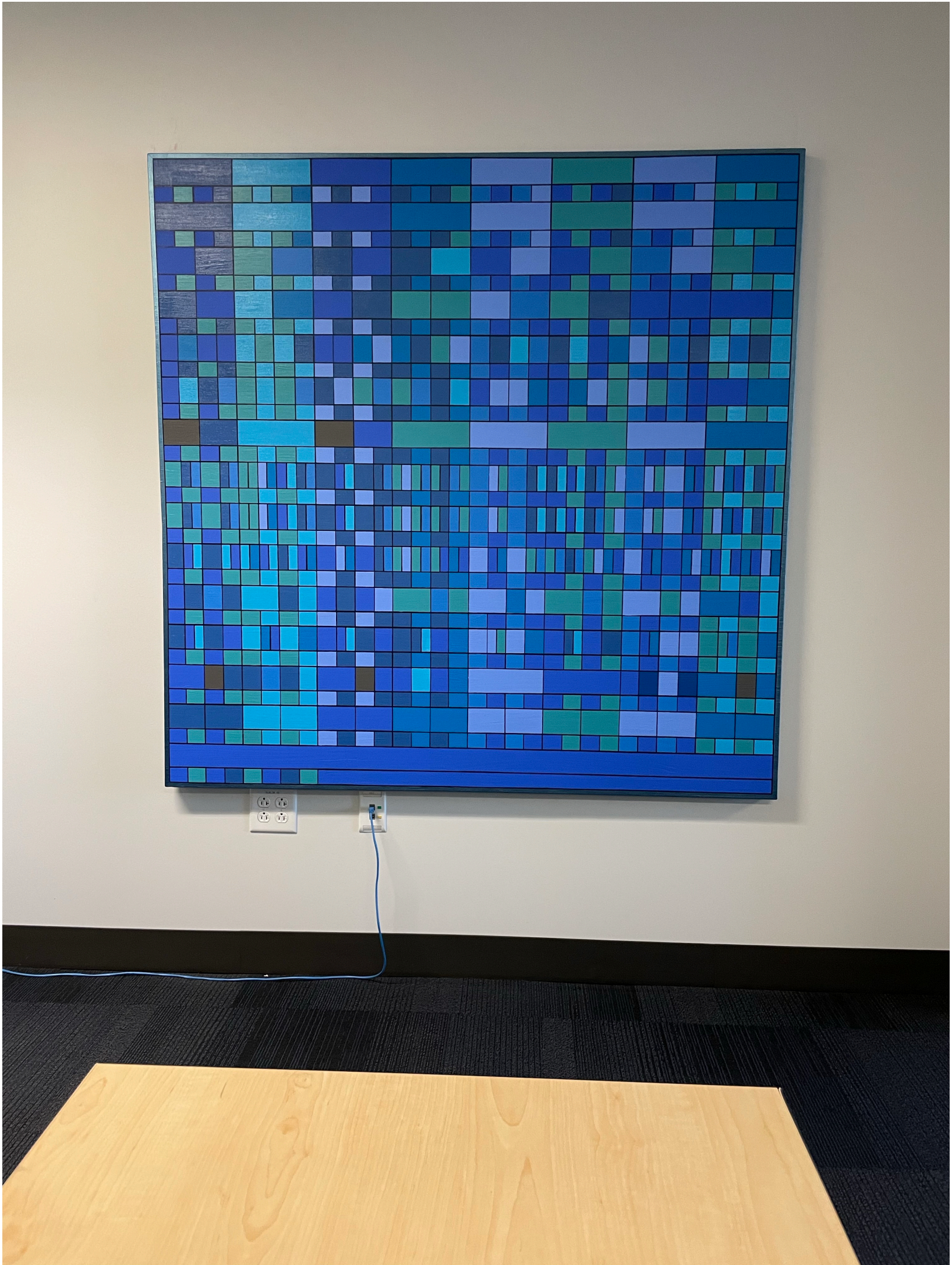
Emphasizing the "Paint by Number" Aspect of the Painting Process



Finished Painting



Canon in D, Hanging in the CS Department Office



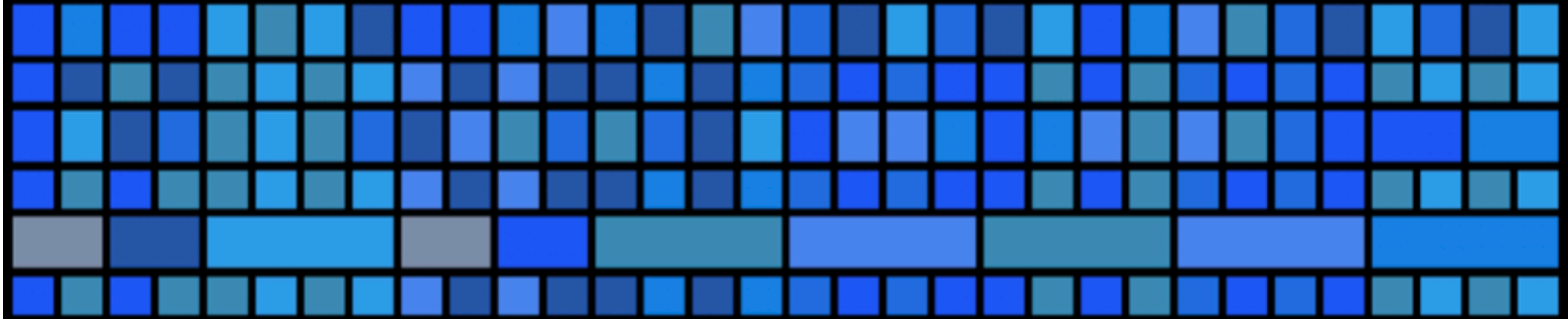
Part 1 (quarter time)



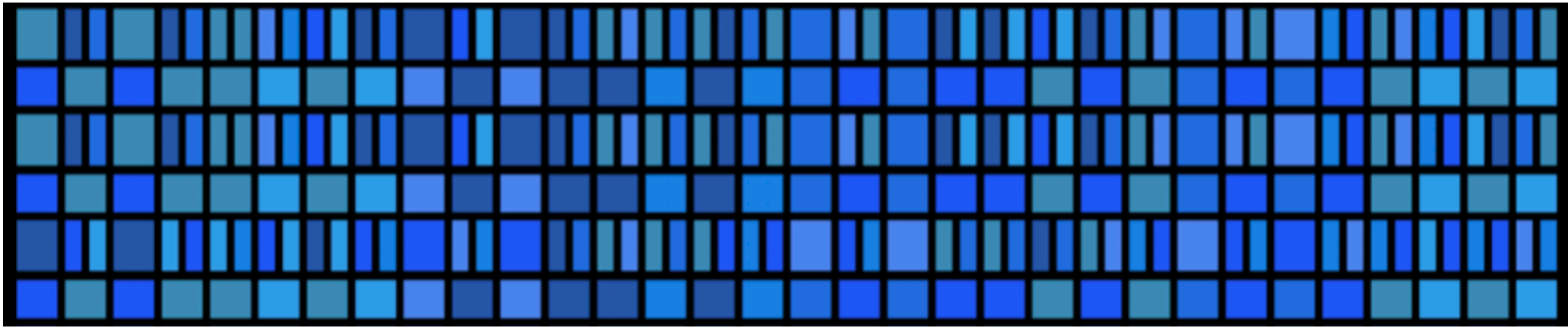
Part 2 (half time)



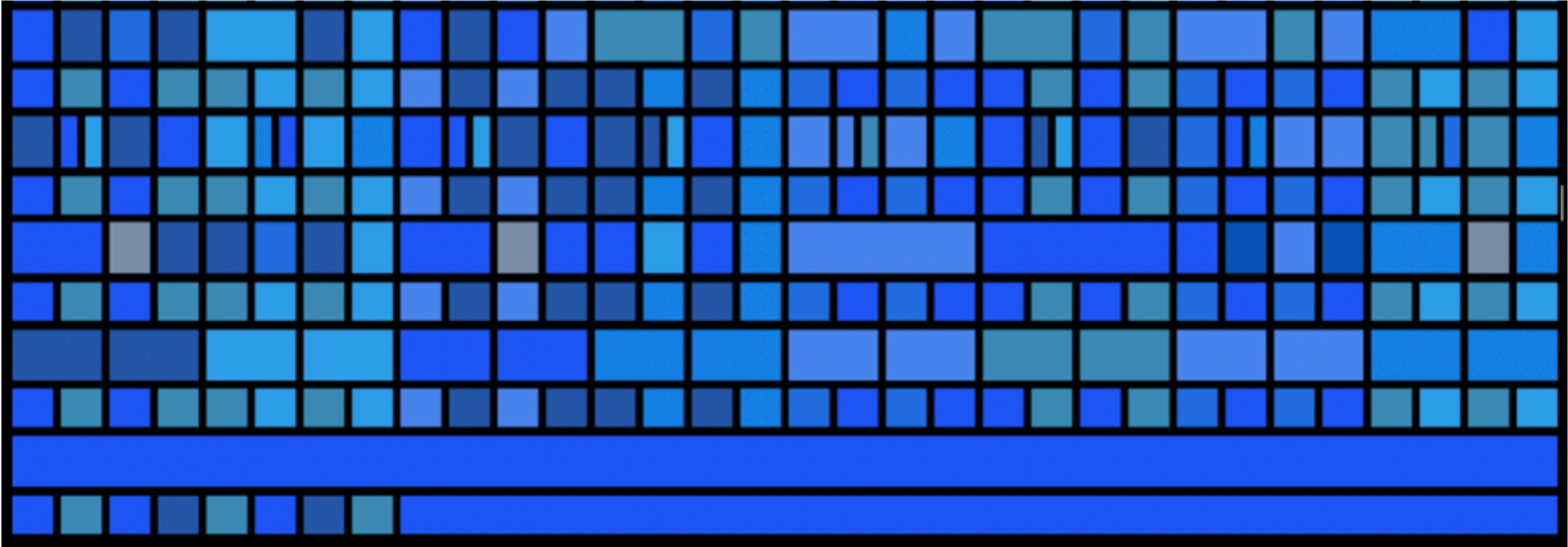
Parts 3-4 (some "in time" + some irregular slow time)



Parts 5-6 (irregular quick time)



Parts 7-11 (various times)



Questions?

Some Definitions of Art

- **Alfred North Whitehead** - Art is the imposing of a pattern on experience, and our aesthetic enjoyment is recognition of the pattern.
- **Rand Inspired Definition** - Art is a selective re-creation of reality according to an artists mental model of the reality. *A mental model is a representation of some domain or situation that supports understanding, reasoning, and prediction, and thus provides a framework for meaningful (whether emotional or intellectual) contemplation of the domain or situation.*
- **Ayn Rand** - Art is a selective re-creation of reality according to an artists metaphysical value-judgements.
- **Paul Klee** - Art does not reproduce the visible; rather, it makes visible. *What Klee mean by this? Perhaps, that instead of merely striving to copy some aspect of visual reality, a work of art serves as a creative reinterpretation of reality that can enhance our understanding of something in one way or another.*
- **Scott Bennett** - The content of a painting, in contrast to the subject of a painting, is that complex feeling that the initiated viewer has when the physical facts of the work of art are translated, synaesthetically, into a unified response.
- **George Dickie** - A work of art is an artifact of a kind created to be presented to an artworld public.

Some Questions and (CG's) Answers about the Paintings

- **Are they abstract paintings?** I would be inclined to say **no**, since, within the visual realm there is no process of abstraction involved in the creation of the works. Then again, I might say **yes**, since there is a process of abstraction that takes place within the musical domain, prior to translation to the visual realm.
- **Are they nonrepresentational paintings?** I would be inclined to say **no**, since they represent musical melody (and in some cases harmony). Then again, I might say **yes**, since most people looking at the paintings may be unaware of this fact.
- **Do they exemplify conceptual art?** I would be inclined to say **no**, because their rendering requires considerable time and effort, and significant decision making with respect to both syntagmatic and paradigmatic concerns. It is not just about the featured idea. Then again, I might say **yes**, since the chromesthetic idea may overshadow the aspects of rendering in the minds of those who know the key to unlocking meaning in the paintings.

Alternative Semiotic Readings

There are two fundamentally different ways in which the paintings can be read:

- **Presentationally** - You can read the painting at a "pictorial" level, in which you study the patterns inherent in the arrangement and colors of the shapes.
- **Discursively** - You can read the painting in a "textual" level, top-to-bottom left-to-right, doing your best to think of the music underlying the painting.

Moreover, repeatedly alternating between these two modes of looking at a painting can result in enhanced understanding of the painting.

Alternative Chromesthetic Readings

There are two fundamentally different ways in which the paintings can be read by those interested in embracing the musical dimension:

- **Internally** - If you know the melody on which the painting is based, you can hum along, from your memory, as you read in the discursive manner. It can be very satisfying to find that your expectation of a particular pitch is realized.
- **Externally** - If you do not know the melody well, find some musical rendering of the piece, and follow along discursively as you play one of them. Doing so, you may find yourself standing in a different relationship to both the painting and the music after reading the painting some number of times.

Either way, the experience of reading the paintings chromesthtically may result in enhanced understandings of tonality.

Notable Characteristics of the Paintings

- **Chromesthetic Aesthetic** – The idea of painting a grid of colored shapes to model melody in a literal sort of way, in which notes are defined in terms of pitch and duration, and sequenced in one way or another, appeals to both my intellect and my senses.
- **Knowledge Integration** – The notion that multiple representations of knowledge enhance understanding has long been acknowledged by AI researchers, and integrating musical knowledge with graphical knowledge in the paintings exemplifies this maxim.
- **Internal Rhythm** – The rectangular layout is based upon musical melody assures that the paintings possess strong “internal rhythm,” which is highly valued by a number of great artists.
- **Precision of Expression** – Elements of design and planning precede the rendering of a piece, which are followed by the exacting process of executing the plan.
- **Affordance of Cognitive Considerations** – Discussion of top-down/bottom-up perception, Gestalt principles, synesthesia/chromesthesia, and other cognitive phenomena flow readily from the paintings.
- **Potential for Enriching Music Education** – Can use the paintings to train the ear, to search for repetitions and transpositions within melodies, to appreciate the architecture of pieces.
- **Tool for Theorizing about Art** – Are the paintings abstract art? Are they like Mondrian’s most famous abstractions in any significant way? Do they fall within the realm of conceptual art? Are they similar in any respects to one kind of expressionism or another? Do they qualify as art? According to whose definitions do they qualify as art?

Exhibits

- Cazenovia Counterpoint Invitational Arts Festival (2014) - Star, Mood Indigo, Crimson Flames
- Cazenovia Counterpoint Invitational Arts Festival (2016) - Portrait of Xim, Sand
- On My Own Time Faculty and Staff Art Exhibition (2012) - Mood Indigo, Crimson Flames

CAZENOVIA COUNTERPOINT FESTIVAL

contemporary music of many styles, art & writing
featuring regional artists, CNY natives & guests
presented by the Society for New Music.

ARTS Matter in CNY-JOIN THE PLAY
In the historic village of Cazenovia, NY
34th season of new music in Cazenovia

July 9 - July 19, 2014

- ART INVITATIONAL ART EXHIBIT** July 1-30
At Cazenovia Public Library, Common Ground, Cazenovia
Artisans, Cazenovia Jewelry, Isabella's, St. Peter's Episcopal Hall
- RECEPTION & GALLERY WALK** July 12
- MUSIC CONCERTS**
- RISING STARS** concerts July 9, 18, 19
 - SORCERER'S APPRENTICE** (opera) July 9 & 16
 - ARTISTS Round-Table** July 13
 - FILM w/ new music A Resonant Chord** July 10
 - YOUNG COMPOSERS CORNER** July 17
 - FAMILY ARTS DAY at SQHAP** July 14-18, 19
- WRITING WRITERS CORNER, Poetry Round Robin** July 12, 15, 19

Events with admission*: \$15, \$12 seniors/students, 18 &
under free, \$30 family

For more information, contact Caz Coordinator Mary Ellen
Zowski 315-251-1151 or www.societyfornewmusic.org

July 1 - 30 INVITATIONAL ART EXHIBIT

Anne Baldwin, Sue Beevers, Scott Bennett, Linda Bigness, Steve Carpenter, Juan Cruz, Bill Elkins, Craig Graci, Cheryl Gressani, Elisabeth Groat, Judith Hand, Miyo Harano, Tom Huff, Harry Freeman-Jones, Barbara Kellogg, Mary Murphy, Jeffrey Parker, Lynn Pauley, Toloa Perry, Deborah Dougherty-Wester, and others at venues throughout the Village.

July 9 **RISING STARS**

12 noon at St. Peter's Episcopal Hall, 10 Mill St. Free

Come hear winners of regional & state-wide competitions perform the classics, plus premieres of new works by **Nikolas Jeleniauskas** (Megan Murphy, soprano), **Gregg Welcher** (Gregg Welcher, piano), **Emmanuel Sikora** (Jayde Martin, violin) with collaborative pianist **Sar Shalom Strong**



July 9 **COLLEEN KATTAU & SOME GUYS** (folk & world band from Cortland) Free

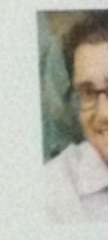
7-9pm at Lakeland Park.
In conj. with the Caz Chamber of

Commerce 'Concerts in the Park' series.
Watch the sun set on the lake & hear original bilingual singer/songwriter



July 7:30pm

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Star (Caz, 2014)



Mood Indigo (Caz, 2014)



Crimson Flames (Caz, 2014)



Sand (Caz, 2016)

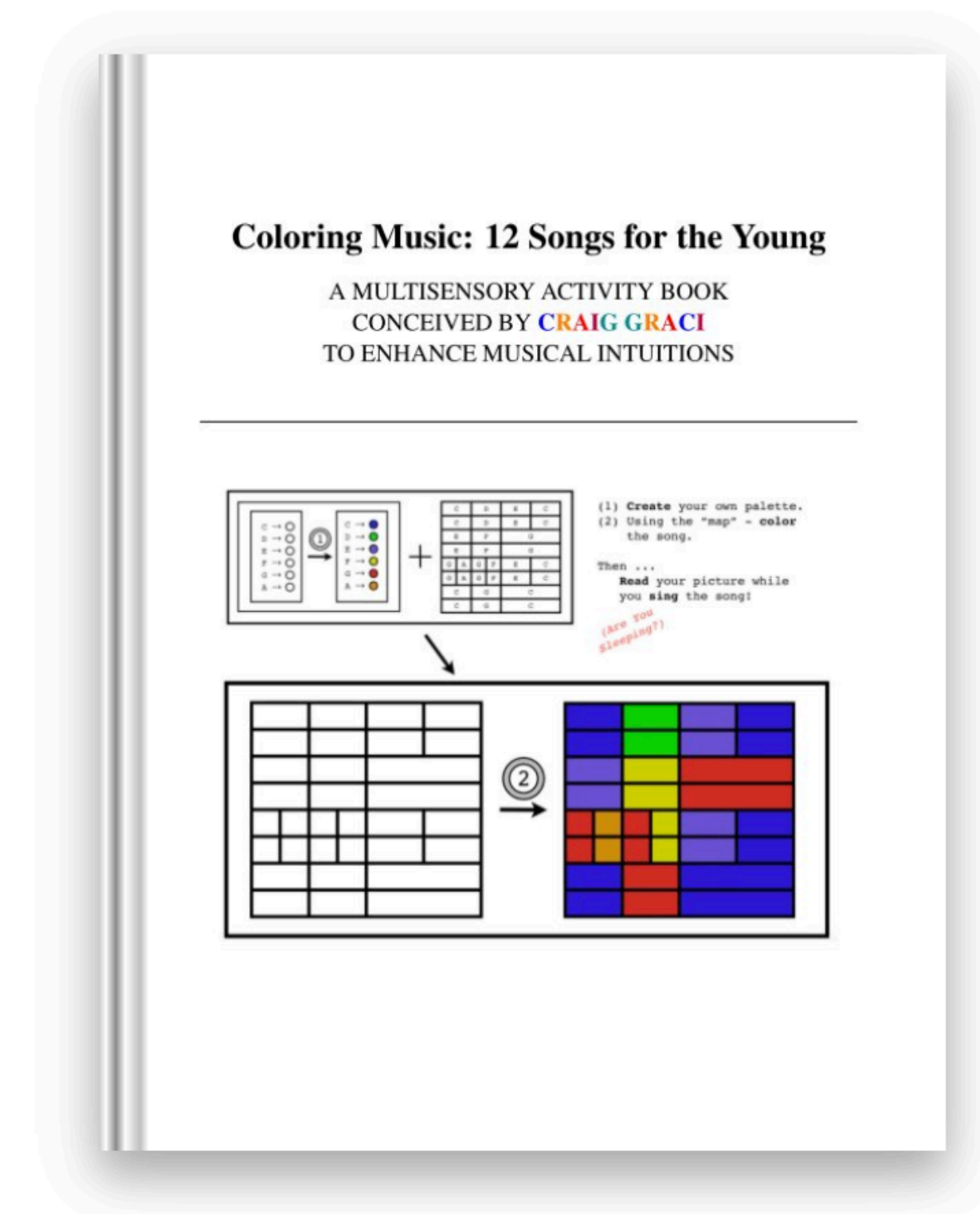


On My Own Time Faculty and Staff Art Exhibition

SUNY OSwego, Penfield Library



Books





PREVIEW

Twelve Painted Melodies

by Craig Graci

HARDCOVER, IMAGEWRAP
Cover design is printed on the hardcover

US \$47.40

[ADD TO CART](#)

About the Book

The twelve paintings presented in this book are inspired by chromesthesia, a neurological phenomenon in which sound is mapped to color. Each painting represents a melody, the notes of which are represented by rectangular shapes. The color of a shape denotes the pitch class of the note. The width of the shape corresponds to the duration of the note. It is imagined that each melody is heard by a different chromesthete.

Features & Details

Primary Category: [Arts & Photography Books](#)

Project Option: Small Square, 7x7 in, 18x18 cm
of Pages: 26

ISBN
Hardcover, ImageWrap: 9781367314108

Publish Date: Aug 25, 2016

Language English

About the Creator

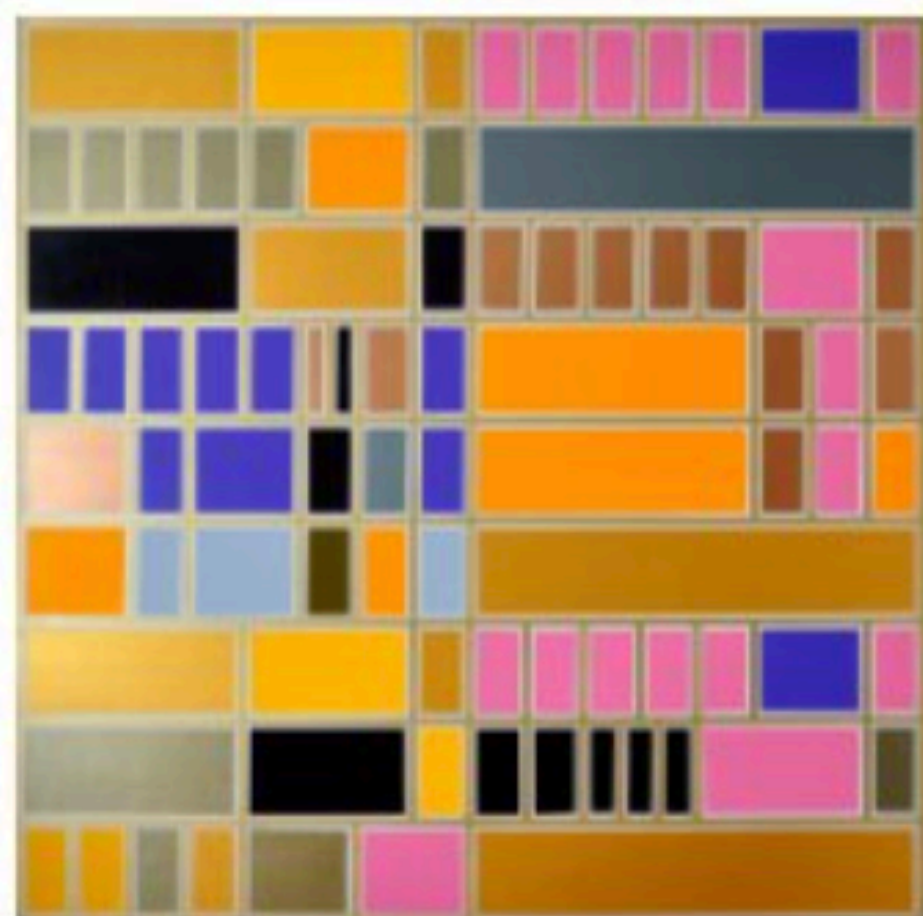
**Craig Graci**

Oswego, New York

Craig Graci is a computer scientist and a cognitive scientist with a passion for music and nonrepresentational art.

Twelve Painted Melodies

Craig Graci



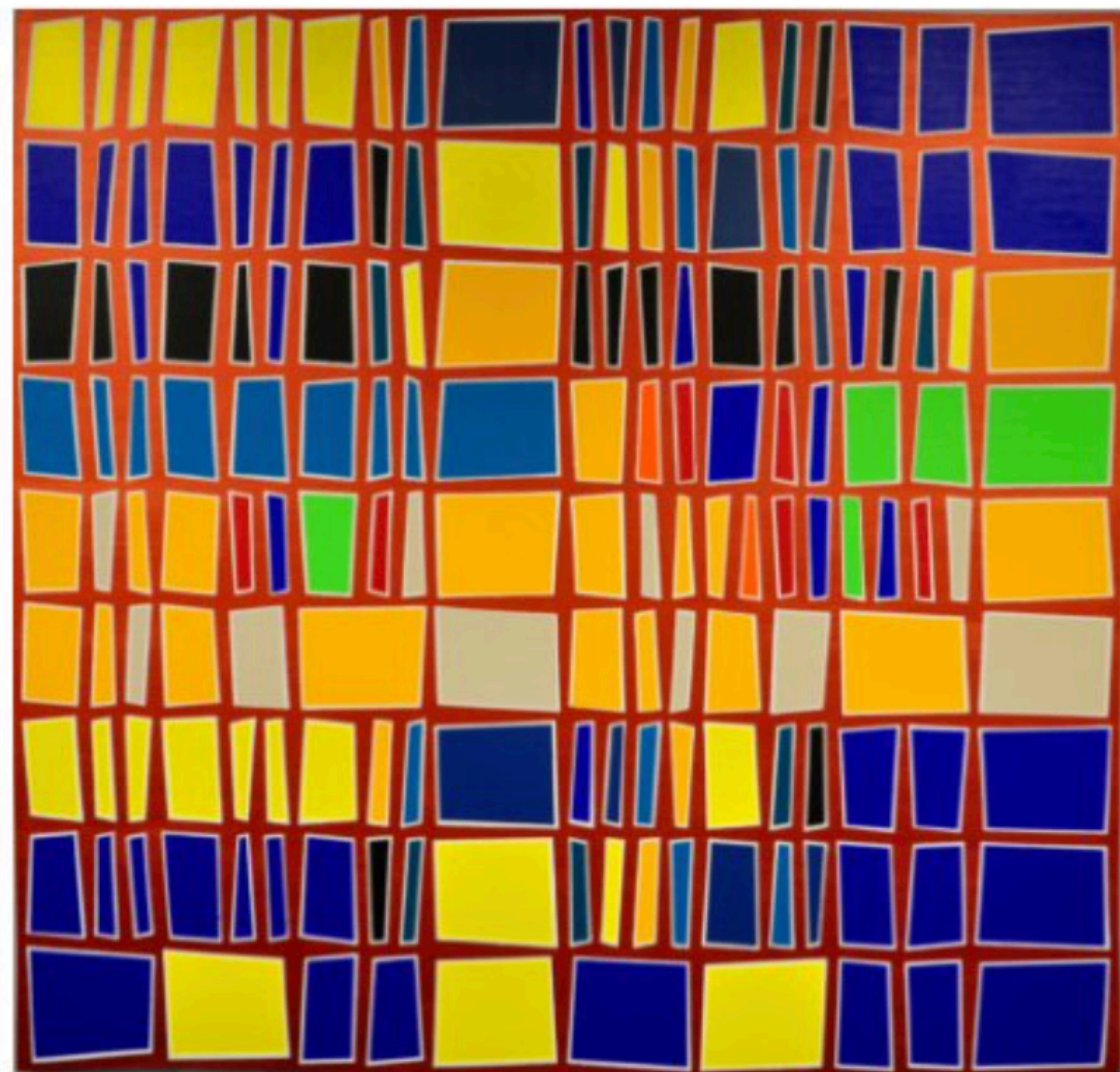
The twelve paintings presented in this book are inspired by **chromesthesia**, a neurological phenomenon in which sound is mapped to color. Each painting represents a melody, the notes of which are represented by rectangular shapes. The color of a shape denotes the pitch class of the note. The width of the shape corresponds to the duration of the note. It is imagined that each melody is heard by a different chromesthete.

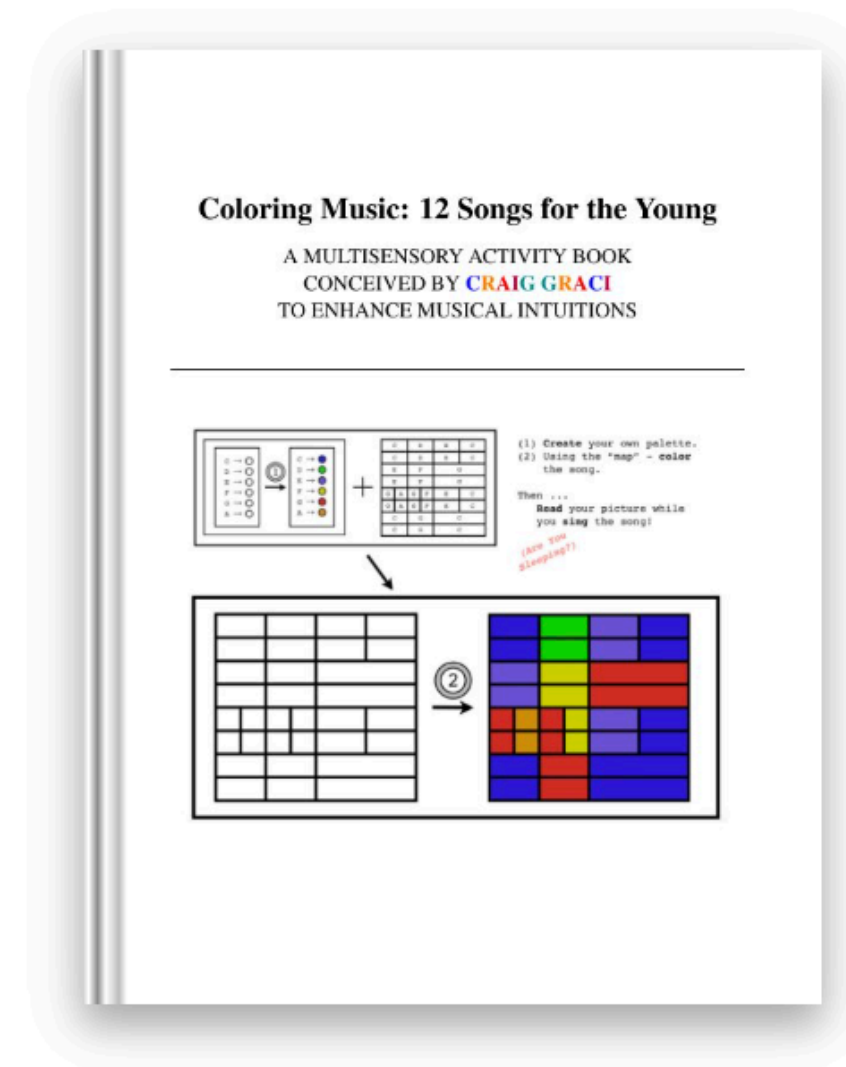
Ode to Joy
Auld Lang Syne
All the Things You Are
Misty
Minuet in G
Stardust
Venus in Furs
Wayfaring Stranger
Cherry Pink and Apple Blossom White
Fairy Tale
Over the Rainbow
You Go to My Head

Fairy Tale

Dmitri Kabalevsky

Palette: inspired by Vincent
Van Gogh's cafe





PREVIEW

About the Book

This book is for those who like to think about musical melodies and color palettes and the representation of knowledge. Although it looks quite like a coloring book, the book was actually designed to inspire thinking and talking about visualizations of melodic patterns. That the book affords opportunities to sing along with the images that you color is a bonus! "Coloring Music" was inspired by the phenomenon of chromesthesia, which loosely speaking is an association of sound with color. It contains 12 blank rectangular grids, each corresponding to a musical melody. Accompanying each grid is a color key and a melody map which collectively indicate how to color the blank grid so that it will chromesthetically represent the melody. Tips on how to best make use of the book are provided in the form of an informal preface and an eclectic mix of end notes.

Coloring Music: 12 Songs for the Young

A Multisensory Activity Book Conceived to Enhance Musical Intuitions

by Craig Graci

MAGAZINE

US \$13.00

ADD TO CART

Features & Details

Primary Category: [Arts & Photography Books](#)

Project Option: US Letter, 8.5x11 in, 22x28 cm
of Pages: 28

Publish Date: Mar 09, 2016

Language English

Keywords

music

color

synesthesia

education

SEE MORE

About the Creator



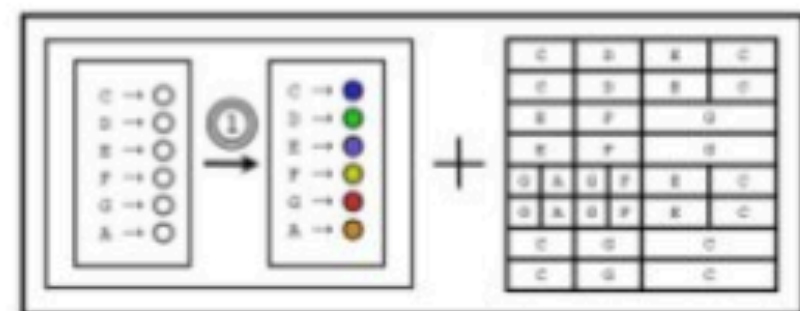
Craig Graci

Oswego, New York

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Coloring Music: 12 Songs for the Young

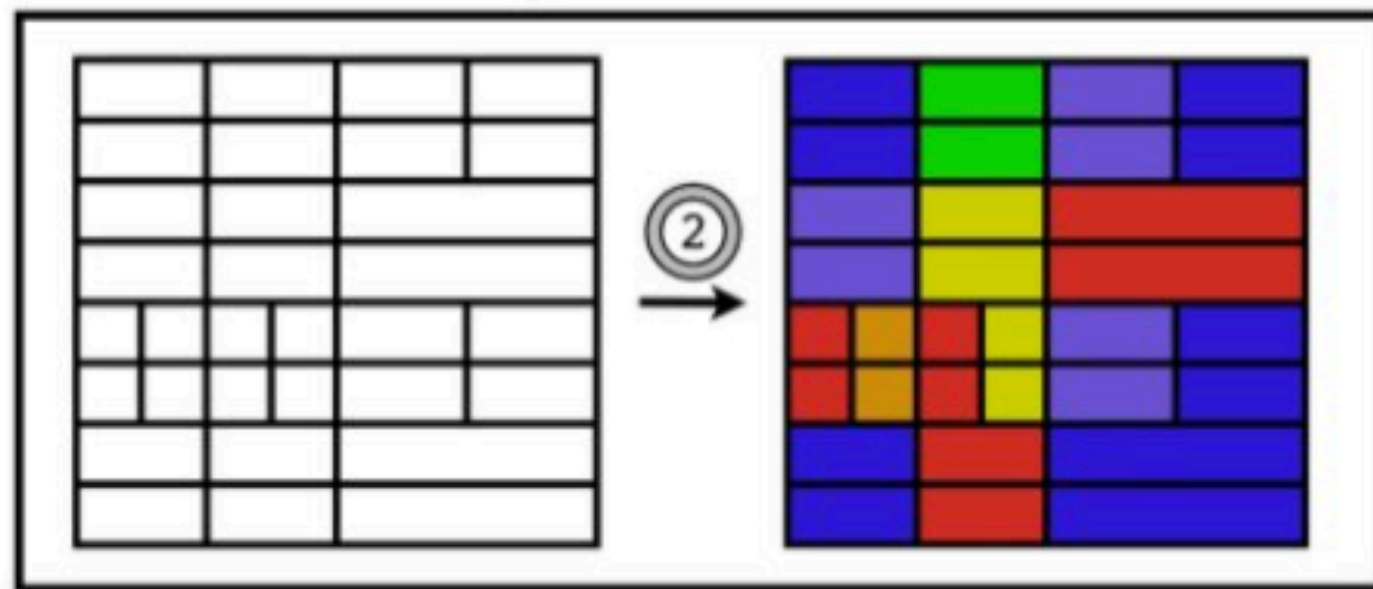
A MULTISENSORY ACTIVITY BOOK
CONCEIVED BY **CRAIG GRACI**
TO ENHANCE MUSICAL INTUITIONS



- (1) Create your own palette.
- (2) Using the "map" - color the song.

Then ...
Read your picture while
you sing the song!

*(Are You
Sleeping?)*



Ode to Joy

Welcome! I hope you will find the music coloring activities in this book to be both informative and fun.

If you like patterns, if you like colors, if you like music, and if you like making connections between different perceptual domains, you may very well enjoy working your way through this book.

Colored pencils are recommended. Take care about the bleed through, especially if you should choose to use markers.

For each song, select a palette by coloring in just the *key* on the left hand page with a mix of different colors. No need to color the *map* on the left hand page! Then, using the *map* on the left hand page as a guide, color in the rectangular grid on the facing page.

Each rectangle in the image corresponds to a musical note. The color of the rectangle represents the pitch class of the note. The width of the rectangle represents the duration of the note.

The identities of the first seven tunes are provided. The identities of the last five tunes are withheld, providing you with a handful of puzzles!

Once you have completed each task, you might like to take a few moments to follow the notes in the colored image as you sing the song. If you don't know the words to a puzzle, perhaps you can hum it, or find a way to render it on a musical instrument.

The selections include nursery rhymes and folk songs. Some are light and happy, others are dark and sad. Some speak to childhood fancy, others to realities that may be encountered in living a long life. Some are laced with irony, others are dripping with sincerity. Young people, or people of any age for that matter, may find that thinking about the ideas embodied in these songs and feeling the emotions engendered by these songs, in the context of an integrated sonic and imagistic environment, is a worthwhile, interesting, fun experience.

Enjoy!!

End Notes

Chromesthesia is technically speaking a phenomenon in which sounds are mapped to colors in the brain. This coloring book plays with the concept, taking it out of the realm of fixed automatic neural processing into the realm of flexible learned mental experience.

Understanding is enriched by having multiple representations of knowledge. If you repeatedly relate visual representations of melody with sonic representations of melody you may find yourself appreciating melodic patterns in deeper and more meaningful ways than if you merely listen to melodies.

Alfred North Whitehead once remarked: "Art is the imposing of a pattern on experience, and our aesthetic enjoyment is recognition of the pattern." You may like to keep this in mind as you view the products of your coloring in this book.

Even if you are familiar with the tunes found in this book and can sing them from memory, it should be great fun to search on-line for various renditions of the tunes and try to follow the notes in the images. Melodic variants make this an interesting challenge, one which holds significant potential to sharpen your attention to musical detail, and consequently your perception of tonal music. Additionally, doing this is a great way to broaden your musical horizons.

If you can't identify some of the the puzzlers (the last five tunes in the book), you may enjoy asking a friend or relative to help you to place the tunes in question.

Ode to Joy, the image featured on the back cover of this book, chromesthetically represents Beethoven's famous melody. One of roughly three dozen chromesthetic paintings created by the author, Ode to Joy appears as a mural in the Chromesthetic Gallery, Shineman Hall, State University of New York at Oswego.

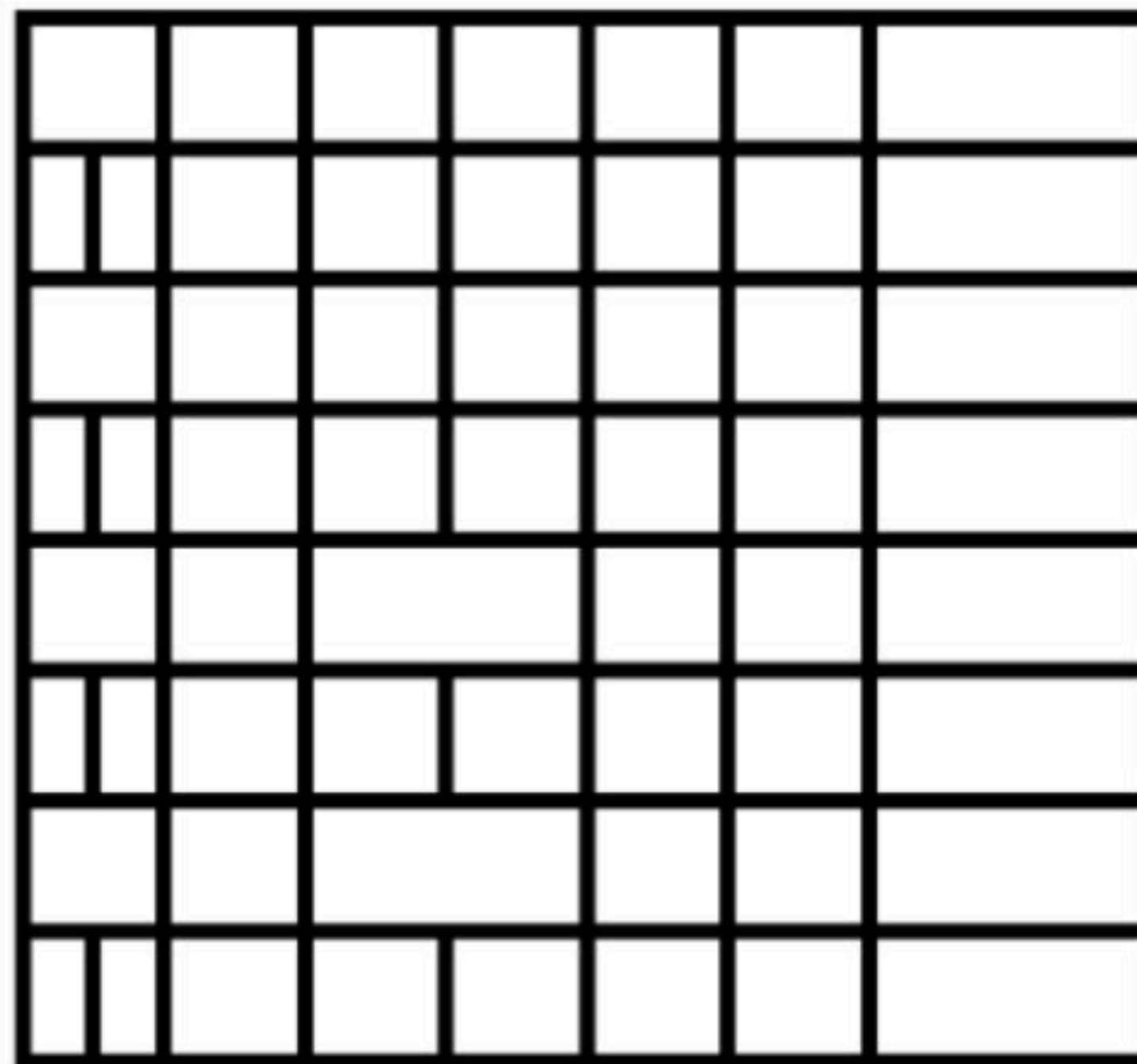
Song 2: Little Brown Jug

I love candy, I love cake,
 many good things are mind to take.
 Milk snow white and peaches pink,
 pretty brown jug from which I drink.

Ho ho ho, you and me,
 little brown jug how I love thee!

Ho ho ho, you and me,
 little brown jug how I love thee.

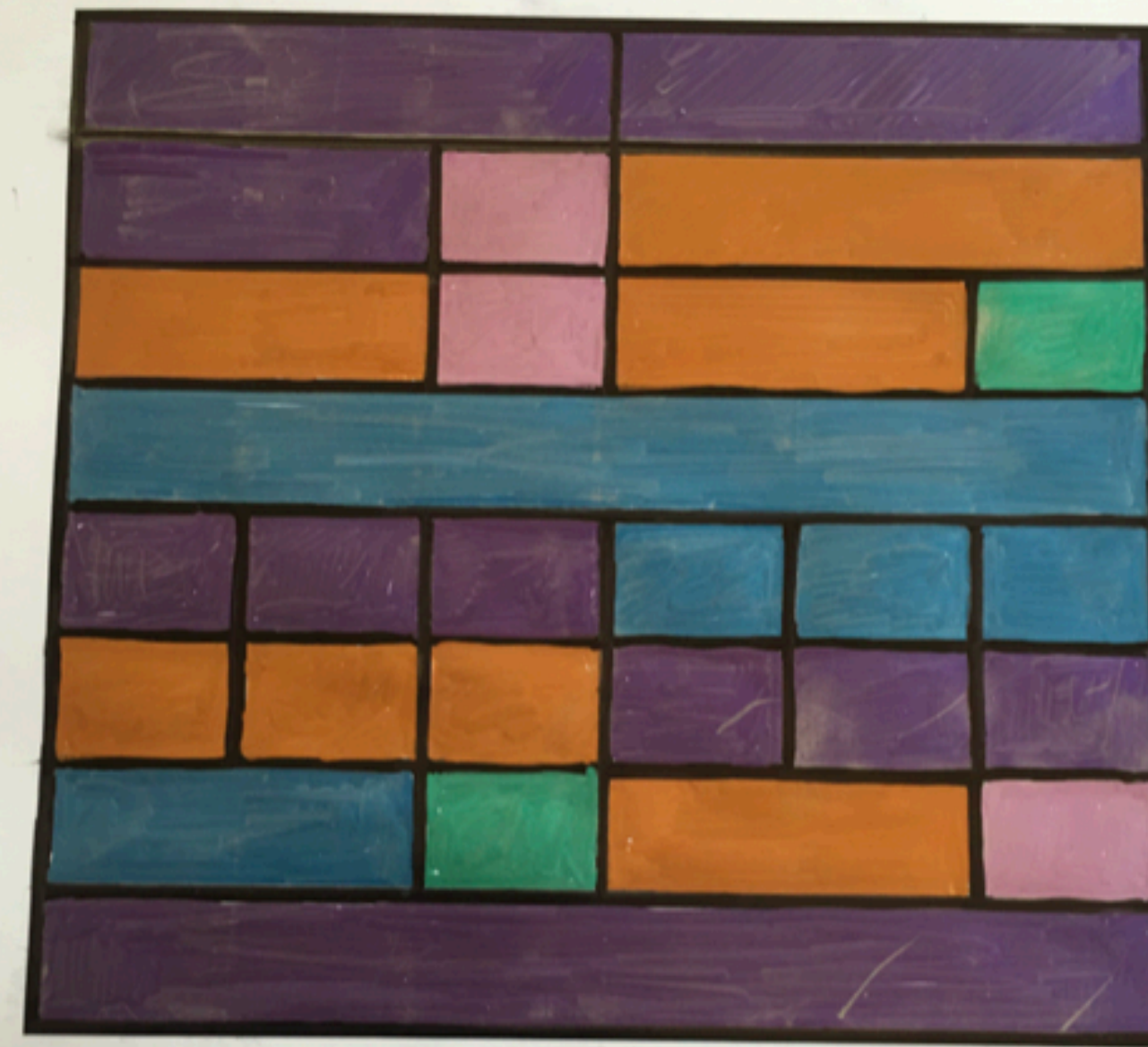
Key	C → ○	Map	E G G G F A A
	D → ○		B B A B C D E
	E → ○		E G G G F A A
	F → ○		B B A B C E C
	G → ○		G G G A A A
	A → ○		B B A B C D E
	B → ○		G G G A A A
			B B A B C E C



Little Brown Jug



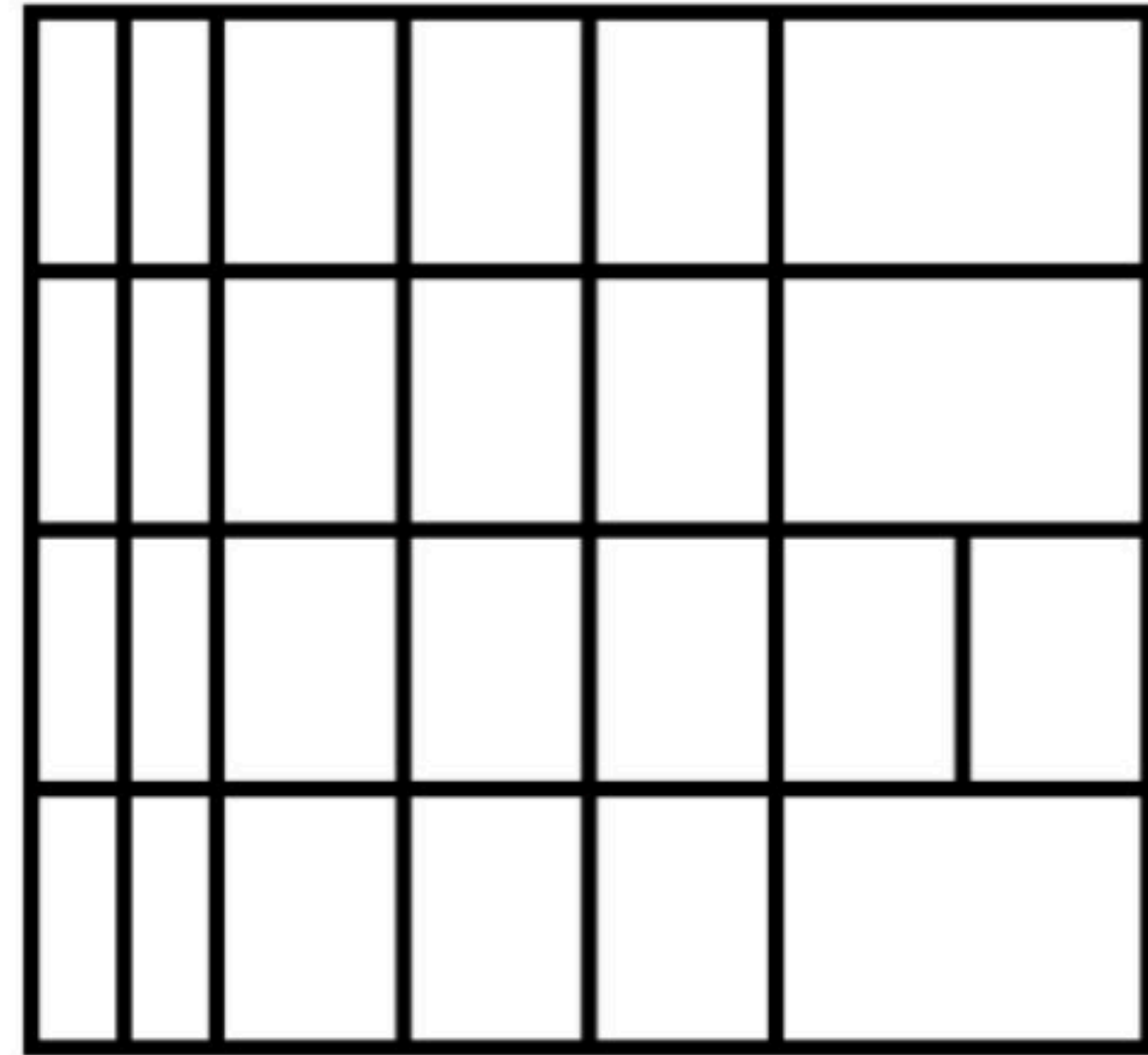
Little Brown Jug



Row Row Row Your Boat

Song 8: *Can you name this tune?*

Key	C → ○	Map	G	G	A	G	C	B	
	D → ○		G	G	A	G	D	C	
	E → ○		G	G	G	E	C	B	A
	F → ○		F	F	E	C	D	C	
	G → ○								
	A → ○								
	B → ○								



Note on the Sensation -> Perception Mapping

Art tends to engage the viewer in a process of trying to make perceptual sense out of sensory information.

Sometimes, the artist will provide the viewer with an interpretive problem that is insoluble, for one reason or another.

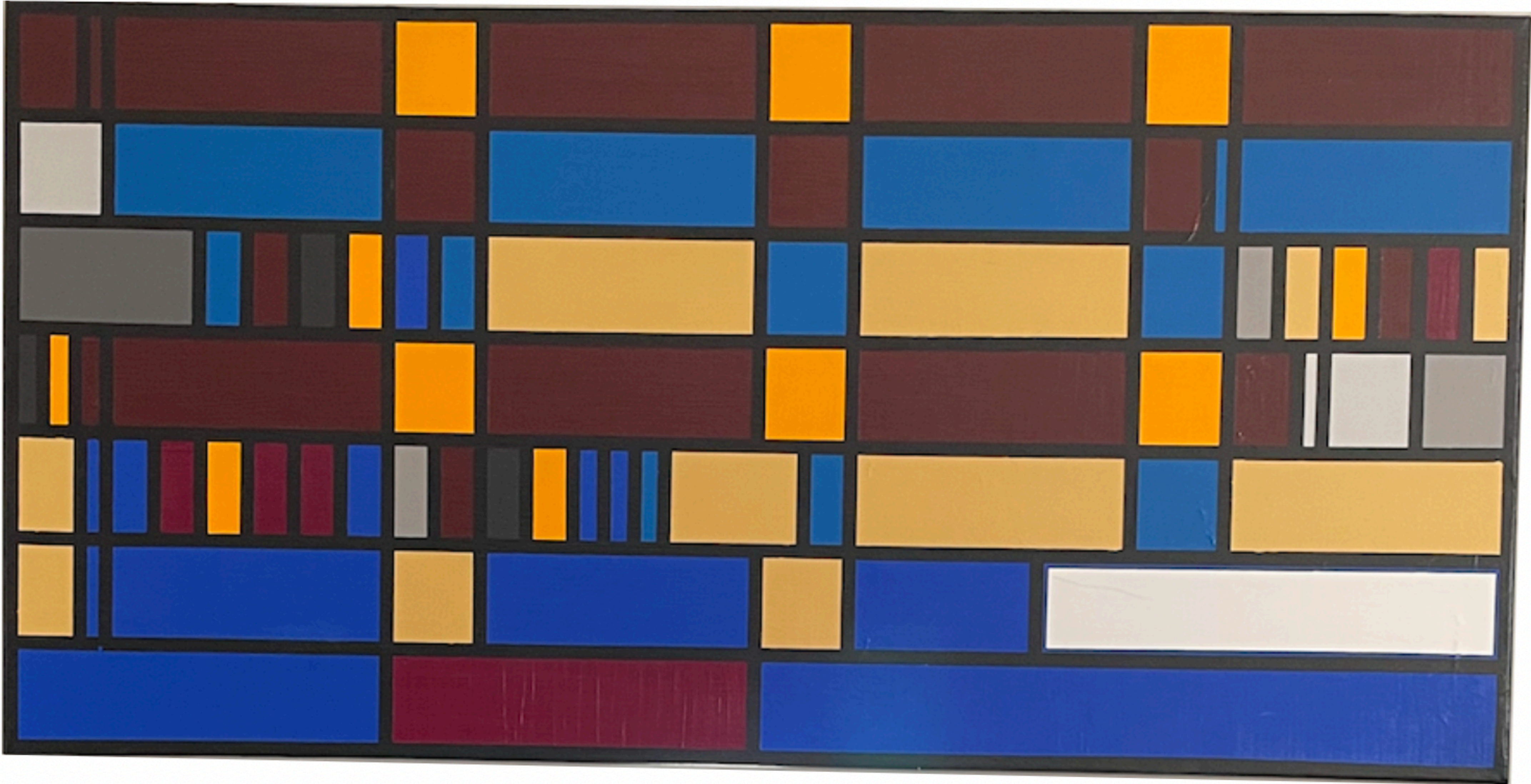
It may be best not to think in terms of achieving a flawless interpretational victory when viewing a painting. Rather, perhaps, merely think in terms of doing your best enjoy the process of mining the work for bits of dopamine accompanying satisfaction.

The paintings on the following two slides, a DeKooning (estimated to be worth \$400 million) and a Graci (estimated to be worth nothing) provide interpretational challenges for very different reasons. Exercise: Can you articulate what these might be?

Excavation (DeKooning)



Sand (Graci)

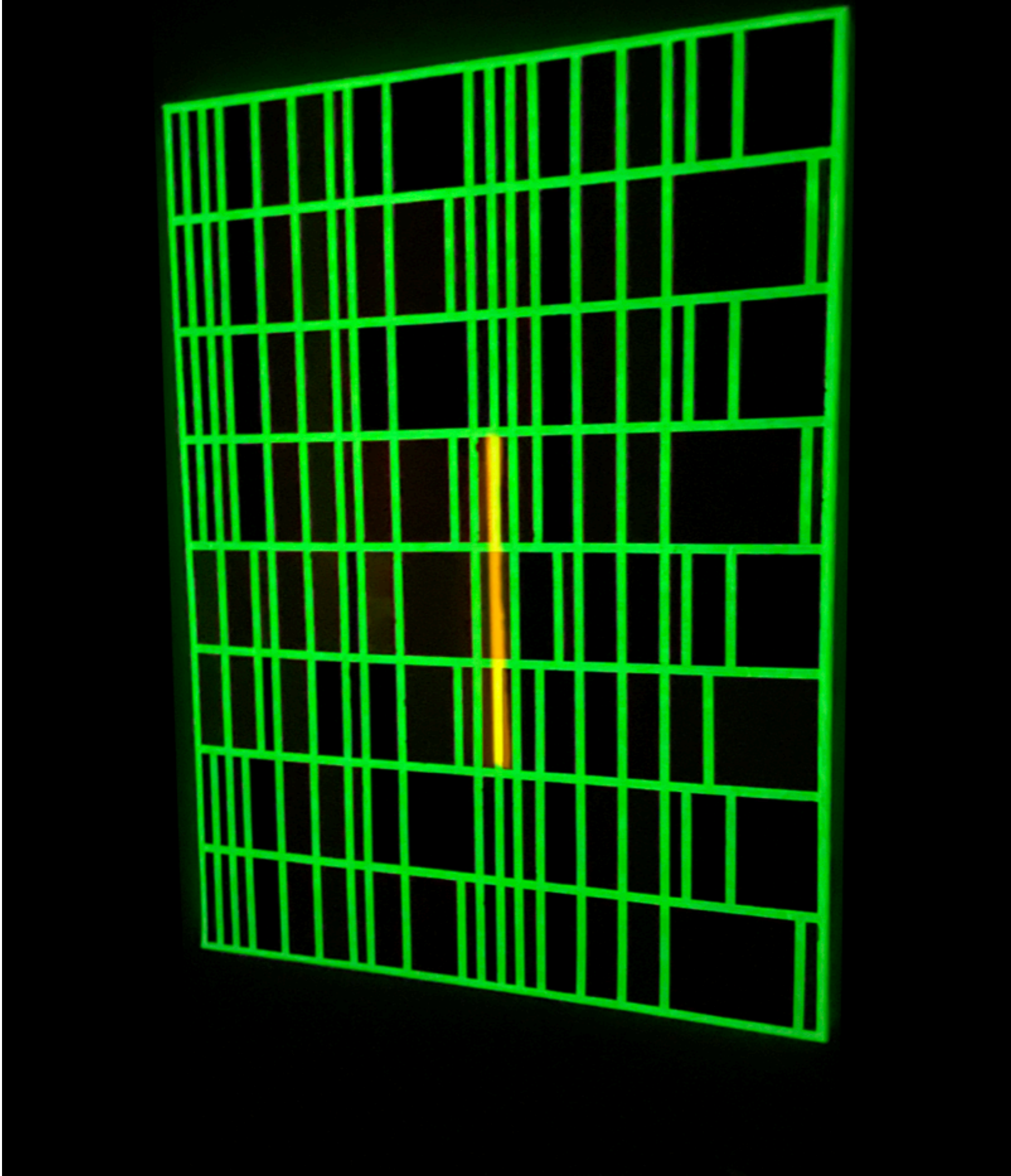


A Few More Paintings, and a List

A Maze: The Song That Never Ends (Lambchop + Friends)



A Nightlight: I'm Beginning to See The Light (Ellington)



Texture: A Bit of Mozart



Titles of the Paintings

Little Tune Crimson Flames Angel Glow Sunshine Sand Echo 1
Echo 2 La Vie En Rose Stardust Misty To A Wild Rose Auld Lang Syne
Portrait of Xim Dorothy's Darkness Moon River Kelsier's Dream 4'33
I'm Beginning To See The Light White Rabbit Lucy In The Sky With Diamonds
El Choclo Star You Go To My Head Apple Pink And Cherry Blossom White
Study in Magenta (aka Joy) Venus In Furs Wayfaring Stranger Mood Indigo
Flying Free Sunny Side of the Street Fascination Bare Necessities Linda
Tennessee Waltz Russian Dance The Song That Doesn't End Arabian Dance (aka Coffee)
Maggie's Song Easy Winners Canon in D

