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IMPROVISATION AND COMPOSITION — SYNTHESIS AND INTEGRATION INTO THE MUSIC CURRICULUM

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INTRODUCTION — REMEMBERING TO RETURN TO FIRST PRINCIPLES

The history of Western society has been typified it seems, by ever increasing fragmentation of disciplines and specialization in practice. In contrast to nearly all the rest of music making on Earth and throughout the history of mankind, the past few centuries of Western European art music have witnessed a growing, rigid separation of composers from performers, performers from composers, and audiences — that is, listeners — from both? The re-integration of composition with performance produces improvisation. The re-integration of these with audiences invigorates the creative act of listening and points up the subtle differences in individual listeners' experiences. As we emerge from this recent past and our cultural thinking becomes increasingly global, it is appropriate that we now search for such re-integration within our music curricula.

In most cultures, improvisation is intimately related to the development of an aural tradition, a collective musical literature to which all practitioners contribute. The most prominent examples in our immediate awareness may be those of Indian classical music and African American music, some of the most vital music on the globe. Yet, in our version of academe, we cannot seem to stop ourselves from fragmenting our study of these disciplines as well. Witness what is, in my opinion, the tragic direction jazz studies have taken in some institutions which seem to be in a stampede to rigidify and codify the *tradition*, to concretize a notion of standard practice, and ostracize those who would be innovative and experimental, whose approaches are so necessary for keeping this precious, collective literature in a healthy state of evolution and adaptation. This is done in spite of the nearly synonymous meanings of the words, *jazz* and *freedom*. One fact is certain: *academic jazz* produces boring players. If we are to enfold an art form into our institutions, we must also accept the responsibility to help maintain its vitality.

Musical societies in the coming decades will require our young musicians to be increasingly flexible, original and to have an ever-broadening set of skills. Each and every young musician today should be focusing on developing her or his original, musical voice as a total musician for the emerging world.

When contemplating issues of such importance, I always believe it is useful — maybe even essential — to return to first principles. I often remind my composition students of the importance of self-analysis, periodically asking questions like, "What am I doing? What are the ideas connecting concepts in all my work? What are the larger concepts that can embrace all my individual ideas? How can I identify my own, emerging, musical language?", and returning to first principles of composition.

Definitions

My definitions for composition and improvisation are quite simple:

> A composer is simply, a creative music maker.
>
> Improvisation is simply composition that is immediately heard rather than subsequently heard.

Any mixture of these is perfectly feasible. Creative music makers may include creative performers, composers, analysts, historians, philosophers, writers, thinkers, producers, technicians, programmers, designers, and listeners — and maybe most importantly, listeners. It may be that we are entering an era, which is characterized by a fundamental shift in emphasis regarding composition, away from the one-way transmission of musical experiences to listeners and towards a focus on listeners', creative experience. To the extent that music is a shared experience, audiences must understand that it cannot take place in a meaningful way without their active participation. This requires a view of listening as composition. Listeners are part of the compositional process. They must take an active role in creating the musical experience. [1, 2]

Compositional Method

A composer's license includes the opportunity to construct, or propose, entire universes. I refer to this as *propositional* music, composition that involves constructing complete, cognitive models of music as a part of the act of composition. [1, 3] It may be useful to consider some fundamental steps in constructing a compositional method. These may be unique for each individual and may apply to single works or bodies of work. Much music is made without considering these steps, of course. However, certain basic assumptions will have been adopted, whether or not through conscious choice.

- Choose your universe. What is the universal set for a work? The universal set will describe a domain of *compositional attention* and the kinds of distinctions that will be made as a result of compositional thought and choice. What are the elements of formal concern? This may include naming the parameters that will carry information articulating forms. Note that these are *generative* parameters, not necessarily *analytical* ones. How will composer(s), performer(s) and listener(s) act as ordering agents in the musical experience? Note that *musical attention* may be directed towards things outside the realm of formal processes, particularly in listening. Compositional attention may also be directed towards things not traditionally considered to be musical.

- How will the universe be ordered? (Not, how is it ordered.) List the potential, *generative relationships* in this universe, along with the elements and procedures necessary for constructing the relationships.

- What are the scales of measure for parametric values to be used? How will parametric values be compared? For example, will *measurement scales* be used? What will be the language and means for making comparisons among compositional elements?

- What are the levels of *significant difference* for each parameter? Establish the criteria by which things are to be considered the same or different.

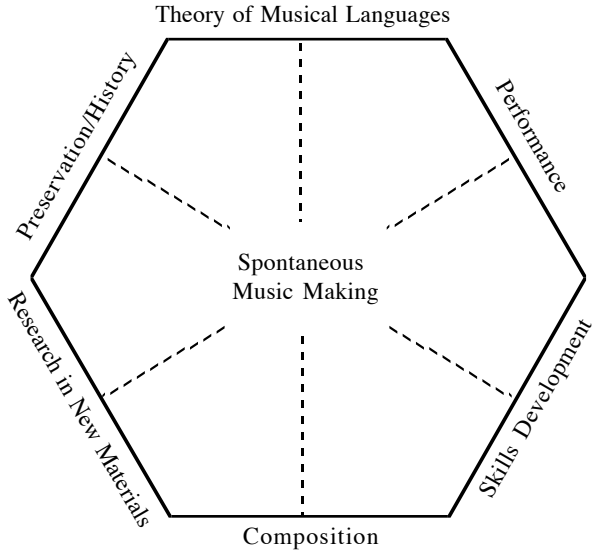
All these considerations apply to how improvisers develop their own, individual, musical languages as well. In what follows, I've constructed a kind of checklist containing ideas to consider as we attempt to create healthy, productive learning environments for the young musicians in our schools to achieve these ends.

QUESTIONS AND ISSUES TO PONDER IN IMPLEMENTING THE GOAL OF INTEGRATING IMPROVISATION AND COMPOSITION INTO THE MUSIC CURRICULUM

Essential Elements for Musical Evolution

A music school must be a healthy environment for the evolution of music as well as for the teaching of music. In this way, those who study in our schools will be most prepared to participate in what is sure to be the multi-dimensional musical environment of the coming decades. Improvisation is, perhaps, the central focal point of this interdisciplinary matrix, at least as far as the practice of music goes. Does your school have these essential elements in place? Here is one view (mine) of such a school design.

Hexagonal View of a Music School



[Note that I've consciously left teacher preparation out. Like spontaneous music making, it also lies at the center. Virtually all our graduates will teach at some time in their lives and any teacher, particularly those intent on a career in teaching, must have substantive experience in all these areas.]

Means to Educate the Total Musician

Note this important fact: spontaneous music making, of necessity, draws on all areas in this matrix. To become skilled in this discipline — and it is a discipline — students must be informed in all of them. Do you have the means in place to educate the total musician?

Faculty Resources

The success of any endeavor like this will only be as great as the people in your programs are prepared to make it. No administrative or curricular structure will be effective if the expertise to put it into practice is lacking among the faculty. Who do you have among your faculties who have already demonstrated expertise or strong interest in this area? Begin by forming a coalition among these faculties, deputize them to articulate new initiatives that they can carry out with existing resources, and support them to put these in place. Do not require other faculty to participate, at least at the outset. Then, provide faculty development incentives, such as release time or course development grants to enable other faculty to begin exploring how they may participate as well. Finally, look for hiring opportunities to bring in new faculty that can help in this evolution. Note that it must be an evolutionary process, not a revolutionary one. Otherwise, your initiatives may backfire.

Remember that, to some degree, our institutions must be reactive organizations, responding to new developments in our culture. As music executives, we must steer our institutions through this evolution, hopefully being full participants in it as well, but if we simply and consistently put our support behind the things we believe in, with a little patience, nature will tend to take care of the rest.

Improvisation and Musicianship Training

Do you have a plan to incorporate spontaneous music making into fundamental musicianship training? All students should develop comfort and confidence in manipulating sonic imagery of any kind. (Notice that I am using the term *sonic imagery*, which is broader than something like, *musical materials*, or even worse, *standard musical materials*.) To succeed in the future, musicians must have what I like to refer to as *big ears*. This means the ability to remain open to all sound experiences, to spontaneously analyze and parse these experiences into their constituent parts, and imagine re-combinations and transformations of them. Students must gain an understanding of how forms and structures emerge in musical languages — that is, how they emerge, not how they have been codified in retrospective analysis.

Developing a good understanding of musical forms depends on constructing mental models for representing musical information in a manner that is appropriate for the forms in question. Also, the components of formal analysis must be understood as *action terms*, entities that can stimulate the formation of sometimes-unpredictable relationships and provide tools for exploring musical environments. For example, a *chord* should be thought of as a *musical verb*, not a noun. It is a channel of action, a temporary marker for movement, a sign post with arrows on a road leading to somewhere on the continuously stretching, rubber sheet of musical space-time. Subtle ideas,

like implication, expression by omission, feeling and context will also weigh in with their individual idiosyncrasies.

Develop Musical Invention in Parallel with Musical Discipline

I recommend reconsidering the ordering of the learning exercises we consider fundamental for gaining what we call, *musical competence*. Fragmentation seems to be the modus operandi of Western culture and, in education, we seem to have developed a method of shattering each student's individual makeup into shards of themselves when we first get them in the hope that we, in our great wisdom, know how to put them back together in a form that will be better than when we first met. This often causes them to become inert, because in the interest of praxis, we force them to obtain high theoretical or skill-based competence before they are allowed to practice their craft in a way that encourages them to develop individual voices. As a result, most never do. We often operate under the misconception that a steady accretion of inert knowledge is forever prerequisite to gaining an understanding of our discipline. This often produces the embarrassing situation that talented, but *unschooled*, practitioners may become more accomplished than the graduates of our schools.

Students should be encouraged to be freely inventive in their musical expressions from the beginning of their life in music. This can develop in parallel with the acquisition of discipline and the intelligent choice making that comes with maturity gained through study and practice. The elements of a student's creative language should grow out of this free expression, not from prescribed formulations. This is not to say that the prescribed formulations of the past are not valuable, rather they are essential for study as examples of well-developed organization, but they do not have to come before a student is allowed creative freedom.

A number of approaches to this idea have been explored with computer software. Jeanne Bamberger of MIT has reported on ways to take advantage of what students bring from their life experiences to the study of music and capitalize on their natural tendencies to identify *familiar*, structural units. This knowledge is used increase the effectiveness of their studies in theory and ear training. [4] She and her team have developed an innovative computer program, called *Impromptu*, based on these ideas. Morton Subotnick's *Making Music* CD-ROM, originally developed at the Center for Experiments in Art, Information, and Technology at the California Institute of the Arts, makes it possible for anyone to create musical gestures, without prior knowledge, and through subtle introduction of techniques for building combinations and variations, leads them to a deeper understanding of musical structure. [5] As the user becomes more involved with the fine details of these gestures, perhaps for editing or transforming, she or he is eventually led to the need for notation. My own software, *HFG (Hierarchical Form Generator)*, makes use of a model of musical perception to parse, or segment, improvised musical gestures into their sub-phrases, and provides the user with a repertoire of techniques for transforming and re-combining them into large-scale forms that can be interactively recalled while the performer continues playing. [6] The parsing algorithm is based on principles of perception and it is often instructive to compare the way in which the computer identifies phrases with how the musician plays, interprets, and hears them. By practicing and performing with *HFG*, the improviser can develop skill in constructing original, musical forms spontaneously.

Teachers Playing with Students
Teachers should play alongside their students. Imitation and musical follow-the-leader exercises are useful teaching methods for improvisation. How is it that we evolved a teaching model in which the piano teacher sits beside the student, rarely playing and usually only referring to notation, style, and hand position? Teacher-student communication should take place partly through playing together, like in non-Western traditions. This is the norm in other cultures. We should consider changing the music lesson and basic training models.

Teach Improvising at the Beginning of Training
Teach potential teachers to encourage spontaneous music making and to understand the importance of improvisation from the beginning of musical training. We have ample, clear evidence of how creativity can be restricted by our educational system. It has frequently been noted by professionals that art works created by children in the younger, elementary grades is often more in touch with aesthetic vision than art created by children from upper grades. Improvisation must be thought of as normal, comfortable, and acceptable from the beginning of a child's musical experience. A CalArts pianist has noted, "Artistic children are inquisitive by nature, and they often exhibit a strong need for self-expression . . . Improvisation is a musical experience that is at once expressive and connected to discovery. Discovery is the essence. Trying to play by ear songs that one has heard elsewhere is another. Beginning pianists should be encouraged to do both from the start." [7]

Individual Variation in Creative Development
It is important to have some sense of standards with which to judge quality, but remember that no two students will come out of our programs with exactly the same knowledge set and competency base. If they do, there is something terribly wrong with our institutions. Does your program have room for individual variation in creative development? Students without any sense of what their own original voice is will be dysfunctional in the future.

Collaboration as a Stimulating Vehicle for Learning
Establish a mechanism to support emerging, collaborative projects involving spontaneous music making that emerge from your student body and faculty. Much of the learning and cross-fertilization associated with this discipline can be gleaned from projects. In fact, much of the pedagogy can even be project based. Assign composers to work with performers or performing groups to develop new works. Insist that composers play, regardless of their level of competency on an instrument or with the voice. Composers' ensembles can be good vehicles to draw in musicians who are interested in spontaneous music making. Interdisciplinary art making, often involving improvisation, can be a potent and stimulating vehicle.

Support Course Development Ideas from Group Projects
Always be on the lookout for new course development ideas that can spring from collaborative, group projects.

Development Through a Variety of Mediums
Goals for student development should include exposure to original, creative production in a broad range of application areas, including writing, new media, spontaneous music, non-linear structure, interactivity, networking, and collaborative group strategies. These will all be required in the future. Graduating students should have experienced free, artistic vision. We are familiar

with the large-scale cultural shifts, migration, and evolution taking place, but often don't know what to do about them. It is certain, however, that multiple skills, ability to be spontaneous and adaptable, and awareness of radically changing methods for the distribution of music will be enormous factors in our students' lives.

Improvisation Requires Practice

Improvisation is a discipline requiring a great deal of practice. Is adequate time and guidance for this available in your programs? Improvisation can be taught in private lessons and the teacher does not necessarily need to play the same instrument as the student. So, we could offer improvisation lessons in our curricula, taught by experts, whatever their performance medium may be.

Improvisation and Standard Practice

Be careful about falling into the trap of believing that improvisation is about reproduction of *learned patterns*. That job can be performed nicely these days by computers. The key for humans is listening — deep listening and parsing of newly presented material is essential for bringing coherence to subsequent, real-time performance through re-structuring or re-forming what has been perceived. This is the skill that must be learned. We must also be careful to understand the limitations of *theoretical* languages. We, in music, are guilty of a misnomer. What we call *theory* is not at all similar to what the word *theory* refers to in the sciences. Our retrospectively derived *theories* are highly limited in their stylistic referents. Even the explosive growth in music cognition research of the past 10 or 15 years has not been very broad in its perspective on musical styles and cultures. Cognitive models that are applicable to many directions of twentieth century or world music are few, but there are some interesting examples. I have written about some of this elsewhere.[1,3] I am strongly opposed to the view that students should first acquire a firm grounding in *standard practice* before they should be allowed to gingerly approach techniques heard in the music of our own time. In fact, I believe this is a sure-fire way to choke the life out of music making and condemn our institutions to inevitable obsolescence.

***Composing* Methods for Practicing**

One way to focus on individual development in improvisation is to use compositional design strategies to structures one's practicing system. I encourage my students to think deeply about how to actually *compose* their practicing materials. In this way, they develop original methods and structure their own musical tool kit to serve their ends. They will ultimately have instant access to many ways of getting from *A* to *B* in live performance situations, but they will be original ways, hopefully.

Make Room in the Curriculum for Creative Projects

The most effective forum for *synthesizing* knowledge and skills acquired in the many areas of music learning is to be found in creative projects. Leave lots of room in the curriculum for such endeavors and provide a supportive environment with ample critiques. We can learn much from schools of visual art in this regard. Critical feedback in seminars with perceptive faculty can often provide the best forum for synthesis among broad areas of knowledge and skill. The synthesis achieved by students must be demonstrated by doing, in these projects, and then assessed by faculty, albeit with a good measure of subjectivity.

Teach Musicianship Skills with Students' Instruments
Musicianship skills training should be conducted with the student's primary instrument in addition to the voice. This facilitates including improvisation, because the students are more comfortable and can relate what they are learning to their primary performance vehicle. Nevertheless, I still believe in students singing — it's the most physically immediate, sound making experience we have access to.

One of CalArts' experienced skills instructors reports that, "In working with scales and, particularly, modes, emphasis is placed on improvisation for pedagogical purposes. Singing improves in various modes and using scale degree numbers strengthens tonal memory. This leads to earlier success in sight singing. The by-product is becoming freer to improvise creatively in a given mode. [8]

Play what is learned in Theory Exercises
Students should play what they learn in theory classes. Then, they should improvise with the lesson materials as well. This is the modus operandi, of course, in jazz and many areas of world music, where it has been so for thousands of years over 90% of the globe. Only in the Western European tradition, do we need to be reminded of this.

Jazz students often perform on the highest levels in these courses, but they often have the greatest difficulty understanding why they need to study the material. They understand the practice, but not the abstractions of theoretical, musical, languages. This is because we have not done an adequate job of bridging our highly specialized codification schemes.

Go back to first principles again. What do you study first? Harmony begins with acoustics and psychoacoustics. Many students only learn the significance of this at the graduate or post-graduate level. In the beginning, there was the harmonic series, born out of first principles in physics. Then, came the simultaneous sounding of different tones. Much later, came the desire to modulate — (note the highly ethno-centric concepts of consonance and dissonance in what composer, Lou Harrison, is fond of calling, *Northwest Asia*) — and that strange anomaly of Western music, the equal tempered scale. Then, our insatiable desire to modulate stretched and warped the diatonic matrix as if it were on a rubber sheet, much like the warping of space-time we now understand from Einstein, and, thus, we gave birth to chromaticism. We continued to stretch and warp the original matrix until it became indecipherable, giving rise to the revolutions and reactions of the twentieth century. Another branch of this chromatic evolution became known as, jazz. Now we can address that jazz student sitting in the corner of the theory class, bored to tears, and say, "a suspension is a suspension is a suspension," and of the resulting serialism, *there is no harmonic there, there*.

Once again, the solution to this problem lies in course development, and this requires faculty release time, money, and carefully articulated goals and assignments for the developers. There is plenty of material out there now, with which to develop a theory curriculum that can provide students with analytical tools more applicable to all music that those we use currently. So, we should be about the task. But, we must return to first principles, and that means starting with how we hear and parse sonic experiences.

We must also recognize that in the context of providing a general music education for undergraduates, we cannot cover the immensely intricate detail and nuance contained in musical languages that have taken hundreds or, perhaps, thousands of years to develop. But, we must recognize the pluralism in global musical experience and do some important spadework in unearthing basic, broadly applicable tools. The only alternative is to clearly declare that we will not maintain a global viewpoint and label our schools as *Academies of Western European Art Music*. This is perfectly legitimate, of course, and there is a place in society for it. Our students, however, can, with better knowledge of what we are doing, make their own decisions about whether to enroll.

Scheduling Problems Inhibit Curriculum Integration

One of our biggest problems — and one most resistant to administrative solutions — is integrating skills, theory, literature, and repertoire studies with spontaneous music making. We all know that we need to do this, but we've fragmented our course scheduling process to such a degree that we have a great deal of difficulty putting this notion together effectively. We have to solve it, but I'm not sure how best to get around the scheduling problems.

Practice Time for Improvisation and Musicianship Skills

Also, related to scheduling problems, there is the issue that improvisation and musicianship skills require lots of time and practice. The best way to learn to play in tune, for example, is to play chordal drones against pitch references for at least an hour a day. Tuning accuracy is a function of time. The longer one listens, the more finely discriminating she or he can be. How can we fit this into institutional life?

Improvisation in Historical Studies

One CalArts instructor practices an interesting approach to improvisation in historical music through the study of ornamentation as follows. "The study of ornamentation in historical music is taught (by me) as follows. The student takes a written out piece, which obviously reflects a codification of an improvisatory practice (e.g. a melismatic passage in Bach) and extracts the basic, unornamented musical text. She or he then learns to perform the piece using the unornamented version. This leads towards spontaneity in performance as well as the building of a vocabulary of stylistic devices which can be applied to other more planned works, which cry out for elaboration and improvisation." [8]

Performance students should also be encouraged to make original cadenzas, even if the result is not always perfectly authentic from an historical standpoint.

Improvisation and Graphic Notation

Another CalArts instructor reports, "I have had good success in introducing classical players to improvisation using graphic music. Modern musical notation is still merely a graphic way of representing sound that has only a moderate degree of precision. Classical players are already used to *improvising* the precise expressive modifications of this notation that make it work in performance.

By gradually removing the precision of the notation, the players are invited to participate more and more in the compositional process. Proportional notation introduces greater choice in rhythm. Spatial notation forces them to deal with pitch. There is a great variety of pieces that use this type of notation running the gamut from fairly precise to very free. They can then move

on with greater confidence to pieces using symbolic notation and ultimately to free graphics with no rules.

The use of specific graphic pieces that have been well thought out as musical compositions helps teach the students that improvisation, to be successful, must be subject to the same rules of structure and form that apply to all composition. It also allows them to improvise in musical styles that are familiar and similar to the music they play from notes." [9]

Remember — back to first principles again — that the musical score is a dynamic object. Elsewhere, I have described an image of the correct relationship between score and interpreter as being like that of the observational astronomer involved in searching for extra-terrestrial intelligence (SETI). "The SETI astronomer looks for a message without any knowledge of what the sender's conception of a message may be. This seems an ideal state of mind for the creative performer to be in. It provides composers with the opportunity to create notation objects, anticipating the dynamics of discovery for the musician. It reminds the performer to continuously ask such questions as: 'What is musical intelligence?' 'How can it be discovered inside a work?' 'How is its order deciphered?' 'How does its existence drive the ontological evolution of the work?'" [10]

There is a wealth of musical literature offering performers opportunities to make creative choices. These require an ability to recognize the language and structural units of compositional styles and work with them. Performance students need to learn to enjoy this musical freedom free and not be afraid when a score calls for such input, broad interpretation, or improvised material.

Use of Technology

Of course, technology can be employed to serve our efforts in these regards. Because modern computers deal with integrated media objects as abstract data, these can be input, manipulated, re-structured, synthesized, and output in almost any form we desire. Computer-based tools can also serve, for the time being at least, as convenient catalysts for collaboration and exchange, bringing together people with the diverse interests. Students can use these media to try out ideas with some form of nearly immediate feedback. The key elements to solve now in order to take advantage of these tools are these: a) Access - students need convenient, user friendly access to a distributed technology base on campus with a rich software environment in which to realize ideas. b) Orientation and technical training must to be made available. Realizing that whatever method is used to provide it, — I believe it should be workshop based in order not to confuse it with artistic training —, this method must respond to the nearly light-speed evolution of technology. Students in many elementary schools are already using software tools that many of our faculty can't even conceptualize. The potential exists here for an every widening and possibly disastrous knowledge gap. We need creative solutions. c) For musical purposes, access to appropriate listening environments is necessary. Computers can be used to assist in music theory, skills practice, keyboard learning, composition, and many other areas, but quality facilities for hearing the results are often missing. Listening to pitches over earphones is just not as effective as being immersed in an acoustic environment in which the air around your body is the transmitting medium for the sound and you can react physically. One idea might be to provide computers as regular equipment in music practice rooms, just like pianos, rather than clustering them in laboratories in which speakers only intrude on other people working in the

same lab. We should think about that. d) Without my ever mentioning or suggesting it, my own composition students now routinely bring MIDI realizations of sketches to their lessons. This has turned the teaching of orchestration or instrumentation on its head, of course, and sometimes a good part of the lesson must be focused on how the intended ensemble configuration will sound differently from the computer version. Nevertheless, given the severely limited resources we have to provide composers with ensembles for readings and performances, the computer has proved an invaluable tool. In the outside world, the increasing costs of mounting performances of contemporary music tragically limit professional possibilities, anyway.

Computer software can be used very effectively to build acuity in recognizing the structural units of musical forms and working with them. With the *HFG (Hierarchical Form Generator)* program, individuals can explore their own creative tendencies in structuring improvisational language. [6] Subotnick's *Making Music* CD-ROM also takes us back to first principles again — start with the gestures, the expressions, and the intuitively created forms — and then work towards a greater understanding of musical languages. [5] Again, Bamberger's work underscores using *familiar* musical objects as starting points in teaching theory and ear training. [4]

CLOSING

Now, we all understand the socio-economic realities of music schools. We have the problem of convincing our trustees, boards, and regents that the teaching of music requires what is for them an unreasonably low student-faculty ratio. Many are faced with the problem of running huge numbers of students through departments and, to do so, relying on large-population vehicles, like lecture classes and large ensembles, big bands, orchestras, and choruses. But, we must remember our first principles and push for forward evolution.

There is the nagging question, "Can large musical groups improvise?" Well, to date, I'm afraid the answer is, not very well. However, there are large-group models we can study in the music of Africa, Asia, Latin America, Eastern Europe, and many other places, along with interesting, experimental approaches from contemporary music.

What kind of society would we have if everybody were a composer? Just think of it for a minute. Well, we would have a vast landscape of mediocre music with a few gems of literature rising to the top and being remembered. We would also have lots of people making music on the side while making a living in other professions. Gee whiz! This sounds a lot like what we have now already. However, we would also have a society of people who have had in-depth exposure to creative processes and have reached out and touched artistic vision, at least a bit. We might have a more sensitive, perceptive, and insightful society.

Improvisation — or spontaneous music making — is the vehicle that transports the full spectrum of musical realization from the realm of abstraction to that of actualization — with the full engagement of intellect, intuition, imagination, proprioception, and physical and psychological being. The total human becomes the total musician. That's how we learn.

ENDNOTES

[1] David Rosenboom, "Propositional Music, On Emergent Properties in Evolving Musical Languages," (written for a book of composers' writings to be published by (New York: John Zorn) and also *Leonardo*, (in press).

[2] _____, "Frames for Future Music (Six Composition Lessons)," in Larry Polansky (comp.), "The Future of Music", *Leonardo*, 20/ 2 (1987): 363-365.

[3] _____, "Cognitive Modeling and Musical Composition in the Twentieth-Century: A Prolegomenon," *Perspectives of New Music*, 25/ 1&2 (Winter/Summer 1987) 439-446.

[4] Jeanne Bamberger, "Turning Music Theory on Its Ear, Do we hear what we see; do we see what we say?" manuscript, (Cambridge, Massachusetts: MIT 1995).

[5] Morton Subotnick, *Making Music*, CD-ROM, (New York: The Voyager Company, NY 1995).

[6] David Rosenboom, "Parsing Real-Time Musical Inputs and Spontaneously Generating Musical Forms: (Hierarchical Form Generator (HFG)," *Proceedings Of The 1992 International Computer Music Conference*, (San Francisco, California: Computer Music Association 1985) 186-189.

[7] Bryan Pezzone, "The Bright Side", *Piano & Keyboard*, (March/April 1996) 17-20.

[8] Paul Vorwerk, "About NASM Standards: Improvisation," internal memo, (Santa Clarita, California: California Institute of the Arts, School of Music 1995).

[9] Stuart Fox, "Teaching Improvisation," internal memo, (Santa Clarita, California: California Institute of the Arts, School of Music 1995).

[10] David Rosenboom, "Music Notation and the Search for Extra-Terrestrial Intelligence," in, Carter Scholz (ed.), *Frog Peak Anthology*, (Hanover, New Hampshire: Frog Peak Music 1992) 103-106, and in *Leonardo*, 26/4 (1993) 273-274.