

Improvisation,  
Nonlinear Dynamics  
and Qualia:  
Experiencing music & poetry

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# 1. INTRODUCTION

Western culture is evolving,  
in particular, art & music are evolving.  
But views of art & music have evolved less.

Changes include moving from:

- abstraction to concrete experience;
- authority to experiment;
- absolutism to relativism;
- modernism to postmodernism.

(though last two can be overdone)

See this in science, philosophy, literature,  
advertising, poetry, ...

In music, now more focus listening –  
Less focus on [the score](#) as final authority,  
on [composer's intention](#), rules,  
[unique correct interpretation](#), etc.  
More interest in improvisation.

Similarly, more interest in multiculturalism,  
negotiation, democracy, ...

Traditional musicology:

score, chords, 12 note scale, rules, ...  
absolute judgements, critic/scholar as god.

Much 20th c. art & music outside this:

atonality, microtonality, interaction,  
generative media, kinetic art, flash poetry,  
improvisation, ....

Need **new musicology**, based on

cognitive science, neuroscience, psychology,  
semiotics, phenomenology, etc.

Need is very clear for free improvisation:

steps towards **cognitive semiotic musicology**.

Actually, most jazz outside conventional forms;

& much great classical music doesn't fit!

Mozart dissonance, Bach harmony ambiguity.

Students taught how to get boring scores &  
boring performances, based on fixed old rules!

But new musicology should include old,

as relativity includes classical mechanics, etc.

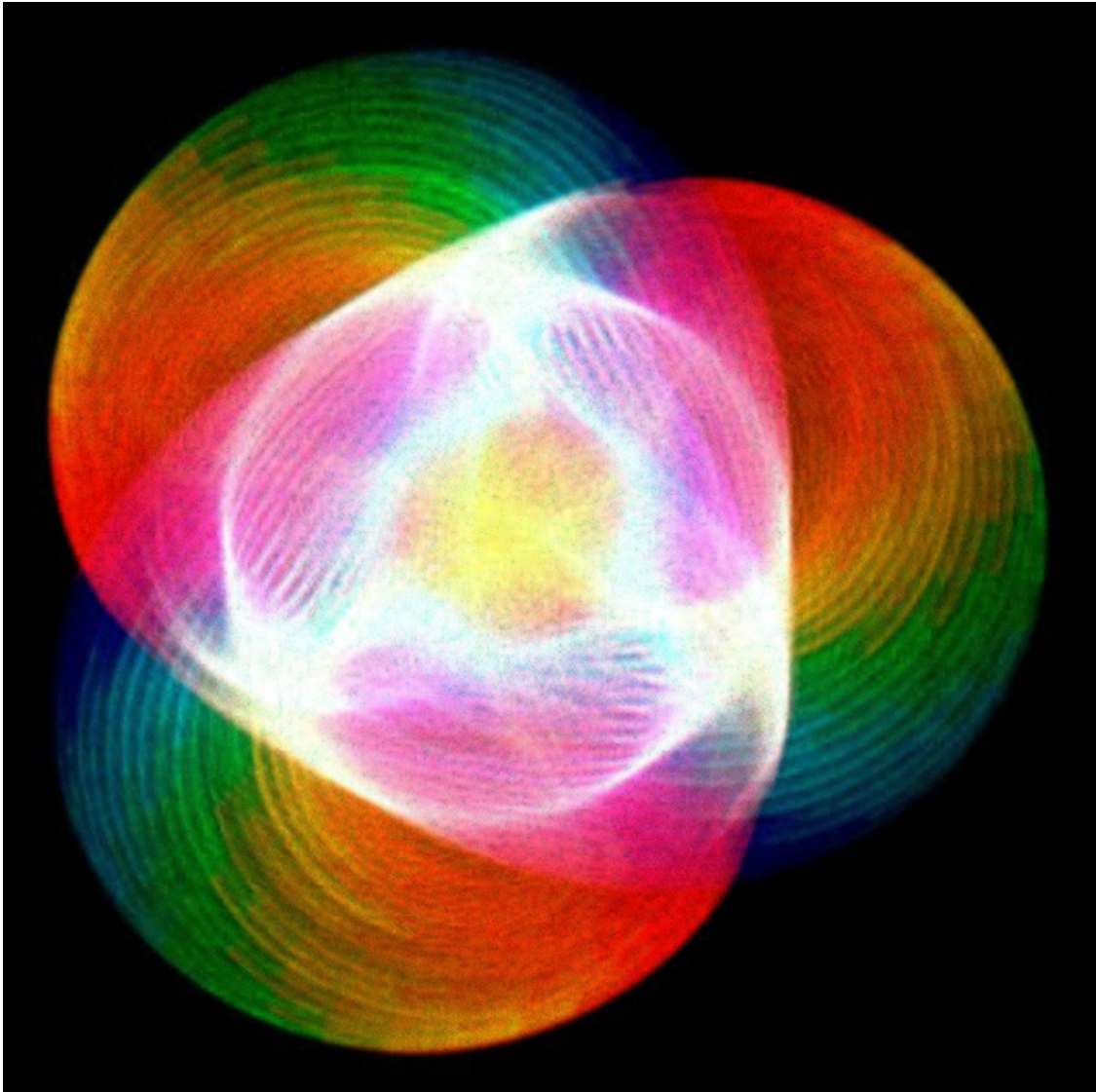
## 2. IMPROVISATION

Free jazz improvisation: no score, fixed chords, fixed rhythms, ...; uses tambre, microtones, polyrhythms, ...  
Could be pre-agreed ideas, definitely uses prior experience; can mix styles, sequential or parallel.

Good improvisation manipulates expectation: plays with listeners – tension & release, contrast, etc.  
Not necessarily beautiful, but interesting.  
Generally aims for surprise.

Improvisation increasingly popular:  
Stockhausen, Grateful Dead, most jazz, ...  
Also important for Bach, Mozart, Beethoven, most classical music until recently!

Music example here.



Surprise is a key point, because  
it requires **expectation**, and  
expectation requires learning.

Listeners **anticipate** what's next:  
doing so produces pleasure!

This has clear evolutionary advantage  
for pre-human ancestors.

(A cognitive socio-biology argument.)

In *Phenomenology of Time Consciousness*,  
Husserl speaks of **protention** vs. **retention**,  
about 10 sec auditory memory buffer –  
their interaction gives sense of time passing:  
temporal thickness of present,  
ineffability of time, etc.

Major basis for music experience –  
but also have longer term memories,  
saliency of events, and  
**qualia** = high saliency (sub)events.

True for music in general,  
not just improvisation.

### 3. TRANSITIONS

Joint work with David Borgo:

Music has **phases**,  
which have **boundaries**;  
good music creates expectations of  
**phase transitions**,  
which can be very subtle –  
may suggest a transition but not do it.

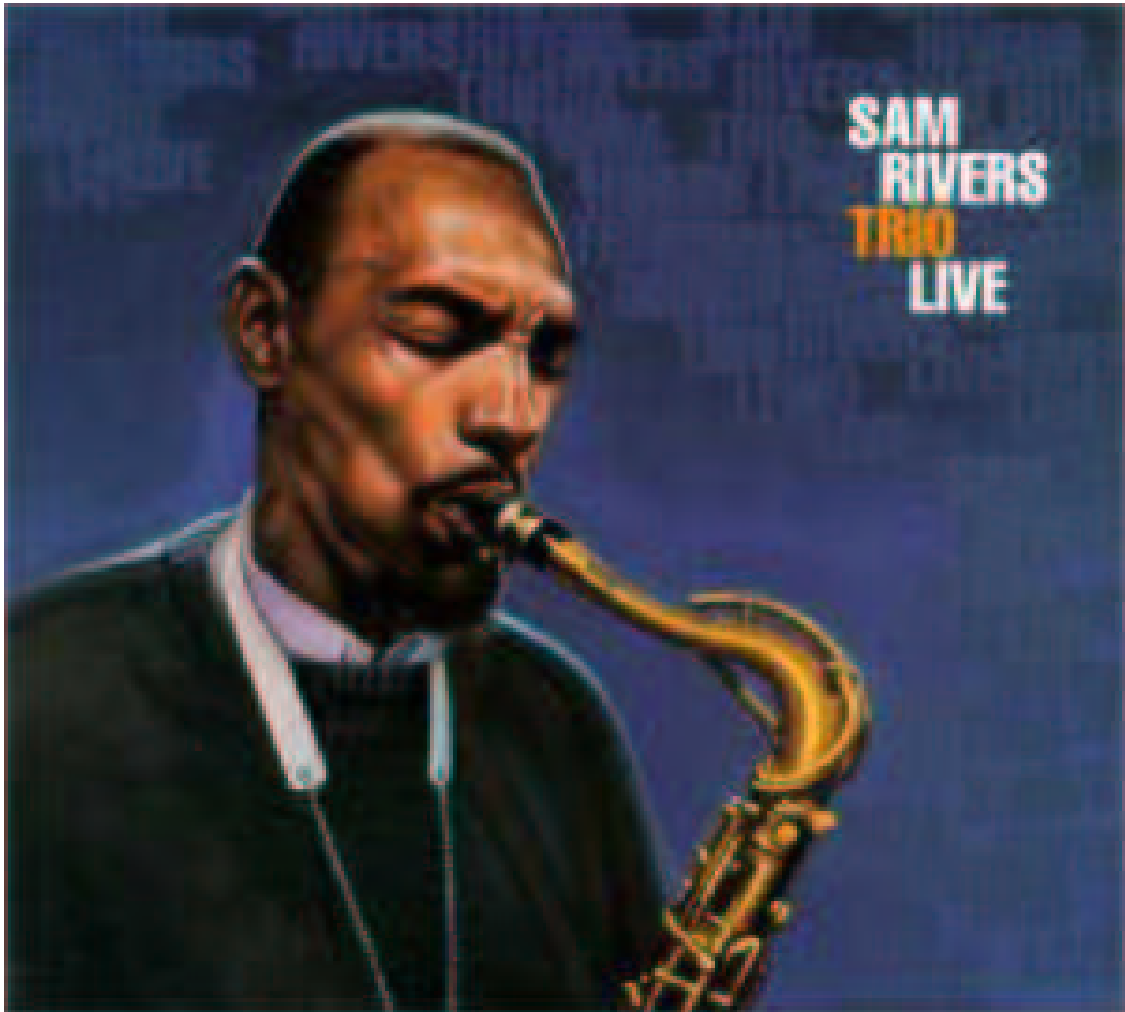
#### Case study:

Sam Rivers Trio *Shades of Melanin*  
(a great metaphor).

Found many transition prefigurations:

- trills from Sam;
- hints of dominant chord;
- hints of rhythmic cadence; ...

Could be in bass or drum;  
often overridden by another musician.





Usually transitions less predictable later on.

This confirms the theory:  
music builds expectations,  
then uses them.

Music is boring if too predictable –  
also if too unpredictable.  
“Edge of chaos” is between these two.

Transitions always interesting:  
boiling water, freezing ice, ...

Musicans can try to stay on edge:  
Evan Parker exploits high overtone instability  
on sax, with circular breathing.

But can also surprise with sudden changes,  
or even by not changing.

Ryoko often works with melodic fragments:  
[Music example here.](#)



Return to familiar also creates pleasure:  
blues progression; AABA (sonnata form);  
I, IV, V, I in pop music; I, II, V in jazz;  
transposition by 5th or 4th; repeats; ...  
Also clear evolutionary advantage.

No key in 12 tone music, get [groundlessness](#),  
so hard to build large structures.  
Compare Webern, Schönberg, Berg:  
miniatures, boring, locally tonal rows.

John Cage randomness also mostly boring,  
but early prepared piano pieces OK.

Some early free jazz also a bit boring,  
since too dense, energetic, or too slow.  
(But not Coleman, Taylor, (late) Coltrain.)

Our theory predicts such results.

More ideas from dynamic system theory:

- basin of attraction,
- basin of repulsion,
- strange attractor (= chaos),
- fractal (= self-similar).

Entropy measures like **fractal dimension**

tend to rise in pieces,

also as a style evolves,

e.g., Jackson Pollack drip paintings.

Needed since audience more familiar with style.

Can measure **self-similarity** of piece

using computer programs –

(autocorrelation of spectrum)

actually gives pretty good results!

but not perfect,

does not find pre-figurations, etc.



## 4. QUALIA

Traditionally, residue of objective analysis.  
Not a very productive definition,  
since can't say anything about them!

My definition of **qualia**:  
a segment of similar qualitative feel,  
or relatively high saliency.  
Based on listener experience,  
useful for analyzing art.

**Saliency** can rise & fall over time:  
rises with repetition &  
falls without repetition;  
influences the surprise value of experience;

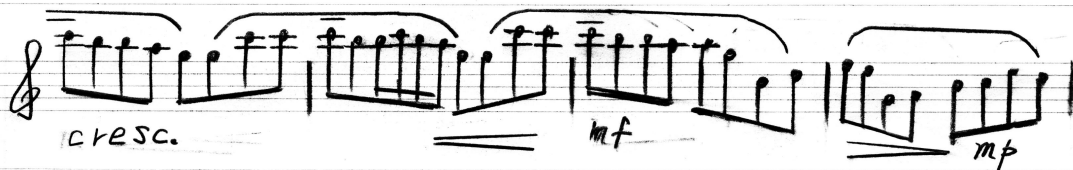
**Observation**:  
Qualia are hierarchically organized.  
They have parts which are salient, and  
these parts can have salient parts, etc.

Music example here.

# Sonata I

Ryoko Amadee Goguen

Allegretto



## 4.1 Blending

Understanding music requires blending  
past, present & future,  
involving many different structures –  
maybe this process creates the present!

Theme, texture, harmonic & formal structure,  
e.g., repeat, bridge, transposition,  
rhythm (Batie grooves), tambre,  
maybe lyrics, acting, dance, graphics,  
image or narrative (Strauss tone poems),  
remembered performances, recordings, ...

Can change qualia greatly:

e.g., Robert Johnson blues, perfect blend of  
rhythm, lyric, chord, melody;  
Romanian folk music constant acceleration.

**Mental space** has conceptual content,  
**geometric space** has models of world:

- we blend both of these.

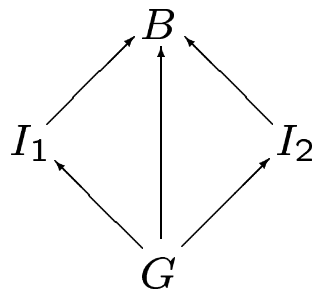
See Zbikowsky on blends of words & music.

Also **material anchors** of Hutchins have both  
mental & material representations.



## Blend diagram:

- input spaces  $I_1, I_2$ ,
- generic space  $G$  (elts. common to inputs),
- put together in blend space  $B$ .



In cog ling, refines Lakoff metaphor theory:  
identifications in  $B$  generate cross space map  
as emergent structure.

## Some Optimality Principles (F & T):

- Integration: Blend space is integrated
- Web: Tight connections blend & inputs
- Unpacking: Easy to reconstruct inputs
- Good Reason: Blend elements meaningful
- Topology: Blend relations similar to inputs
- Metonymy: Elts. same input close in blend.

They apply to music just as well as language,  
but must modify for non-literal styles.

**Semiotic spaces** generalize mental spaces:

- functions, esp. constructors for structure, inspired by Saussure;
- complex axioms, not just relation instances;
- levels, priorities as value representations.

In music refer to phase space dynamics,  
involve memory, learning, saliency, entropy.

**Basic image schemas** helped survival  
of pre-human ancestors;

Exs: path, boundary, container;  
evolutionary advantage; unify mind & body.

**Frames** unify concepts with geometry:  
names, assertions with phase, path, etc.

We extended Fauconnier spaces;  
must also extend Gärdenfors spaces with  
paths, motion, velocity, etc.

Frames are like Peirce's triadic semiosis:  
unify constructivism & realism.

## 4.2 Literature

**Alloy** blending algorithm for semiotic spaces,  
is core of our **Griot** system, for  
interactive multimedia narrative events.

Implemented by Fox Harrell at UCSD.

interactive poems, stories, games;  
featured in new CalIT2 building opening.

Hiraga studies haiku as blends:

before & after cut word.

Also have saliency, hierarchy, surprise.

Poem examples here:

Basho;

entropy in Burroughs & Griot polypoems.

**Polypoem** = set of poems, or their code.

Optimality criteria for blends yield style.



元景冬  
雨霏  
九  
月  
廿  
三  
日  
畫  
于  
滬  
上  
謹  
書

## 5. SOCIAL CONTEXT

Ways to understand how something is used:  
ethnomethodology (Garfinkel, Sacks),  
activity theory (Vygotsky),  
distributed cognition (Hutchins, Star, ...),  
cultural psychology (Cole, ...)

Categories & methods of ethnomethodology.

A favorite neglected topic is *values*:  
key to understanding much human behavior.

For early blues & jazz, freedom was an issue,  
civil rights struggle, equality, justice, etc.  
but hidden in code words, improvisation,  
approach to everyday life.

Big bands did party music, mostly whites,  
but Ellington, Basie continued tradition.

Bebop showcased complexity & creativity.

Baroque music mostly about religion  
and its supporters (clergy, merchants, ...).

Much of best American pop about rebellion against materialist, competitive values:  
punk, metal, psychedelic, classic rock, ...  
even hip hop, surf, techno, house, ...

Values shared by musicians & audience and will appear in their music, e.g.:

- how phase transitions are handled;
- how much entropy exists, at what level;
- optimality criteria for blends.

Example: Vienna 1900  $\pm$  20:

- Culture war, nobility vs. new arts –
- Strauss waltz vs. 12 tone (Webern, etc.);
- Schiele, Kokoshka proto-punk style.
- See also Ravel *La Valse*, ironic.

Music example here.



## 6. CONCLUSIONS

Art & esp. music are now everywhere:

iPods, shop sound systems, PCs, cell phones,  
sport events, holidays, street musicians,  
clubs, raves, bars, homes, radio, TV.

Much more than just concert halls.

High sales of guitars, drum kits, DJ sets.

### But Why?

Can be approached socio-biology:

Image schemas & blending help survival  
of humans & pre-humans  
and are basic to art, esp. music.

Compare bee language, talking drums,  
military signals & ceremonies (taps), ...

Can even argue that language origin is music.



Art used many ways in societies,  
but always expresses deep shared  
values of musicians & audience.

How deal with phase transitions, boundaries,  
foreshadowings, etc.?

- collectively, as in free improvisation,
- by authority, as in classical orchestra,
- by avoidance, as in 12 tone music.

Music may be deepest expression of values:

- encoded in very structure of time;
- uses most basic cognitive capabilities;
- moves us very deeply.
- Origin of integrating feeling, reasoning?
- Endlessly creative, varied & fascinating.
- Rich site for scientific study.

Same for poetry, close relative of music.

Art is free expression of human spirit,  
in all its diversity;

should not be bound by rules that  
encourage conformity & obedience.

Free improvisation maybe its best expression.