3. Translating the musical image: case studies of expert musicians

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There is more to music than the production and perception of real sounds; musical experience also involves musical thought through imagining and mentally re-presenting sounds. This can occur unintentionally, as in the phenomenon often called 'tune on the brain'. Alternatively, imaging music can be an involuntary corollary of musical activity, such as anticipating the next track on an album while listening to music or working towards an ideal musical sound in performance based on internally 'hearing' how it should sound. Finally, a mental image of music can be deliberate, as in the 'silent' analysis of a musical score or the *auralisation* of sound in harmony and counterpoint exercises.

How does musical thought in the form of musical imagery—a mental image of how the music should sound—translate to musical production? Musical imagery is the conscious experience of an internal representation of music, or *inner hearing*. Various definitions of imagery have been offered. In the auditory domain, Intons-Peterson (1992:46) describes it as 'the introspective persistence of an auditory experience, including one constructed from components drawn from long-term memory, in the absence of direct sensory instigation of that experience'. Musical imagery is a production of the *mind's ear*. It can differ importantly as an experience from the internal processes that channel and interpret any real incoming sensory information, otherwise known as *perception*. Imagination encompasses imagery, being 'the faculty or action of producing mental images of what is not present or in one's own experience' (*Collins New English Dictionary* 1997). The other definition of imagination (from the same source) as 'creative mental ability' presents imagery as a key ingredient in creative thought. Seashore (1938:161) makes a link between imagery and creation when he speculates that 'perhaps the most outstanding mark of the musical mind is auditory imagery, the capacity to hear music in recall, in creative work, and to supplement the actual physical sounds in musical hearing'. Robertson (1996:20) argues that 'we must accept that memory and a beautifully formed musical imagination are the prime factors in music making'.

Musical imagery has particular importance for musicians, functioning in creation, performance, auralisation, recollection and anticipation. Examples of its assumed occurrence include a performer developing an interpretation in her or his head, a conductor doing silent score reading in the absence of any instrument and a composer imaging new sounds or new combinations of sound. We know

surprisingly little about the phenomenon of musical imagery, however, due in part to a reliance on introspection or inference based on a translation of the image into observable sound. What do expert musicians say about their imagery? For example, how important and how prevalent is musical imaging in expert musical activity, and how does it translate to and from perception? This chapter investigates these questions, with respect to three professional musicians in Western classical music: a composer, a pianist and a profoundly deaf organist. These musicians discuss the relationship of their mental representations of music to the music they perceive. First, an examination of existing research into the translation of image to sound, and sound to image, will be presented here.

Translating image to sound

The most obvious starting point when considering the translation of an auditory image to sound is the task of a composer. There is no shortage of anecdotal reports concerning the musical imagery of famous composers such as Beethoven, Stravinsky and Elgar. Mountain (2001:271–88) and Retra (1999) have attempted to undertake a more systematic understanding of the subject. For instance, Retra designed a study in which composers were asked to provide a verbal commentary on a composition task away from an instrument. The purpose was to investigate the nature of mental representation in the composition process.

Inspiration in composition is often taken to be synonymous with musical imagery and 'the myths that surround the one have confused investigation of the other' (Mountain 2001:273). One of these myths is that inspiration takes the form of a complete and pure auditory image to be translated in a sequential manner from the mind to paper. Mountain's evidence suggests that, in reality, composers are more likely to have been mentally working on music for a while, modifying and developing an image rather than transcribing one in virgin form. Harvey (1999) provides a comprehensive discussion on the subject of musical inspiration. Drawing on the reports of composers including Mahler, Dukas, Elgar, Boulez, Maxwell Davies, Schumann, Ligeti, Hindemith and Rubbra, he writes that 'the unconscious is clearly capable of reordering mental impressions to find solutions to compositional difficulties, without any need for conscious thought' (Harvey 1999:22). Penrose (1999) formulates a theory that creative thinkers unconsciously put up ideas for contemplation but consciously eliminate those that are redundant. Retra's (1999) conclusions are similar to this. She found that the composers in her study seemed to use imagery in compositional decision making as a means of holding information in conscious attention, inwardly 'hearing' it in what was metaphorically termed the 'mind's ear'. Mountain (2001:275–6) describes a similar intermediary role of mental imagery towards the final stages of musical composition: '[t]he vividness of the auditory image is…necessary…so that it can be clearly maintained and referred to during the sometimes tedious procedure of notation.'

The alternation between unconscious and conscious thought seems to be at the root of many misconceptions regarding the role of inspiration and the role of assimilation. A chronological dimension might mean that composing 'traces a path from the intangible imagination to the tangible reality of a created work' (Saxton 1998:6). Imagination is more than imaging, involving a degree of creativity over mere visualising or experiencing a ready-made copy. According to this, musical imagery might represent an intermediary point in translation between imagination and what Saxton (1998) describes as the 'aural detection' stages of creation. The process of developing a compositional idea implies a musical imagination, musical memory and the ability to alter and mentally rehearse an image.

Remarkably little research on musical imagery has looked at the translation of image to sound in performance, with the exception of Brodsky et al. (1999:370–92), who explored the inner hearing of orchestral musicians. Kvifte (2001:219–35) also explores imagery for performing musicians, describing the importance of mental imagery for the memory of form in Norwegian *Hardingfiddle* music. The author's main concern is to determine 'the relation between observed formal structure and possible internal images of them' (Kvifte 2001:219–20). In other words, the interest is in understanding what information about the performer's guiding mental image can be gained indirectly from their observable performance. This assumes a direct translation from mental imagery to overt behaviour, describing a feedback between one and the other in the process of performance.

In Western classical music, there is a tradition of translating visual and auditory imagery to sound when performing from memory. Marek reports that Toscanini was renowned for his musical memory and the veridical nature of his imagery:

> His memory was strengthened by what I may call the 'mind's ear', meaning the ability to hear a composition by reading it. That ability is essential to a conductor, but Toscanini possessed it to an amazing degree. He had but to glance at a page of complex music, his glance seemingly casual, and he heard the page both horizontally and vertically in his imagination. (Marek 1982:416)

Translating sound to image

Where does the musical image come from? A translation occurs from the perception of sound to the creation of a mental re-presentation of that sound, including the conscious auditory image. Musical composition is not purely endogenous, requiring as it does the initial perception of constituent sound material. Even in Western classical music, in which written notation might seem to be the principal carrier of musical information, 'Western art music is in fact dependent upon an "oral" transmission of performance tradition' (Godøy and

Jørgensen 2001:182). Great musical performers convey information additional to the musical score through the shared communication of a detailed musical image. Marek (1982:415) believes that 'retention of minutiae is an attribute of the interpretive artist; it lies at the base of performance, and it can be trained'. It is important to note the emphasis on the retention of perceived sound as a foundation for creative interpretation and the supposed potential to develop this skill.

Musical essence

'Take out the image from the musical mind and you take out its very essence' (Seashore 1938:6). Some musical traditions, however, are more dependent on auralisation than others. For example, consciously imaging sound away from a musical instrument (be that a violin, voice, CD player or computer) might feature less in improvisation or electro-acoustic practice than in the performance of a folk melody from memory. Moreover, some sound dimensions seem to be more susceptible to inclusion in an auditory mental image than others: in a sampling study of the occurrence of spontaneous musical imagery (Bailes 2006), I found that participants were more likely to image melody and song lyrics than harmony, timbre and expressive features of music. Intons-Peterson (1980, 1992) explored auditory imagery of environmental sounds in laboratory conditions and also found that timbral and dynamic dimensions seemed to be optional rather than essential to a conscious image. Harmony, timbre, dynamics and musical expression are, however, meaningful dimensions of musical experience. It would be wrong to strip down the notion of musical essence to those dimensions of auditory experience that can be mentally re-presented in consciousness. Nevertheless, translating from image to sound, it seems likely that musical dimensions important to the musical imagery of expert musicians would also be described as significant to the sounding of music. A content analysis of interviews with musical experts might reveal descriptions of musical dimensions important to image and sound.

Case studies

A semi-structured interview technique was employed that was designed to capture the individual experiences of the interviewees. While the respondents were selected because of their activities as professional musicians, the intention was not that they be considered representative of a wider musical population. The interviews reported here are necessarily limited by the musical and cultural backgrounds of interviewer and interviewees. Nevertheless, the focus on the experience of classically trained musicians represents a relevant viewpoint, coming from a tradition that promotes a key role for musical imagery.

The purpose of the interview was to explore emergent themes concerning the relationship of imagery to perception in musical activity and to allow the

respondents to express their own accounts of their imagery experience. The interview schedule differed slightly for each respondent and was used as a prompt rather than a rigid set of questions. The aim was to encourage respondent-led discussion, albeit within loosely defined areas of researcher interest.

Interviews lasted between one and three hours. They were recorded with the permission of the respondents and later transcribed for thematic analysis. Each case study was analysed separately, examining the material repeatedly and systematically in order to determine emerging themes. Ultimately, a comparison of the common themes across the respondents was formally made (Bailes 2002). Common analyses relevant to translation of the image, across all three individuals, will be presented here.

Respondent profiles

Table 3.1 summarises the biographical details of each respondent. The broad areas addressed with each respondent are listed, along with the key emergent themes arising from an analysis of each interview.

Table 3.1 Respondent profiles

NG	
Biographical details	Composer. Teaches in the music department of a university in the United Kingdom. Experienced in directing contemporary music and in piano performance. Studied composition with Bernard Rands and David Blake.
Interview questions	Musical background, composition process, teaching, directing contemporary music.
Emergent themes*	Differences between imaging and imagining music, the respective limitations of imaging and perceiving music, conceptual flexibility, musical meaning, musical familiarity.

HP	
Biographical details	Pianist. Teaches in the music department of a university in the United Kingdom. Experienced in conducting. Studied with Cyril Smith and Nadia Boulanger, and worked with Messiaen.
Interview questions	Ideal working method of a performing pianist, including the importance of mental preparation, musical training, role as a teacher, aural skills.
Emergent themes*	Definition and centrality of a guiding 'conception', importance of formulating detailed thoughts about a piece before hearing it, balance in mental preparation, ideals and realities, conceptual flexibility, tricks to develop auditory perception.

WP	
Biographical details	Organist and pianist. Also experienced in choir conducting. Has congenital hearing loss and has been profoundly deaf since age seven. Works as a signer for the deaf in opera and musical performances. Runs a charity to assist in the musical education of deaf children.
Interview questions	How he perceives music, nature of his musical imagery, performing, conducting, signing.
Emergent themes*	Reliance on musical score, awareness and observation, perceiving through imaging, the 'working out' of music, memorising, imagination.

* Many themes emerged from the dialogue, but only those pertaining to the translation of musical imagery and perception are discussed here.

Interview analyses and discussion

Loss and gain

Translation from one language to another entails loss and gain. By virtue of no longer using the same word, expression or musical medium, some quality is lost, but there can be a gain through the new perspective afforded by the translation. In this way, Eco (2003) describes translation as a negotiation. For example, NG explained that translating sound to mental imagery inevitably involved a loss in the veridical nature of sound colour. For example, when asked to describe any surprising outcomes of finally hearing his compositions performed, he replied:

> I've always felt that the colour comes up more vividly in real life, and it's always better than you imagine it's going to be…Timbres are also going to be that much brighter—at least that's what I find—than the way I imagine them. They're always a little bit kind of, a little bit hazy, you know? They're not quite as resonant as they are in real life.

All three respondents expressed in various ways the importance of flexibility in perceiving and imaging music. In composition, this meant a delicate balance of fixing a musical idea without it becoming irremediably 'stuck' in notation or perception. In performance, the flexibility lay in the conception, a schematic framework that allowed for image and perception change. For WP, there was a need to ensure that learning from the technique of others did not transfer to mere copying without room for interpretative variation. Similarly, NG and HP described situations in which over-familiarisation with perceived music could occur: for NG this might involve hearing a composition repeatedly and becoming indifferent to its potential to grow, while for HP this would be the unwanted influence of other performers' renditions or being ruled by physical factors before a mental conception had been created.

NG believed that in composition, musical imagery could function to retain the balance of conceptual freshness. When talking about the 'use' of imagery in electro-acoustic composition (a medium in which he had only occasionally written), NG explained that having perceived the same music repeatedly could lead to over-familiarity with the material:

> An instrumental composer is imagining a performance or imagining a sort of idealised performance whereas the studio composer's hearing the real thing. And you can, in the studio, get bored with the material and feel that you need to produce more layers of activity to liven it up, whereas the listener coming to that afresh might find it very exciting.

It is true that a listener would rarely attend to a piece of music in as much detail as the composer. The composer's boredom from repeatedly hearing the material

might be avoided by composing some of the work through imagery rather than perception.

Translation is more than mere transcription and requires imagination. There was general agreement as to the role of imagination in music making, with it differing slightly from imagery in its creative function of reaching beyond given material. Perceived or imaged representations of music might equally constitute this given material, so that imagination was related but separate. In composition, hands-on manipulation of sound might be a more fruitful source of imaginative development, though imagery might also help break free from learned material through its inadequacies as an exact mental representation of given music. NG found the metaphor of a faulty tape to be a useful means of describing musical imagery. The weakness of mental imagery as a faithful reproduction lends it value for experimentation and modification. In this case, a certain gain in creativity is afforded by the use of imagery in composition rather than perception.

For HP, the 'imaginative impulse' in musical performance was at risk of being stifled by overly perceiving rather than imaging music. For him, going beyond the given meant looking beyond the surface information in the score, without distraction from the given material of perception, in order to create new meaning. In piano performance, HP described the principal advantage of forming mental imagery before physically tackling new music as freedom from technical constraints. It was suggested to him, however, that mental states were just as prone to becoming fixed as physical ones. When he first adopted the method of mental preparation and imaging sound before playing it, he said that he did become 'locked' into his imagery and he had since learned to rely more on the conception than the strict auditory image. He explained that conceptions could be refined and modified in accordance with changing ideas:

> The important thing that you don't want, or I don't want anyway, [is] a performance that is so completely planned and cut and dried in every detail that it has no possibility of further growth…I mean in a way a certain, if you like, imprecision has to be built into the business of being a musician.

HP goes to some lengths to balance flexible and stable dimensions of his performance approach by noting down his initial impressions of a piece for reference at a later date. The emphasis here, as elsewhere in his interview, was on using indirect methods to practise music, avoiding habit and maintaining a fresh perspective while deepening a musical understanding.

WP also spoke of imagination, as having had to establish an 'imaginative vocabulary' of timbre. Implicit in his use of the term is the notion of extending given material, as for him, timbral information is not presented aurally, but needs to be created through combining and extending proprioceptive, observed

and analytical knowledge. Contrary to Marek's description of the oral tradition of learning the 'minutiae' of performance practice from listening to great performers, the two expert performers interviewed in the current research described quite different approaches to image formation. For HP, hearing examples of music he wished to perform was to be avoided in preference for a highly autonomous mental image of the music. For WP, musical perception concerned visual perception and hands-on experience of playing an instrument.

Mediating the musical 'essence'

Translating image to sound and sound to image implies at least a basic level of equivalence between the two phenomenal experiences. For example, where there is an intention to communicate musical imagery in sound, it can be hypothesised that the composer/performer will translate the most meaningful elements of the mental image. The elements reported to feature in NG's mental imagery seem to correspond with those meaningful to his concept of music. In fact, he deliberately pointed out this relationship, saying that musical imagery necessarily related to an individual composer's musical language. An example of this concerns what he considers to be good examples of timbral writing in the composition of others: '[i]t's partly to do with working with the instrument and getting the best out of the instrument…finding something which is so characteristic of the instrument that you can't imagine another instrument playing it…Some timbres seem absolutely right for particular situations.' NG reported a conversation he had with a colleague about whether harmony was experienced as part of the mental image for music, using the example of the slow movement from Rachmaninov's *Symphony No. 2 in E Minor*. His argument was that harmony was necessarily 'heard' as integral to musical meaning and his colleague's disagreement made him 'question his musicality'. When asked if there were any musical styles that he would find harder to internalise and remember, he explained that he could not create an image of the whole of *Gruppen*,[1] but that as gesture was the main meaning of that music, so gesture constituted the aspects of sound he could hear in his mind's ear.

Essential to HP's musical understanding and method of approaching performance is the 'conception'. This can take the form of a mental musical image, but bears closer resemblance to a more abstract schema generated for each piece. Indeed, the conception might be understood to be a generative force behind an individual piece of music: essential to its musical understanding and able to accommodate surface-level changes. He compared the conception with the largely structural overview held by a novelist. Once clear in the mind, the conception acts as a form of imagined model against which to compare all perceived renditions. HP explained that 'I like to know what I'm aiming at, and then I will find the means to realise it'.

For HP, it is important to maintain the ideal conception. For example, he described his reluctance to practise at the venue for his next concert because of the piano's inadequacies, which might tarnish his idealised image of the music. The physical inadequacy of the instrument is largely beyond his control, while the ideal conception of how the performance should go is not. While an ideal performance is difficult to achieve, 'you're never going to get it unless you've imagined it. But you'd be amazed what you can do if you have actually set Everest in front of you…[because] the other thing is you're motivated by your imaging. You want it. You're not satisfied with less.' This was in contrast with the neglect that HP observed in most people's inner hearing. He bemoaned what he described as the 'sticking plaster' approach to solving performance errors, whereby individual notes were physically repeated, rather than listening and imaging the desired sound before attempting a performance: 'I suppose the huge lesson that I learned from my teacher…Cyril Smith, whose thinking in this area was incredibly advanced, which is that…we want to lead our hands.'

As a professional pianist, HP was concerned with the memorisation (formation of a memory image) of music. He spoke of his approach to memorising music as a developmental trajectory. For him, rote learning was something suitable to a child's mind, but the more experienced a musician became, the more an understanding of musical meaning was important to the process of remembering. As the number of musical episodes that have been experienced increases, the more the semantic rather than the episodic quality is significant. Accordingly, HP increasingly found the semantic musical meaning and conception to be important in learning a piece of music. The implications of this are an increasingly analytical relation of the music to abstract musical knowledge.

WP described harmony as a salient musical feature, as it not only featured in his favourite musical moments, it seemed to elicit the strongest emotional response. When describing favourite moments in pieces of music, WP's description took the form of the analysis of modulations. Speaking of *West Side Story*, he says, 'I never get tired of listening to that. It's such an incredibly analytical piece of music.' Analytical structure features heavily as the essential component in describing his method of memorising a work. His musical memory is more structural than note level: 'When I say that I memorise a piece of music, I obviously don't memorise every single note…I suppose it's a pared down representation of the whole thing…I suppose I'm really aware of form in a way.'

It is impossible to know to what extent WP's aural imagery resembles that of a musician without a hearing impediment. In spite of his emphasis on an analytical grasp of score, he also describes his music in terms of an 'aural tape' playing in his mind. When asked whether he envisaged the score mentally when memorising music, he replied, 'No, I don't actually…It's like I have a tape in my head, and I'm playing the tape.'

Schemata based on past experience mediate perception, so that each perceptual moment is a process of extracting information from the environment that is meaningful to the individual. The musicians in these studies described imagery comprising features that correlated directly with those features they found interesting and meaningful in perception. This is not unusual when considered alongside the reported imagery of some famous composers. Stravinsky continually stressed the important use of instrumental colour as an integral part of a musical idea. He presents the way to write effective instrumentation as comprising imagination and declarative knowledge about the instrument, stating that Berlioz had both aptitudes (Stravinsky and Craft 1979:29). Elgar also experienced instrumentation as part of the musical meaning of his composition:

> The fact is I mentally hear the instruments, and when scoring put down what I feel that the sentiment of the words, if there be words, demands for the most perfect expression attainable. So far as I am concerned the thing is already complete in my mind: to make others feel it as I do is the trouble. If I could only write as fast as I think! (Quoted in Buckley 1912:87–8)

The translation process

The notion of balancing loss and gain in translation has already been outlined. All three interviewees described intentionally exploiting this property of the translation process to suit their needs. When questioned about the relative merits of writing down compositional ideas or guarding them as mental constructs, NG clearly articulated a need to balance fixing ideas and maintaining flexibility. Describing musical imagery, he explained:

> If it's a playback mechanism you can't actually be certain that every time it's the same, and I think this is the beauty and the drawback to notation that it actually fixes a version. If you're unlucky, that version becomes something that you can't develop any further because it becomes so fixed you can't see any potential in it any more. It's definitive; it's complete. Whereas, you know, sometimes it's more valuable to try to keep the ideas fluid.

NG describes imagery in his composition less as a static mental copy of sound than a way to free the imagination in its departure from repetition and fixed musical detail. A 'casual listener' to his own musical imagery, NG might attempt to 'capture the drama':

> I've got strategies for trying to get the music down quickly. I mean there are two distinct processes: one which is to try to write down the music that's going on in your head, and the other which is to project more music. So one is constructivist, if you like, and the other is trying to capture something on the wing.

Giving an example of 'capturing music on the wing', NG described how in order to produce a 20-minute composition assignment as a student, he had once attempted to imagine music in real time for that period, but

> [w]hat came out eventually at the end of that summer was richer than what I heard in my head. Because I hope that I built into it layers of meaning…layers of activity which the casual listener the first time round wouldn't have heard. And in that position I was of course the casual listener.

The composition process necessitates making something more of this inner sound, so that the product is greater and richer than the image. Composers might only rarely experience moments of inspiration in the form of a complete auditory image. Rather, an amalgamation of auditory knowledge, based on perceptual experience and the unconscious association of ideas, is likely to underpin the bulk of musical creation. Where a conscious image of sound can be of particular value is to present auditory information to the mind's ear for contemplation, selection or transcription.

HP envisaged the translation from conception to surface detail to be a continuing cyclical process, described as follows:

> I think you start with a conception, but clearly when you work on the details, I mean they are conceived too, and will feed back into the wider conception which will be modified accordingly, and indeed they may be modified by the instrument which you're playing on, and even in performance itself by the performance, and so on.

Familiarity with music, through its repeated perception, is assumed to lead to a strong corresponding mental image. An ideal for HP, however, is to avoid excessive familiarity with the music he is working on. The reality of over-familiarity is described as a loss of freshness. A direct comparison can be made between this performer's desire to rejuvenate his musical ideas and NG's balancing of perception and imagery in order to maintain creative newness. For HP, over-familiarity in motor terms means that 'if you're so conditioned in your nervous system and so on, doing it just like this, you can't react anyway'.

HP's extremity of isolating the mental preparation of a performance should be contrasted with his description of the balance needed to become what he described as 'a great pianist':

> Everything has to be in balance. When things are in balance you're playing well, and when you're not playing well, when you've lost your form, whatever it is, it's just like golf or something like that, or tennis…it's usually almost always because there's some key area that you're neglecting, whether ear, or indeed the conception.

This balance relates to the practicalities of managing repertoire as mental and physical preparation:

> It seems to me in a way that every day you come to practise a piece, and if it's a very difficult piece you may have to practise it day after day after day, but still every day you have to bring some new imagination to it, because otherwise the work simply becomes kind of technical, and in some way divorced from the imaginative impulse.

HP also mentions balance as important to the work of a conductor in safeguarding a conception and accommodating any change brought about by individual performers.

> I say the task of being a conductor is really…treading that particular tightrope, isn't it?…There has to be some kind of balance in a conductor's work, and so it is obviously with any kind of instrumentalist, there's a balance between your pre-rehearsal planning, or pre-practice planning, and then what you actually do. But essentially, of course, you're able to diagnose, correct, improve and so on because you do know what it is that you want.

The balance between mental and physical dimensions might change during the process of preparing to perform a piece, but the guiding conception, a fundamentally mental measure, is present throughout. HP described his own approach to performance as 'controlled imprecision', a phrase that exemplified the balance required between conscious and unconscious thought in a piece. Control needs to be introduced and this is a predominantly conscious phenomenon. Unwanted unconscious influence should be avoided: 'The fact that we may be unconsciously influenced in the early stages by what feels comfortable, or safe, or whatever, is bad.' For HP, it is a lesser concern that processes become automatic than that processes should result from mental thought rather than physical tendencies.

Holding an idealised performance in mind requires imagery, but acting on it requires a perceptual feedback mechanism. HP said that ideally, the formulation of a conception, and the subsequent ability to image the desired sound, would allow a performer to diagnose their own problems. 'It is unquestionably the only path towards radical improvement, and huge standards…I am convinced it is the only method…if there's a secret…Because it enables you to be your own teacher, your own doctor. You diagnose everything yourself.' Based on his own experience, HP outlined useful tricks for a performing pianist to develop their perception and imagery—for instance, anything that involved playing the music in a physically different way, such as hand swapping, would necessitate aural rather than kinaesthetic cohesion. Singing the more aurally insecure left hand

of a piano part while playing the more melodic right hand would also guarantee a thorough aural knowledge of the music.

The translation process of sound to image and image to sound described by WP is unique to his experience as a deaf musician. He was asked whether he could imagine the different sound qualities of different instruments when he read the score. His response was positive and he was able to explain it in terms of firsthand experience in playing different instruments when he was younger. He spoke of having had the 'chance of feeling' the bass clarinet. Interestingly, he expressed a particular interest and ability in orchestrating music: 'Now by rights I shouldn't be able to do that, 'cause you need a good ear…You need to be able to tell what instruments will sound like when you combine them…I freely admit I didn't have an extensive knowledge of the workings of these instruments.'

WP attributes his ability in orchestration to a vivid imagination, explaining, 'I've tried playing different instruments, or being in close proximity to them you build up this imaginative vocabulary, for want of a better word. And somehow your brain just absorbs it.' Thus, imagination, more creative than imaging, plays a crucial role in the translation of timbral experience for WP.

When asked whether there had been any overt emphasis on imaging music in his musical training, WP replied that hadn't been the case, probably because he had relied on performed examples to learn. Really performing music forms a central part of WP's experiences. He has learned to play the organ through observation, yet he says:

> Interestingly enough, I don't frequently have the image of somebody physically playing. If I look at a piece of music I don't imagine somebody sat [sic] at a keyboard and how they're going to finger it…That could be because every performance that you do has got to be unique in your own interpretation.

This final comment is illuminating, as it demonstrates flexibility required to accommodate individual interpretation. When asked whether WP deliberately listened to and attended the performances of others when preparing a piece for performance, he explained that he tended to imagine his own interpretation.

WP frequently described a process of 'working out' some aspect of music. He said, for instance, 'I don't find it difficult to work out the harmony and even the structure just from looking at it' and 'I prefer to sit down and work out my own'. WP relies on musical score in order to experience music, though he is unable to explain how he acquired his apparently detailed auralisation skills. Score reading combines with a general awareness and observation of musical situations, such that music for this organist is more clearly an amalgamation of sensory modalities than otherwise acknowledged in music perception. He also

describes perception in imagery terms—for, to him, perceiving necessitates image formation and the two are part of the same process.

Fluency within a given 'language'

Successful translation requires fluency in both languages. The accurate translation of sound to image or image to sound equally entails fluency in both. Interviewees expressed different comfort levels with imagery and perception relative to their experience or practice in each. When asked whether practice in composition had affected his own image formation, NG replied, 'Yes, I think it must…I can't say that I'm tremendously confident that I'm better at it now than I was, but I suppose I must be.'

Practice in musical imagery for HP meant balancing fixed and fluid tempi, as he felt that performers should be able to image tempo 'and in a way be able to switch ideally effortlessly from one to another, from say a very fast tempo to a very slow tempo, and vice versa'. Freedom is an important theme for HP. In general, he reports that his mental imagery is not restricting but liberating, and that 'the marvellous thing about imaging is that I can fly anywhere I want to'. From that he goes on to say that physical limitations, time and ambition are the only factors that could prevent the communication of a perfect musical interpretation: 'I've no doubt that you could put…a lot of repertoire in front of me, and that I can inside myself imagine what Smith would have called a world-beating performance.' HP made it clear that for him, score reading was a more productive exercise than sight-reading at the piano, as this bypassed technical problems in favour of a well-founded musical interpretation. For this to be the case necessitates exceptionally fluent imaging skills.

The notional division between sound and image is irrelevant to WP. He explained that he relied entirely on the printed score, as listening to music 'doesn't mean anything, its just some abstract noise with no recognisable shape, no recognisable form'. He went on to exclaim, 'I just cannot imagine life without a score'. For WP, score is the primary musical experience. How is WP able to translate score into a musical image given his lack of conscious aural memory and having been profoundly deaf from early childhood?

> I never knowingly sat down and taught myself how to read a score. I always thought that that was something that anybody could do…It's not something I've knowingly learnt to do. I don't know whether that's been some sort of automatic compensation for my hearing loss, or the fact that I have to relate to what I see.

WP explained that scores differed in their difficulty of reading and subsequently in imaging them. Of a particularly dense score, he said, 'that's not to say I couldn't do it. If you gave me time I could sit there and work out what was going on.' His approach when presented with new score was to 'flick through

it' to gain an overview and pick out important features. Given that the musical information represented in score is WP's primary access to music, it is unsurprising that an incomplete score is troubling to him:

> If somebody gives me a lead sheet and some lyrics I don't feel confident at all. I find it so hard to do. *Blood Brothers* is an example. I've been signing *Blood Brothers*…for about six years now. They don't have a score. All I have is a vocal selection book so a vast amount of the time I've no idea what the band is doing.

WP reported difficulties in recreating music he had heard without a score. For instance, as a child, he heard Mahler's *Symphony No. 8 in E Flat Major* and only subsequently bought a recording and a score. He was then unable to re-experience the passage he had liked at first hearing, perhaps due to memory problems or perhaps because of a faulty original perception: 'What I imagined was happening and what was really happening may not have been the same thing.' WP proposed that a mismatch between perception and image could have occurred. He expresses this idea explicitly:

> If I go to a concert or on the rare occasions I might listen to a piece of music without a score, but I do know what's going on, I can actually conjure up some kind of picture in my head, but when I get the score afterwards I find it bears no relation at all to what I thought I heard.

This is an example of perceiving music through imaging. Comparing a mental image with the score is, for WP, tantamount to comparing his mental image with a 'listening'.

Conclusion

The purpose of the case studies reported in this work was to gather detailed information about the perspective of individuals on the relationship of imagery to perception in professional musical life. Their experiences have been presented as forms of translation from image to sound and sound to image. The reader should note that in addition to the translational level of musical thought to sound, or sound to mental re-presentation, a number of interpretative levels have been superimposed on the interviewees' experience. Not only has the author translated the experience of the three musicians according to themes of translation, the interviewees were asked to reflect on how introspection and self-reporting affected the very experience of musical imagery during the interview process. NG commented on this and, as he did so, he described imaging *L'Après-Midi d'un Faune*, saying:

> I suspect that it's to do with the sense of what in the textures you're listening to are most immediate…And I would suspect that trying to describe it to you would tend to make these layers drop away. So what's

> immediately retrievable will stay—so the flute will stay and the harp will stay at the beginning—but other things might drop away.

This presents imagery in the light of an ability to attend to different sounds much as might occur in perception. It is important as an indicator of how changes in introspective attention might alter the entire imagery process and represent an interpretative translation in themselves. This is a facet of a further level of translation described in the introduction—namely, the translation in musical process between unconscious and conscious thought.

The chapter began by asking how conscious musical thought, or musical imagery, translated to musical production. It is not within the scope of this work to consider the physical coordination involved in sound production. Instead, this research hopes to highlight the role of auditory imagery in planning musical production, and conversely as a translation from the perceptual experience of sound. Imagery and perception could be so intertwined as to appear inseparable. Certainly, for WP as a deaf musician, perceiving music necessitates the immediate formation of a musical mental image and imaging music through score reading constitutes perception. The musicians of this study, however, also drew certain fairly clear boundaries between image and sound. In translation terms, it is beneficial to retain a certain fluency in both 'languages', as each is essentially linked to an underlying conception or schematic framework, but each provides a complementary interpretation, unattainable in isolation. Imagery as described by the respondents might be an idealised musical representation, being held up as the perfect goal in performance. Perception might never live up to the exemplary image. This perspective imbues imagery with a freedom that cannot be matched in musical production. At the same time, imagery is acknowledged to be a flawed representation of perceptual experience.

In translating from one language to another, there is inevitably a negotiation between loss and gain. Saxton (1998:6) articulates the intricate negotiation of perception, imagery and imagination involved in composition, saying that '[f]or a composer, there exists continual two-way osmosis between the material itself and applied methods of treating the ''received'' musical ideas'. We have seen that perception or imagery can furnish these 'received' ideas, while imagination works to develop this, either consciously or unconsciously, to present in a new form. Perception and imagery are described as playing crucial roles with respect to the need for creative musicians to fix their ideas. This applies as much to performers as to composers. For instance, in accordance with the views of HP, Brendel (1976) says that when music is not easy to retain in memory, having to relearn it contributes to a fresh performance. Here the mental image is not a fixed 'master record' but is closer to a flexible conception. Musical imagery and musical sound might be expressed as translations that serve to 'augment the

significance and expressivity' (Eco 2003:82) of musical experience. It is certainly difficult to conceive of the existence of one without the other.[2]

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Endnotes

[1] *Gruppen* (1955–57) is a piece for three orchestras by Stockhausen. The instrumentalists surround the audience on three sides and the music is characterised by the superimposition of independent tempi.

[2] The research reported in this chapter is adapted from a portion of my doctoral work conducted at the University of Sheffield, United Kingdom, and supported by an Arts and Humanities Research Board scholarship. I wish to thank my interviewees for their generous participation in this research, as well as Karen Burland, Eric Clarke and Hazel Smith for comments on previous versions of this manuscript.

CHAPTER TWO

Cognitively Guided Instruction: Challenging the Core of Educational Practice

Thomas P. Carpenter and Megan L. Franke

Carpenter and Franke emphasize the idea that the scale-up of cognitively guided instruction (CGI), a distinctive approach to teaching mathematics in elementary schools, has come about by focusing on changing the practices of communities of teachers rather than on developing organizational infrastructure. Drawing on four case studies, they identify mechanisms that have helped to promote the spread of CGI, all of which emphasize "growth from within," relying primarily on teachers' observations of the success of CGI methods as a motivator for changing practices and on the influence of a cadre of expert teachers who, as their expertise grows, assume responsibility for helping other teachers.[1]

The vision of school mathematics that current reform recommendations (e.g., National Council of Teachers of Mathematics, 2000) offer calls for fundamental changes in what Elmore (1996) calls "the core of educational practice." Elmore conceptualizes the "core" as being the fundamental ways teachers think about the nature of knowledge and as including teachers' and students' roles in teaching and learning. He argues that

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> innovations that require large changes in the core of educational practice seldom penetrate more than a small fraction of American schools and classrooms, and seldom last for very long when they do.

The closer an innovation gets to the core, the less likely the innovation will influence teaching and learning on a large scale. Elmore provides a way of conceptualizing the failure to scale up by highlighting the level of change required to affect the core. A great deal of evidence supports Elmore's claims about the difficulty of scaling up educational innovation.

The failure to scale up reforms that have been successful in local (or otherwise limited) contexts is a conundrum. Real reform that addresses the changes in curriculum and teaching that are necessary to teach students meaningful mathematics requires changing the core, but we have had little success in promoting widespread innovation that challenges core conceptions, values, and practices. If we want to bring about changes that make a real difference in the learning of mathematics, we must find ways to overcome the resistance to changes in the core of educational practice. Anything less would fail to address the fundamental problems with mathematics instruction.

We propose that it is possible to scale up innovation that addresses the core of educational practice. To support our contention, we describe specific efforts to scale up one professional development program, CGI (Carpenter, Fennema, and Franke, 1996; Carpenter, Fennema, et al., 1999), that challenges the core of educational practice. In particular, CGI challenges teachers' notions about what students know, how they learn, and what they can accomplish in mathematics. It challenges teachers' ideas about their role in the classroom and how they interact with students. It provides a basis for teachers to listen to students and to talk with each other about their students' mathematical thinking. It engages teachers as learners and provides the opportunity for teachers to see themselves as learning in the context of their practice. Teaching is no longer about covering the curriculum or engaging in activities. It is about learning—learning about the mathematical thinking of one's students and about the

practices that will support the development of that thinking. It becomes about learning mathematics. Using CGI, learning becomes what happens in the school, both inside and outside the classroom. Elmore talks about the importance of incentive structures. With CGI, learning (both student learning and teacher learning) is a primary incentive. Although not all teachers may initially see learning as an incentive in itself, many do over time, and it is an incentive that never goes away.

In developing CGI, we did not set out to "scale up" or to affect a large number of schools and teachers. We set out to study what would happen if we shared research-based knowledge about the development of children's mathematical thinking with teachers. From this one systematic study, grass-roots reform, driven by teachers and with multiple models of scaling up, has emerged. In this chapter, we describe four versions of scaling up CGI. We do not propose that the scale-up models we have observed are equal in their effects on teachers and students; neither do we claim that these models will work in all situations. Instead, we provide examples from one long-term ongoing project of how the core can be changed such that the changes are sustained and provide the basis for continued growth.

The Conceptual Basis for Scaling Up

Our work is based on what we know about how people learn, and we have applied these ideas to our conceptions of student learning, teacher learning, and how we think about scaling up. We see "learning, thinking, and knowing [as] relations among people engaged in activity *in, with, and arising from the socially and culturally structured world*" (Lave and Wenger, 1991, p. 67; emphasis in original). Understanding learning as it emerges in activity is paramount, so we look to see how people engage in activity; what the community's practices are; and the role that such elements as tools, artifacts, and participation structures play in the evolving practices. Learning is detectable in members' changing participation in the work of the community. These shifts in participation do not merely mark a change in a par-

ticipant's activity or behavior. Shifts in participation indicate changing roles and identities—identities linked to new knowledge and skill. Beyond thinking about the shifts in participation and the identities shaped by one's participation, the theories push us to consider the community in which the participation occurs. The norms that are established, the tools and artifacts that exist, and the participants themselves together create the learning space and interact to define the learning that occurs.[2] This conception of learning seems to have significant implications for scaling up. Our notions of scaling up and why it may or may not take hold relate very much to how we view teacher and student learning. We will return to this conception of learning throughout this chapter.

Cognitively Guided Instruction

To understand the particular challenges faced in scaling up a program like CGI, some insight into the goals and details of the program is needed.

CGI is a research-based professional development program that focuses on the development of children's mathematical thinking (Carpenter et al., 1999). The goal, however, is not only to understand student thinking for its own sake but also to provide a context for teachers for developing their own knowledge of mathematics and for reflecting on and revising their teaching practices.

CGI provides teachers with opportunities to engage with research-based knowledge about the development of children's mathematical thinking. This research is synthesized in a book that portrays the development of children's understanding of basic number concepts (Carpenter et al., 1999). The book is supplemented with a series of videos that provide examples of children's strategies for solving key problems and their interactions about their strategies in elementary classrooms. The book and accompanying videos serve to

[2] Rogoff (1994, 1997), Wenger (1998), Wertsch (1991, 1998), Greeno and MMAP (1998), Cobb (1999), and Boaler (2001) create the basis for our understanding of these ideas.

define CGI and distinguish it from other professional development programs that focus on students' mathematical thinking.

We neither provide a curriculum for teachers to follow nor specify explicit forms of teaching, grouping students, or interacting with them. Teachers bring knowledge to the task and engage in sense-making around the development of students' mathematical thinking. We saw early on that it was important to take into account how the teachers thought about student thinking in mathematics and to provide ways to connect their new research-based knowledge to what they already understood. Establishing these links between new knowledge and what the teachers already knew made it possible for them to figure out how to implement new approaches in practice.

The first principle of CGI is that fundamental change in teachers' practices can result from understanding and building on their students' mathematical thinking. A related principle is that teachers learn from listening to their students and struggling to understand what they hear. CGI focuses on helping teachers understand the development of children's mathematical thinking by providing a context and support for teachers to construct models of the evolution of children's thinking for specific mathematics concepts and skills. Our goal is not to provide teachers with a static body of knowledge but to help them develop conceptual models of student thinking that they can use for engaging in practical inquiry in their classrooms so that learning becomes generative.

CGI is grounded in research-based knowledge about the development of children's mathematical thinking that provides structure for organizing teachers' understanding. Within this structure, coherent principles relate types of mathematical problems to the strategies that children use to solve them, and the evolution of children's strategies is portrayed as following predictable trajectories. This model of children's thinking is robust, effectively capturing the problem-solving strategies that teachers encounter in their own classrooms.

The Development of Children's Mathematical Thinking

The initial work on CGI focused on the development of basic number concepts, and most of the research on CGI and most attempts to scale it up have focused on this content. When CGI was initially developed, a body of research that provided a consistent and coherent picture of the development of basic number concepts was emerging (Carpenter, 1985; Carpenter et al., 1999; Fuson, 1992).

This research documented that most children enter school with a rich store of informal knowledge and problem-solving strategies that can serve as the basis for developing much of the mathematics of the primary school curriculum. Although older students consistently show deficits in problem solving, young children generally can construct viable solutions to a variety of problems. Building on these intuitive problem-solving strategies not only enhances students' problem-solving abilities but also provides a basis for constructing meaning from the concepts and procedures of addition, subtraction, multiplication, and division.

One principle underlying our model of students' mathematical thinking is that children naturally solve problems posed in real or imaginary contexts by representing the action and relations described in the problems. Thus, to understand how children think about and solve a specific problem, teachers must appreciate the actions and relations that distinguish different types of problems. The following four problems illustrate some of the critical distinctions among problems that result in quite different specific solution strategies:

1. Twelve children were playing on the playground. Five children went home. How many children were left on the playground?
2. Sheryl has 5 dollars. How many more dollars does she need to save to have 12 dollars to buy a basketball?
3. Raymond earned 5 dollars babysitting. When he put it with the money he had already saved, he had 12 dollars. How much money did Raymond have before he earned the money babysitting?

4. Marsha scored 12 points in the class basketball game. Alicia scored 5 points. How many more points did Marsha score than Alicia?

Although all four problems could be solved by subtracting 5 from 12, young children may use quite different strategies to solve them. A first-grade student might solve the first problem using counters by making a collection of 12 counters and taking 5 from it. The same child might solve the second problem by first making a collection of 5 counters, adding counters until the total reached 12, and then counting the number of counters added to figure out the answer. The strategies are quite different, but in each case the strategy directly models the action described in the problem. Thus, an underlying strategy accounts for each strategy and the differences between them.

This underlying strategy is also reflected in the child's response to the remaining two problems. The child would most likely solve the fourth problem by making one collection of 12 counters and another collection of 5 counters, lining them up so that the 5 counters corresponded to 5 of the counters in the collection of 12, and then counting the unmatched counters to calculate the answer. Problem 3 would be quite difficult, and it is likely that the child would not be able to solve it. The difficulty arises because the number of objects in the initial set is the unknown, so the child would have difficulty figuring out where to start. Older children come to recognize the relation between the second and third problem, but younger children generally perceive them as quite different problems.

Over time, children become more flexible and begin to abstract these strategies to make them more efficient. For example, a child who has progressed from the direct-modeling stage illustrated in the above examples might solve the second problem using a counting strategy. In this case, the child would not make the initial set. Instead, she would start counting at 5 and count up to 12, keeping track of the number of counts on her fingers. The answer would be represented by the number of fingers extended as she counted from 5 to 12. Similarly, she might solve the first problem by counting back 5 from 12. In both cases, the strategy corresponds to the action

described in the problem, but the representation of the action in the problem is more abstract.

Finally, children move beyond modeling the problem and using related counting strategies to relying directly on number facts. Children do not, however, learn all their number facts at the same time; for an extended period, they may use a core of known facts to generate unknown facts. For example, children often learn doubles (e.g., 6 + 6, 9 + 9) and sums to 10 (e.g., 4 + 6, 8 + 2) earlier than other facts, so they may use this knowledge to generate the answer to the problems above as follows: "Five and 5 is 10 and 2 more is 12, so 5 + 7 is 12. So the answer is 7."

The same progression characterizes the development of basic multiplication and division concepts and addition and subtraction with two- and three-digit numbers. Although multiplication and division are traditionally deferred until children have learned to add and subtract, research shows that, as early as kindergarten, children can successfully apply modeling strategies to learn multiplication and division concepts and skills (Carpenter, Ansell, et al., 1993).

Children extend their strategies to larger numbers by using units of ten to model addition and subtraction involving two- and three-digit numbers. As with problems with smaller numbers, modeling with tens gives way to more symbolic solutions (Carpenter, Franke, et al., 1998; Carpenter, Fennema, et al., 1999; Fuson et al., 1997). For example, a second-grade student might initially solve a problem involving the sum 25 + 37 by modeling the problem using base-ten blocks. She first would represent 25 using 2 ten blocks and 5 one blocks. Then she would make another group of blocks consisting of 3 tens and 7 ones. She might then first combine the ten blocks in the two groups to create a group of 5 ten blocks. Then she may combine the one blocks and find that she has enough for one group of 10 one blocks and 2 left over. She could put the 10 one blocks with the collection of ten blocks to make 6 tens, and together with the remaining 2 ones, would arrive at answer of 62. Another student in the same class may not use the blocks at all, relying instead on a strategy that is essentially an abstraction of what the first student did: "I knew that 2 and 3 is 5, so 20 and 30 is 50. Then I added the 5 and the 7. That's

like 5 and 5 is 10, and 2 more. So that's one more 10, so 60 and 2 is 62." Note how similar the abstract strategy is to the description of the solution using base-ten blocks. This strategy also is fundamentally the same as the standard algorithm in which numbers are aligned in columns to facilitate adding ones and tens. The relation between the standard algorithm and representations with concrete materials can, however, be rather opaque, whereas the strategy described above is an abstraction of a more concrete strategy that generally makes sense to children.

The initial CGI research and development focused on the learning of basic number concepts and skills in the primary grades. Recently we have extended this work to show how developing algebraic reasoning throughout elementary school may enhance the learning of arithmetic and smooth the transition to algebra in the middle grades and high school (Carpenter, Franke, and Levi, 2003). Other researchers have extended the work to include basic ideas of fractions (Empson, 1999), geometry (Lehrer et al., 1999), and data analysis (Lehrer and Schauble, 2002).

These efforts have in common a focus on student thinking in specific content domains. This focus includes a fine-grained analysis of the content that plays a pivotal role in understanding student thinking and provides a basis for teachers to learn related mathematical content as they learn about student thinking. The focus may be on student thinking, but that focus provides a context for deepening teachers' knowledge of essential mathematics and for reconceptualizing their practice.

The specificity of the focus is critical. We do not simply provide teachers with general principles about student thinking. We have found that general observations about students constructing their own knowledge, using manipulative materials to develop meaning, and the like are too general to be useful. The details involved in understanding student thinking are essential.

CGI in the Classroom

Although CGI does not provide teachers with instructional materials or specify instructional practices, the professional development materials do include video examples of teachers interacting with students in classrooms. These examples are characterized as ways that some teachers implement knowledge about students' mathematical thinking in their classrooms but are not held up as models to emulate. The teachers in the video examples represent a range of practices, but certain normative practices generally emerge when teachers genuinely engage with the models of children's mathematical thinking described above. Recognizing that children may solve problems in different ways and that the different strategies reflect fundamentally different understandings of the underlying concepts, teachers begin to ask children to explain the strategies they used. Instead of assuming that all students will solve a problem in the same way, teachers expect a range of strategies. Rather than presenting one way to solve a given type of problem, the teacher leads a discussion that becomes an opportunity for students to describe the strategies they used for a given problem. Students learn not by imitating a procedure demonstrated by the teacher but by solving problems themselves and by listening to and comparing one another's problem-solving strategies.

These changes represent fundamental shifts in teachers' epistemology and in their conceptions about mathematics, students, and teaching. Mathematics is no longer a static body of knowledge to be passed on from the teacher to the student. Students do not come to the class as blank slates; they have substantial knowledge worth attending to and building upon. Teaching is not about telling; it is about understanding children's thinking and helping them to build on the concepts and skills that they have already acquired. Decisions about whether a procedure is correct are not based on the authority of the teacher; they depend on the arguments used to justify the procedure.

The Nature of the Professional Development

Consistent with our assumptions about the development of children's mathematical thinking, we recognize that teachers have practical knowledge about students' mathematical thinking that we attend to and attempt to build on. We have found that teachers' experience is consistent with our model of students' thinking, but this knowledge is not well organized and generally has not played a prominent role in teachers' instructional decisions (Carpenter, Fennema, et al., 1988). Our goal is to help teachers focus and build on this initial knowledge.

Our models of the development of children's mathematical thinking provide frames that guide our professional development, but our goal is not to impose them on teachers. Rather, we take them as basic models that we use to help teachers construct and test their own models of students' thinking to guide their instructional practices. Although a leader's guide describes one implementation of CGI (Fennema et al., 1999), professional development based on CGI has taken a number of forms. In all cases, however, it involves the focused and informed study of the development of students' mathematical thinking in specific content domains, and it is grounded in teachers' practice. Professional development may start by considering carefully selected video cases that illustrate critical features of children's mathematical thinking (Fennema et al., 1999) or by having teachers give selected problems to their own students and working collectively to make sense of the responses (Kazemi and Franke, 2002). In both cases, the selection of problems and student work is based on our models of student thinking. In both cases, the most-significant learning takes place as teachers struggle to make sense of their students' strategies for solving problems.

How Change Occurs

The model of the development of children's mathematical thinking described above provides a picture of the trajectory of student learning of basic number ideas but does not account for how or why stu-

dents progress through the trajectory. That is where the conception of learning we discussed previously comes in. We see student learning in CGI classrooms in terms of their changing participation in the class. CGI classes generally are structured to permit students to discuss alternative strategies for solving problems. At any given time, some students may be using concrete modeling strategies and others more abstract strategies, so levels of participation in the discussion of strategies and the relation among them differ (Carpenter, Ansell, and Levi, 2001). Students' learning is evident in the strategies they present and in their participation in the discussion of relations among strategies. Shifts in participation also reflect changing roles and identities. Over time, students assume responsibility for deciding whether a strategy or answer is correct, whether an explanation is adequate, or whether an argument is valid. Thus, they become learners who can understand mathematics and for whom mathematics should make sense.

In the same way, we conceive of teachers' learning in terms of their participation in their classrooms and in communities of teachers engaged in learning about and implementing CGI. In their classrooms, teachers' roles change from being the source of knowledge and the authority for whether a strategy or answer is right or wrong to participating in a learning community in which everybody's ideas are valued and strategies and answers are validated not by authority but by the warrants for the claims. These changing roles are reflected in changes in the way teachers think of themselves. They come to see themselves not as authorities but as learners and their classrooms as places for their own learning, as well as for learning about students and mathematics.

Teachers' participation in professional development follows related paths. The most-basic level of participation involves getting teachers to give specific problems to their students and to attempt to keep track of how they solve them. When teachers are asked to share the work of their students, they often initially participate in limited ways, sharing only superficial examples of student work. Over time, however, their participation shifts toward much more-detailed discussion of students' strategies and the mathematical thinking the strategies represent. Discussion of students' thinking becomes an impor-

tant part of teachers' professional lives, and their perceptions of themselves as engaged in inquiry about students' thinking become part of their identities (Franke et al., 2001).

The role of artifacts is important in understanding these shifts in participation for both students and teachers. The problem types illustrated earlier and the descriptions of specific strategies that students use for solving these problems are artifacts that are important for understanding both teachers' classrooms and their participation in professional development. The model of the development of mathematical thinking discussed above provides a framework for understanding the role these artifacts play.

Teacher and Student Outcomes

Our research, as well as that of other investigators, has documented fundamental changes in the knowledge, beliefs, and practice of CGI teachers, and these changes are reflected in the achievements of their students (Carpenter et al., 1989; Fennema et al., 1996; Secada and Brendefur, 2000; Villasenor and Kepner, 1993). Teachers' beliefs became more consistent with the ideas that students construct knowledge and that the teacher's role is to facilitate that construction rather than to demonstrate procedures. Teachers' classroom practices generally evolved toward a focus on student thinking, fostering student invention, solving fewer problems, and providing opportunities to discuss alternative strategies. These changes were reflected in students' problem-solving abilities and in their invention of arithmetic procedures demonstrating understanding of basic number concepts. In spite of a significant shift in emphasis from skills to understanding and problem solving, computational skills were unaffected; spending less time on drills did not reduce students' ability to carry out basic computations. Follow-up studies have demonstrated that teacher change has been sustained years after teachers completed the CGI professional development program and that CGI provided a basis for continued learning and growth (Franke et al., 2001).

Challenges

Perhaps the most critical challenge in implementing CGI is helping teachers attend to the first principles of CGI rather than to its surface features. When they are beginning to implement CGI, teachers often change their practices so that their classrooms look like classrooms in which teachers pose problems and ask how students' solve problems and build on student thinking. The teachers do not demonstrate procedures; students share strategies. Such changes represent progress over traditional teacher-directed instruction, but the adaptations often do not go beyond these surface changes. The changes do not represent changes in the norms and goals of the classroom mathematical practice. In these cases, teachers do not struggle to understand the students' thinking and do not provide the scaffolding that helps students extend their knowledge and adopt more-advanced strategies. They tend to think that the knowledge they have acquired is something that they learned from someone else, not something that they could figure out, adapt, and elaborate. In consequence, they do not engage in inquiry as a regular part of their teaching practice, and their learning does not become generative.

Developing leaders for efforts to scale up CGI embodies the same challenges. To help teachers move beyond the surface features of CGI instruction, leaders must understand the first principles of CGI at a deep level. They must understand that the goal is not to help teachers master a fixed body of knowledge but to help teachers learn in such ways that their learning becomes generative.

Scaling Up

Next, we consider four examples that provide different perspectives on how CGI may be scaled up. The first example is a grass-roots effort involving a group of elementary school teachers working together to learn more about CGI and to engage other teachers in learning about CGI. The next two examples consider how CGI spread through two schools. In one case, the efforts of one teacher

were the driving force behind the change; in the other, the principal provided the impetus for creating a community focused on understanding student thinking. These examples might be perceived as representing the efforts of heroic individuals, but neither the teacher nor the principal saw themselves that way. They believed they were simply doing their jobs—providing the best mathematics instruction possible to the students in their schools. The fourth example represents a more-organized effort to scale up in districts served by a center dedicated to supporting professional development in districts throughout the upper Midwest. Together, these examples illustrate how CGI has changed the teaching of mathematics in entire schools and districts and how it has spread to new schools. Underlying the four cases are some consistent themes that we will discuss after we have presented the cases.

Grass Grows in Minnesota

The first example is a grass-roots effort involving a group of elementary school teachers working together to learn more about CGI and to engage other teachers in learning about CGI. "Paul" is one of the leaders of this group; the following account of its progress is based on an extended interview with him.[3]

During the summer of 1993, 22 teachers attended a weeklong teacher academy focused on CGI sponsored by the Minnesota Department of Public Instruction. The principles of CGI and how to apply them in classrooms cannot be fully assimilated in a five-day workshop, and a number of the teachers recognized the need for follow-up support during the school year. They approached the state mathematics supervisor, who was able to make Eisenhower in-service funds available through one of the teachers' districts.[4] Eleven of the

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[3] We have used pseudonyms for interviewees throughout this chapter to preserve their anonymity.

[4] The Eisenhower Professional Development Program (Title 2 of the Elementary and Secondary Education Act of 1965, as amended) was enacted in 1994 as part of the Improving America's Schools Act of 1994. The Title 2 Program is the largest federal program supporting professional development activities to improve teaching and learning of all students.

original 22 teachers participated in the follow-up sessions during the year. During the following summer, seven of the eleven teachers organized a second summer workshop. Each returning teacher brought two to three additional teachers from his or her school or district. The goal was to create communities within schools and districts for the purpose of discussing children's mathematical thinking.

The program continued to grow within these teachers' schools and districts as the enthusiasm and accomplishments of their students became evident to other teachers. When the teachers who had participated in the CGI workshops reported about their students at local professional meetings, they attracted the attention of teachers outside their districts, and participation began to extend beyond the bounds of the original schools and districts. Currently, a core group of nine teachers is active in helping other teachers learn about CGI, and about 700 teachers throughout Minnesota have participated in programs led by this group. About 300 teachers are enrolled in CGI workshops scheduled to take place in summer 2003. About half are new teachers, and about half are in their second or third year of participation. Although the teachers did not initially have formal district support, four districts have now adopted districtwide programs to scale up CGI.

What is notable about this scaling up effort was that it has had little formal support, organizational infrastructure, or significant infusion of outside resources. Only one of the teacher leaders has had major district financial support. All the other districts have provided tacit support, but none has looked on CGI as a district initiative. The program has grown as a grass-roots effort of teachers working together to learn about, implement, and share something that they believed in.

When we asked Paul what kept the teachers engaged in a program that involved such a major commitment of time and effort, the theme that came up again and again was that it was the students. Participation in CGI helped the teachers see what their students were capable of doing in mathematics, and this motivated them to continue to struggle to learn more:

> Every time I think I have got it, I sit down with a student, and the child puts me in my place. I am so in awe of how my young students think about mathematics. This keeps me going. . . . The students keep me going. [When you can listen and understand what they are thinking, you see that] the mind of a child is awesome.

Before participating in the CGI workshop, Paul had recognized that listening to students was important. He felt he had a lot of ideas but did not really understand how they fit together or what to do with them. CGI gave meaning to what children do. It provided a framework for interpreting student thinking. Paul said that he continues to read other work, but CGI gives him a basis for interpreting it.

Getting teachers to listen to children has been a key factor in motivating new teachers to learn and implement the principles of CGI in their classrooms. A regular feature of the summer school programs in Minnesota has been to involve teachers in work with children. Many of the children do not understand the standard algorithm but show rich informal knowledge. The teachers see children using strategies that the teachers themselves do not initially understand. They see that the children are capable of remarkable insights and are motivated to learn the mathematics and the models of children's thinking that can help them understand the children. The children motivate the teachers and get them to try CGI with their own students.

CGI provides a framework for helping teachers listen to and understand students' thinking, which plays a critical role in keeping teachers engaged in implementing CGI and in engaging new teachers. Teachers do not, however, learn CGI overnight or without support. As the Minnesota teachers were learning CGI, they enlisted the participation of teachers who had been involved with CGI and had a deep understanding of the first principles. As their understanding of CGI grew, they relied less on the participation of outside teachers, although they do continue to have conversations with them via email, telephone, and occasional visits.

By all accounts, it has been critical for the teachers to participate in a network of colleagues they can talk to about children's thinking,

and it is important that at least some participants in these conversations have sufficient knowledge of the first principles of CGI to keep the focus on them. Initially, outside experts played this role, but, increasingly, the Minnesota teachers have assumed this role themselves. A critical feature of the success of the program has been that the teacher leaders in Minnesota really understand the goals and substance of CGI.

Administrative and community support has also been important for these teachers. Administrators and parents have been able to see what students are capable of learning and the changes in their learning when they are given the opportunity to build on the intuitive knowledge they bring to instruction. For the most part, administrative support has consisted of letting the teachers assume leadership in implementing CGI, and one of the notable features of their efforts is how they have taken responsibility for the learning of their colleagues. In Paul's words,

> I cannot be an island [with a class that lets students think about mathematics] and then have the kids go back to a traditional class. If I have colleagues around me, it is easier to do my work. And it is motivating to talk to my colleagues [about what they see their children doing].

What a Difference a Teacher Makes

"Lynn" changed the mathematics instruction at her school. She did not do it alone; she had the support of her principal. Neither did she do it quickly. She has been working on it for over three years and sees changing instructional techniques in mathematics as an evolving enterprise. Lynn's approach to working with the teachers in her school was modeled after what she learned as a beginning CGI teacher. As she worked with the teachers in her school, Lynn wanted to engage them, get them working together to figure out the details of CGI, and help them see that CGI does not look the same in every classroom. She made herself available because she felt, "CGI is what we should be doing for kids." Currently, Lynn reports that 100 percent of the teachers in her school are engaged, at some level, in CGI.

After describing her experiences in the school where she now works, she described how she had been able to help the school become what she and others speak of as "a CGI school." Lynn learned about CGI as a preservice teacher working with two teachers in North Carolina. When Lynn moved to California, she knew that she wanted to implement the ideas of CGI that she had learned. She is not the only example of a teacher who has moved to a new community and fostered the spread of CGI, and her story exemplifies the kind of difference we see individual teachers making.

Lynn began laying the groundwork for scaling up CGI even before she relocated. The process began as she searched for a new teaching job. She specifically set out to find a school with a principal who would support her efforts to implement CGI. She found a supportive principal during her interview at Weaver Elementary. She reports,

> I was told that I could use CGI as long as I could also pull in the textbook. I felt I could do that, so I spent my first year there doing CGI, and I invited the principal to come and see what we were doing many, many times.

She found that the principal was impressed with what she saw: "She was amazed at the mileage my kids were getting out of the mathematics we were doing." By building a relationship with the principal around CGI and providing evidence from her classroom, Lynn created an ally. The principal began sending teachers into her room, so they could see her mathematics instruction. The principal also tried to get the district involved. She wanted CGI to be implemented throughout her school and the district. The principal and Lynn had little influence on the district at this point. After observing Lynn's classroom, the district mathematics coordinator concluded that she was unique and that CGI worked only because Lynn was doing it. Lynn told us,

> This made me so mad, so mad. I tried to tell her that she should have seen me when I started. I was a . . . I was a follow the textbook page-by-page person. If I could do it anyone could do it.

However, Lynn was unable to convince the district mathematics coordinator to think about CGI as a possibility for the district. The principal and Lynn did not, however, give up on the district. Instead, the principal invited the district superintendent to visit. Lynn told us, "She was amazed, but she told us she didn't have any money. She told my principal to do something creative and use Weaver as a place where we can show what can happen." So, with few resources but with support from her principal, Lynn set out to work with the teachers at her school around CGI.

The school-based strategy that emerged developed through a series of cycles. Initially, teachers volunteered; later, all teachers participated. Throughout the cycles of CGI work, Lynn and the principal worked together to find ways for the teachers to become intrigued with CGI and to continue to learn about it. The first engagement with teachers began with seven volunteers. These teachers had seen Lynn and her students engaged in CGI and wanted to know more. They agreed to give up five days of their winter vacation to engage with Lynn in CGI professional development. Following the five days, the principal found money to release Lynn one day a month to visit the teachers. They also met once a month after school to talk about CGI and teaching mathematics. Describing the meetings, Lynn said,

> They reminded me of the North Carolina meetings with no money. We all pitched in and helped each other. . . . we talked about what we were all trying and what the students were doing. One time the meeting went on for four hours.

These teachers met together for more than a year, and they, along with Lynn, now help promote CGI in the school.

The experiences of the first cycle of CGI teachers at Weaver further convinced the principal that CGI could spread throughout the school. The teachers showed her what their students could do in mathematics, and the parents began to request CGI teachers for their children. The principal and Lynn discussed a plan for engaging all of the teachers at the school in CGI. The principal began by having teachers not involved in CGI visit the classrooms of those doing CGI. Lynn felt that many of the teachers already recognized that

> the math program was not meeting the needs of their students. They [the teachers] knew we needed to do something. For the most part, we were a young . . . a very young staff and that helped. When we started listening to the students, we saw the successes. Teachers [from the first group] left the professional development saying that it was the best professional development that they ever had.

For the second cycle of professional development, the principal arranged compensation days for the teachers and Lynn; every teacher participated. When we asked Lynn why she thought teachers were willing to participate in CGI, she said that

> Probably the most valuable piece was that it was something, they could go back and really find meaning in mathematics. . . . CGI meets our kids' needs, they can see that. . . . They said they saw how to use manipulatives. They have seen and heard about using manipulatives for years, and now they really see how they can use them. The teachers told me that they now understand what the kids are doing. They had felt before that they didn't know what they knew about them.

She admits that some teachers were reluctant. One teacher told Lynn that she did not think she would be able to write the word problems to pose to her students. Another teacher had been teaching for a long time and already had an established way of teaching mathematics. Lynn helped them by explaining that CGI did not need to look the way that it did in her class. She tried to get them to see that they could listen to their students in many different ways and that they could "get started on it slowly." The principal helped by requiring all teachers, even those who were tenured, to teach a CGI lesson as one of the three lessons she observed during the year.

The first group of teachers is now in its third year. Another school in the district is ready to begin to implement CGI, and it wants full training. The teachers who started three years ago are hesitant to do the professional development. They feel that they still have a lot to learn. Lynn understands that fully and has encouraged the teachers to help; she is convincing them that they can continue learning as they work with other teachers. She is hopeful. She sees

CGI building within the district, and she has a growing core of teachers to work with her in expanding CGI.

From the Inside Out

Another approach to scaling up CGI has been to work within the school structure. Crestview Elementary School is a multitrack, year-round school with approximately 1,300 students and 40 teachers. The school draws from a low-income community of new immigrants, and most students speak Spanish as their native language. Our work at Crestview brought together teachers, administrators, and our professional development team to focus on understanding the development of students' mathematical thinking. We worked together for three years, with each of the participants evolving in the ways they participated and the roles they took on. The work has led to a number of changes within the school. First, the focus on student thinking and the inquiry around it continues four years after the professional development team left. Further, teachers and administrators have stated that focusing on children's mathematical thinking has changed their mathematical work: Collaboration exists where none existed before; teachers' practices have changed; and students are demonstrating more mathematical understanding (Franke and Kazemi, 2001; Franke et al., 2001; Kazemi, 1999).

The teachers and administrators at Crestview and the professional development team engaged in monthly work group meetings. Prior to each meeting, all participating teachers posed the same mathematical problem to their students and brought their students' work to a cross-grade-level meeting.[5] A major goal for the professional development was to encourage teachers to come together to make sense of their students' mathematical thinking and to make public their private acts of teaching. We wanted to provide teachers a forum in which to develop relationships and create a community of

[5] Our intent was to create space, as Wenger describes, for teachers to share, challenge, and create ideas about the development of children's mathematical thinking. Our work groups were intended to be a place, as Lave (1996) and Cochran-Smith and Lytle (1999) describe, where teachers can shape their identities and take on a "stance."

practice that was not separate from their classrooms and reflected the interactions and identities developed there. Not only were the participants learning about the details of children's mathematical thinking, they were also creating communities of inquiry.

During the work group meetings, participants reported the range of strategies their students had used for the problem they had posed, ranked the strategies in terms of mathematical sophistication, and talked about implications. At each meeting, the teachers were asked to respond in writing to the same set of questions for reflection about their students' work and classroom practices. Between the meetings, we visited each classroom at least once and also spent time within the school (at lunch and talking in the halls). We also met regularly with the principal.

By the end of the first year, all but a few teachers participated regularly in the professional development. At the end of the second year, the professional development team and the principal invited teachers to lead the work groups. At the same time, the principal found money to hire one of the teachers as a half-time mathematics specialist. In the third year, the Mathematics Team Facilitators (MTFs, their name for themselves) led the work groups. We provided support to the MTFs, as did the principal and the mathematics specialist. The work groups continue today, four years after we moved out of facilitating the groups.

Adapting Teacher Evaluation. The leadership practices of the principal, "Karen," were central. She invited us to work in the school and supported our participation in the community. She attended to the learning trajectories of the teachers, was a full participant in the professional development, and kept the district at bay while we struggled together. Karen's evaluation of teachers exemplifies the role she played in supporting innovation, as well as her ability to align her practices with the goals and norms of CGI. During our first year of work together, Karen decided to use students' mathematical work as the basis for "evaluating" her teachers. Rather than observing in their classrooms and documenting pedagogical practice, Karen asked the teachers to discuss their students' mathematical work with her. When asked why she had made this change, Karen replied,

> I was dissatisfied with observation because I found that anybody could do anything for an hour, no matter what they were doing on a daily basis. And little of what I saw or we talked about ever got to how the students were doing. . . . The biggest thing that focusing on student work accomplishes is that it tunes us into student work, it sets the tone that we use student work to talk about teaching, all decisions in the classroom are based on what you see in the student work, not how the lesson goes.

The teachers brought Karen examples of their students' mathematical work three times during the year. Karen asked the teacher to describe the student's thinking, what the teacher thought it meant, and how the teacher would respond to it. Karen would ask questions that pushed the teachers to detail the student thinking and to think about what the student work told them (or did not tell them) about a student's understanding. She would talk with the teacher about what they would do next with a particular student.

In a concrete, highly visible way, Karen showed the teachers that she valued knowing about student thinking and that she wanted all the teachers in the school to be able to talk about it, no matter what other classroom decisions they made. Karen supported the teachers in thinking about themselves as people who understood student thinking. The ritual of evaluation and supervision continues but as a practice focused around students' mathematical thinking and aligned with the professional development. The principal took an existing structure and adapted it, drawing on the substance of the professional development.

Spreading the Core from the School to the District. As the teachers increased their knowledge of students' mathematical thinking and refined their identities as teachers who could determine how to teach mathematics and explain their choices, they not only began to talk with each other more but also joined in broader discussions outside the school. One way in which this broader discussion occurred was through participation in the district's mathematics curriculum committee. During the second year of our work together, three teachers volunteered to serve on the districtwide curriculum committee. The teachers' experiences with the committee began as

the district rolled out its new mathematics standards. The Crestview teachers were struck by the long list of skills for each grade level. They were surprised that these standards were introduced to the teachers on the same day that William Schmidt, National Research Coordinator for the Third International Mathematics and Science Study (Mullis, et al., 1998), came to talk to the district about how U.S. schools approach mathematics teaching by teaching many skills each year rather than by going deeply into a few areas:

> We heard Schmidt, the guy from the [Third International Math and Science Study], talk about the problems with math education in America on our opening day and came to the committee the next week asking how we could make changes in accordance with the findings he presented. I and a few others were determined not to let such an opportunity for change pass us by. We felt that the district would support this radical change . . . after all, they invited Schmidt to speak to us! We realized that we were trashing 3 years work by the committee but knew that it was the only way we could fix the problem with math achievement.

At the first meeting of the mathematics curriculum committee, the Crestview teachers proposed that the district standards be rethought. Surprisingly (to the teachers, the principal, and us), the superintendent and the rest of the committee agreed that the standards should be revisited. The Crestview teachers on the curriculum committee took the lead. They ended up not only convincing the curriculum committee to adopt their form of the standards but also convincing the superintendent and the school board. While the process was challenging, the teachers were excited about their ability to argue their case. They had evidence from their classrooms and research they had collected indicating that their new version of the standards would be more helpful to teachers and a better fit for the development of their students' mathematical thinking. The district has now adopted the Crestview teachers' version of the standards.

Building Capacity Within. At the end of the second year, the research team planned to move out of the work group leadership role. The principal took the lead. She worked out a way to release one

teacher half-time to provide leadership in mathematics. She quickly realized, however, that one teacher could not take this on alone. The principal came to us with the idea of recruiting a group of teachers within the school who might be interested in taking on leadership roles. Eight to ten teachers met and discussed what their role might look like and what they might work to accomplish. One member of the research team offered to meet monthly with the leadership team to support their work.

The leadership team decided enough school support existed to continue the work group meetings, so each teacher or pair of teachers from the leadership team became responsible for facilitating each work group. The leadership group discussed possible strategies for what to do during the work group meetings. They created a plan to cover the next few meetings and began their work groups. Through the work of the MTFs, the mathematics leadership in the school became shared. The MTFs used their meetings with the leadership team as a way to push their own learning. They viewed their participation in the leadership team as a learning opportunity—an opportunity they thought all teachers needed. So, at the end of a year of their leadership, they proposed that the leadership rotate the following year so that all teachers could take on the role at some point in the year.

Crestview evolved from a school focused on mathematics drill and practice to one focused on developing the mathematical understanding of its students in ways that brought together skills, problem-solving, and understanding. Every person at Crestview participated, and all continue to see themselves as learners. Many structures had to change to engage in CGI at Crestview, and many participants played roles in making sure the necessary structures were put in place when needed. We found learning occurring throughout the school. We saw all participants evolving in the ways they interacted in the professional development, their classrooms, in the hallways with their colleagues, and in the leadership roles they took on.

What remained constant was the focus on the details of students' mathematical thinking. Karen used it in her adaptation of supervision, the teachers used it in their revision of new district stan-

dards; the MTFs used it to design the work group meetings; and the teachers used it as they argued points of view with their colleagues inside and outside of the work group setting. However, not only the knowledge or the language around student thinking came out, but also the ways those involved engaged in discussion, used student thinking as evidence to argue their case, and conceived of themselves not as having answers but as having a vision supported by evidence. Becoming learners changed the ways they engaged in their work—in the classroom, as supervisors, and as teachers outside the classroom.

The Kudzu of School Reform

The fourth case describes the program for scaling up implemented by the Upper-Midwest Comprehensive Regional Assistance Center. This center's efforts are aimed at widespread implementation of CGI within participating schools and districts. The long-range goal is to build an infrastructure for scaling up within each of the participating districts. Achieving this goal involves preparing teachers and other district personnel to become leaders in providing professional development and engaging teachers throughout the district in implementing CGI. Although this process involves developing leadership within the district and handing off the responsibility for providing professional development, it is not exactly a training-of-trainers model. Teachers, not professional development providers, are the linchpin of the effort and shifting participation.

To illustrate the work of the center, we focus on the work with one district in Dearborn, Michigan. Dearborn is a city of about 100,000 in the Detroit metropolitan area. It has one of the largest Arabic-speaking populations in the United States, and about 35 percent of the students in the Dearborn Public School District are classified as English language learners. Dearborn sent a group of 17 teachers and administrators to the initial CGI summer institute and has been expanding the program throughout the district in the years since.

The metaphors used to think about problems often drive the actions taken to solve them. Recommendations for changing schooling are commonly based on a metaphor that portrays school systems

as large machines with specified inputs and outputs. Based on this metaphor, schools are changed by changing the inputs (the curriculum, materials, and other resources available for instruction), changing the process by which the resources are used (changing instruction), or by more carefully monitoring the output (setting standards and instituting high-stakes assessment). The work of the Comprehensive Center is based on a different metaphor the center's director, Walter Secada, articulated when the CGI scale-up effort was initiated. Rather than conceiving of school systems as machines with inputs and outputs, he proposed thinking of school systems in ecological terms (Secada, 2000, p. 2.):

> We think of the CC-VI [Comprehensive Center-Region VI] work with individual schools as *seeding* change. We strategically introduce new ways of teaching mathematics, support teachers and their schools in implementing those ideas, then depend on the system's own internal mechanisms to help spread the innovation—while still lending our support. The Comprehensive Center assumes that professional development will affect the balance of a school's ecosystem and that forces from within the system will act to strike a new balance. Our goal is to help create the conditions for that balance—a balance in which the introduced species can survive and eventually spread throughout the system.

In much the same way that a new organism may enter an ecosystem, establish a foothold, then expand within the environment, the Comprehensive Center introduced CGI into the schools by initially working with a few teachers. When these teachers (and their students) thrived, CGI expanded gradually but steadily throughout the district.

Districts were invited to send teams of two or three teachers and one instructional leader (a principal, a mathematics specialist, a Title 1 coordinator, etc.) to an initial five-day summer institute, at which they learned the basic principles of CGI. The Comprehensive Center limited participation to teams of teachers, so that the teachers would have one another's support when they returned to their classrooms. The inclusion of an instructional leader was intended to produce broad support for the teachers, and the Comprehensive Center

insisted on written commitments from principals that the teachers would be encouraged to try out the ideas they had learned in the institute.

When the teachers returned to their classrooms the following year, they met to discuss their observations about students in their own classrooms and how they were adapting instruction to build on what they were learning about their students. It is one thing to learn about children's thinking in the abstract, and it is another for teachers to see it with their own students. It was this experience that convinced them.

When asked what motivated them to implement CGI and to work to encourage other teachers to implement it, the teachers uniformly responded: "It's the kids!" One teacher elaborated:

> I looked at my students one day, and I was in awe of their ability. I couldn't believe what they did. And I didn't teach them anything. . . . It's [all about] understanding, and they were!

Another teacher talked about the remarkable things she was observing in her lowest-achieving students:

> With traditional math, I would have thought, "This kid can't do it. This kid, maybe, has learning problems." But they have their own ways to figure things out. If we allow them to do that, then we can see their growth.

A third teacher commented that she was still skeptical after watching videotapes of children solving problems in the summer institute. She asked: "Do they know my kids?" When she began asking her students to solve these problems, the level of thinking they exhibited amazed her. She commented that when her first-graders would solve a complex problem using thinking that she had believed impossible: "I'd be so excited. I'd say, 'Go tell Miss T. I don't care what she is doing over there! Just disturb her!" (Brendefur and Foster, 2000, p. 20).

As this last quote indicates, another important factor in nurturing these teachers was the support of their colleagues. The teachers met monthly to share stories of students, write problems, and support

one another. They would spend two or three hours sharing, and they were "so excited to share what we started to see [in students]." (Brendefur and Foster, 2000, p. 20).

Full-scale implementation of the principles of CGI often requires teachers to radically change their practices and the ways that they interact with students; not surprisingly, these changes challenge many teachers. Although all teachers used ideas of CGI at some level, three patterns of participation were observed in the teachers' implementation of CGI during the first year: For some teachers, the problem-solving portrayed in the CGI institute was a supplement to their traditional mathematics instruction; some teachers supplemented CGI with traditional instruction; and some teachers adopted CGI as the primary means of instruction.

Although not all participants of the summer institute radically changed their teaching practices overnight, the changes that did occur began to attract the attention of other teachers. The "infectious enthusiasm of the first group of teachers" and the accomplishments and enthusiasm of these teachers' students attracted the attention of their colleagues (Secada, 2000, p. 2). One colleague commented,

> I observed a classroom of one of the teachers who went [to the CGI institute] the first year, and it was just unbelievable! I couldn't believe the types of problems the students were solving successfully and the strategies they were coming up with. And when I saw that, it really was an incentive for me to come [to an institute].

During this first year, CGI was encouraged to grow because it made measurable differences in student learning. The Comprehensive Center provided research-based evidence that students were learning more, and this evidence reinforced administrators' commitment to supporting the teachers' efforts to spread CGI throughout the district.

The following summer, another cohort of Dearborn teachers attended the introductory CGI institute, and five teachers, a principal, and a resource teacher from the first cohort attended an advanced institute to prepare to lead CGI professional development. Currently,

with the support of the Comprehensive Center, this group is providing professional development for other teachers in the district. Furthermore, by making presentations at local and national meetings, these teachers are sowing the seeds for CGI to spread beyond the district. One of the interesting byproducts of this approach to scaling up has been the level of professionalism it has produced in the teachers. Many of the teachers are not only concerned with continuing to improve their own practice but are also assuming responsibility for helping other teachers improve.

Conclusions

One lesson learned from these stories is that, for the most part, CGI has not scaled up by changing the organizational structure of the school, by top-down efforts to implement CGI by school administrators, or through continuing implementation or the infusion of resources by outside agents. In the cases we have seen, CGI has scaled up because the teachers and administrators engaged in it felt that it made a difference in students' learning of mathematics, their enthusiasm for learning mathematics, and their conceptions of themselves as learners of mathematics. Seeing the remarkable mathematical achievements of their students has driven teachers (and their students) to become the primary movers in scaling up CGI.

Scaling Up as Participation

In much the same way as we have characterized the learning of students and teachers participating in CGI professional development, we think of scaling up in terms of shifts in participation. As we reflect on notions of participation, four issues emerge that help us better understand scaling up. First, if we see learning as participation, we must take into account the importance of relationships. Second, some participants in the learning must possess the knowledge, skills, and identities that reflect and represent full participation. Third, artifacts need to be available to support participation around the core ideas within and outside the professional development community. Fourth, teach-

ers need opportunities to engage in legitimate peripheral participation.

Importance of Relationships. Relationships played a central role in the success of each of our scale-up examples. Rather than thinking about CGI as something passed on to someone, CGI was seen as something engaged in with another person. Here, those engaged in CGI purposely developed relationships with others that supported the work of CGI. For example, at Crestview, the professional development team worked to develop relationships not only with the teachers but also with the principal and other school staff members. The developers became members of the school community and shared in the lives of the teachers and the principal. The principal became a part of the work—not an outsider. She engaged with the teachers in the work group and talked informally with them about their students' mathematical thinking. In addition, she used her more-formal role to continue to support the development of CGI by changing her evaluation practice and by encouraging different levels of participation in and out of the classroom. In the case of the Comprehensive Center, the administrators also participated in the professional development and had to agree to support the implementation of CGI at their sites. The professional developers worked to create formal and informal relationships with teachers; the teachers were invited back in the years following their initial professional development to work again with the professional development staff. These relationships allowed each participant to gain an understanding of the core of CGI so that they could carve out a role to support the ongoing development of CGI.

Drawing on Expertise. Building a cadre of teachers who understand CGI is critical to scaling up. The purpose of building the cadre is not simply to provide others with CGI professional developers. The purpose is to create communities with teachers who can share expertise and support the learning of the group. Knowledgeable teachers with existing identities as CGI teachers can begin to define full participation. The teachers who understand CGI provide the basis for redefining the norms and goals of the communities they participate in. These teachers can ask questions–challenging each other and their

students in ways different from those of an outside professional developer. How the more-expert teachers choose to participate in learning CGI provides a way for dialogue to begin, student thinking to be shared, and stances and practices to be articulated. Thinking about the cadre of knowledgeable CGI teachers this way changes how we think about working with teachers who want to participate. Rather than starting with all teachers, we see the benefit of working with teachers who want to participate and are interested in learning about CGI.

One could argue that working with teachers who want to participate is easy—we are reaching the reachable teachers. The examples we shared all began this way, but none ended there. In each example, the teacher or teachers who had developed expertise worked in communities to assist other teachers and administrators. The goal was to build the capacity to make a difference. We saw this in the case of Lynn, as she pulled in more and more teachers until all the teachers are participating and as a core of teachers began to engage a new school. Or, we saw it in the case of Paul, as he engaged more and more teachers and they began to engage other teachers in their districts. This growing core is essential to scaling up. We do not see expert teachers in CGI as becoming isolated from their colleagues; we see them as teachers who can form the new core.

Building the core does not necessarily work in all scaling up endeavors. We see it working to support the development of CGI because CGI engages teachers in learning about their students' mathematical thinking in ways that enable teachers to see that they themselves will always have more to learn. Even the experienced, knowledgeable CGI teachers see themselves as continuing to learn with their colleagues, and in that way, they can continue to share and learn together, thus removing the basis for isolation.

As teachers develop CGI expertise, a shift in their identities as professionals occurs. Although some CGI teachers do not perceive themselves as participating in a broader community, many of them do. They see their role as not just learning about CGI to improve their own instruction; they also begin to assume responsibility for helping other teachers learn about student thinking. One of the ways

that they begin to participate in a broader community is by inviting other teachers into their classrooms or by sharing their students' work with them. Although many teachers are at first intimidated by the thought of leading professional development for other teachers while they are still trying to figure CGI out for themselves, a number will begin to lead professional development efforts. In fact, most of the professional development for CGI is now led by elementary classroom teachers.

Developing Artifacts and Tools That Support Learning. CGI provides artifacts that transcend the different aspects of a teacher's practice and allow learning to occur as different participants engage with those artifacts. The types of problems and strategies are artifacts that can be elaborated in different settings and that can provide the basis for developing a common language and reestablishing norms. The teachers at Crestview posed the monthly problems that became objects of discussion and reflection throughout the school: in classrooms with students, in the hallways with other teachers and the principal, and in work group settings with their colleagues and the professional development team. The CGI teachers that Paul engages with have ways of talking with each other around student work—a common language that is supported by the trajectories of strategies shared in CGI. Paul and other teachers share with each other what surprises them about their students' strategies and, in doing so, elaborate on each other's understanding. In each of these examples, CGI provides artifacts that can be used, elaborated on, and restructured in ways that define and trace participation. These artifacts provide outward signs of how people are participating and allow participants to make explicit shifts in their interactions with students, other teachers, administrators, and professional development staff.

Legitimate Peripheral Participation. A unique feature of CGI and other programs that focus on students' thinking is that they afford opportunities for different levels of participation. Teachers need not buy into it all at once. They can participate in legitimately peripheral ways by giving students relevant problems, by beginning to talk to students about how they solved problems, and the like. Even if the teachers do not entirely understand what their students tell them

and cannot successfully provide the scaffolding for their students' responses to help them build on what they know, the teachers are engaged in practices that represent an important step toward understanding and building on student thinking.

Teachers are neither expected to be "CGI teachers" after the initial professional development, nor are they expected to have developed the same understandings or ways of teaching CGI. The teachers that Paul worked with developed over many years. Some of the teachers were seen as full participants and some as participating less actively, but all were seen as participants. Lynn specifically talked about teachers who were not quite ready to participate and described her strategies for engaging them. She knew she needed to get them started and help them see that everyone can participate at different levels. This perspective held true for those doing the professional development or leading the effort: The leaders also saw themselves as participating at different levels. In each case, teacher leaders saw themselves as learners. So, everyone involved in learning about CGI was seen as learning, and learning took on different forms and different trajectories for the various participants. Teachers were not required to buy in completely from day one. Not only was it not required, but teachers who did not buy in helped the groups' learning. The legitimate peripheral participation afforded by CGI allows time and space for teachers to acquire the knowledge and skills they need to move toward fuller participation.

Struggles in Scaling Up

This chapter has portrayed four different scale-up efforts that have been successful in different ways. Our goal has been to show an alternative vision of scaling up—one that is driven by ideas that make a difference in teachers' and students' lives rather than by changes in the organizational structures of schooling. It would be false to leave the impression, however, that implementing CGI has not involved struggles or that scale-up efforts have met with universal success with all teachers or in all situations. Drawing on the agricultural metaphor discussed earlier, if the seeds of change are not nourished, they do not flourish.

For CGI to develop and spread, the environment has to support it. It takes time for teachers to learn CGI, and it takes a community that supports teachers as they learn about their students' mathematical thinking. Some of our colleagues have worked in situations in which teachers were not provided the opportunity to form communities that engaged in inquiry about student thinking. In one large school district, the administration supported initial CGI institutes but provided little opportunity for the teachers to engage with one another afterward. Most of the teachers were in different schools and had little opportunity to talk with one another or to share their struggles and successes with other teachers in their own schools or throughout the district. Many of the teachers in the institute bought into the basic tenets of CGI and made some remarkable changes in their own classes, but because these teachers tended to be isolated from one another and from other teachers who might have learned from their experiences, there were few effects beyond the initial cadre of teachers.

Making It Work

We have outlined what CGI affords, the opportunities it can create for changing the core of schooling, and the potential for scaling up. Describing what CGI affords, however, is different from describing what happens in schools. The affordances play out in different environments in different ways, so we must attend to the particulars of how CGI evolves within a particular environment. The stories we have told about the ways in which CGI has evolved demonstrate that CGI in and of itself does not lead to successful scaling up. It requires those involved to recognize and develop an understanding of the principles driving CGI and to create mechanisms for the principles to lead to continued learning. It requires knowledge and skills of individuals to drive the work and a constant focus on the principles of the development of students' mathematical thinking.

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Steve Reich's *Clapping Music* and the *Yoruba* Bell Timeline

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Steve Reich's *Clapping Music* and the *Yoruba* Bell Timeline

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January 12, 2006

Abstract

Steve Reich's *Clapping Music* consists of a rhythmic pattern played by two performers each clapping the rhythm with their hands. One performer repeats the pattern unchangingly throughout the piece, while the other shifts the pattern by one unit of time after a certain fixed number of repetitions. This shifting continues until the the performers are once again playing in unison, which signals the end of the piece. Two intriguing questions in the past have been: how did Steve Reich select his pattern in the first place, and what kinds of explanations can be given for its success in what it does. Here we compare the *Clapping Music* rhythmic pattern to an almost identical *Yoruba* bell timeline of West Africa, which strongly influenced Reich. Reich added only one note to the *Yoruba* pattern. The two patterns are compared using two mathematical measures as a function of time as the piece is performed. One measure is a dissimilarity measure between the two patterns as they are being played, and the other is a measure of syncopation computed on both patterns, also as they are played. The analysis reveals that the pattern selected by Reich has greater rhythmic changes and a larger variety of changes as the piece progresses. Furthermore, a phylogenetic graph computed with the dissimilarity matrix yields additional insights into the salience of the pattern selected by Reich.

1 Introduction

The history of music is often the history of humanity's reactions to it. A good example of this may be observed in Minimalism. Since the *Second* World War, mainstream classical music has been dominated by composers such as Boulez, Berio, Cage, Ligeti, and Stockhausen, among others. These composers represent postwar Modernism, either through postserialism, Boulez being its most prominent figure, or through indeterminacy, where Cage is its most notable figure. Although the term Minimalism was originally used for visual arts, it was later applied to a style of music characterized by an intentionally simplified rhythmic, melodic and harmonic vocabulary (see [23]). Its main representatives are LaMonte Young, Philip Glass, Terry Riley and Steve Reich. Their music and ideas become the major reaction to the Modernism epitomized by the aforementioned composers. Indeed, whereas Modernism is decisively atonal, Minimalism is clearly modal or tonal; whereas Modernism is aperiodic and fragmented, Minimalism is characterized by great rhythmic regularity; and whereas Modernism is structurally and texturally complex, Minimalism is simply transparent.

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Minimalism has different materializations depending upon the particular composer, but minimalist works share concern for non-functional tonality and reiteration of musical phrases, often small motifs or cells, which evolve gradually. For example, while Young uses sustained drones for long periods of time, Glass chooses recurrent arpeggiation of chords, and Riley and Reich incorporate repeated melodies and quickly pulsating harmonies. No less significant is the fact that minimalist music possesses almost none of the main features of Western music (at least since the time of the Romantic period) that is, harmonic movement, key modulation, thematic development, complex textures or musical forms with well-designed structure. On the contrary, this music deliberately skirts around any sense or awareness of climax or development, and seems to ignore the dialectic of tension and release, at least as usually posited in the classical music tradition. As Roger Sutherland [26] says, "The listener is invited, not to follow a complex musical "argument", but to concentrate upon a slowly changing sound and focus with microscopic awareness on different aspects of it."

Probably, it is Reich the minimalist composer who most unhesitatingly repudiates the Western classical tradition. Reich objects to both European serialism and American indeterminacy because in these traditions the processes by which the music is constructed cannot be heard and discerned clearly by the listener. Before him, the critic Pousseur [21], as well as the composer Xenakis [32], had already pointed out that "where the most abstract constructions have been employed ... one has the impression of finding oneself in the presence of the consequences of an aleatory free play." This rejection, formulated not only by Reich but by other minimalist composers as well, may be the reason why minimalist music has been so incomprehensibly ignored by many critics and scholars. See, however, [21, 17, 26, 20], and, of course, Reich's essays [24, 25].

In his essay *Music as a Gradual Process*, included in [24], Reich states his principles as follows: "I am interested in perceptible processes. I want to be able to hear the process happening throughout the sounding music." For such processes to be accessible to the listener, they must flow in an extremely gradual manner. The process itself must be related to the idea of shifting phases. First, a melody is played by two or more players, and after a while one of them gradually shifts phase. At the beginning of the phasing a kind or rippling broken chord is produced; later, as the process moves forward, the second melody is at a distance of an eighth note, and a new interlocking melody arises. The process continues until the two melodies are in phase again.

These ideas are fulfilled in many of Reich's works composed between 1965 and 1973. This experimentation starts with *It's Gonna Rain* and *Come out* (both composed in 1966), where he uses phasing on tape music; it continues with *Piano Phase* (1967), and *Violin Phase* (1967), where he experiments within an instrumental context (no electrical devices); and finally, Reich reaches the highest development in *Drumming* (1970-71), *Clapping Music* (1972), *Music for Mallet Instruments, Voices and Organ* (1973), where he incorporates gradual changes of timbre and rhythmic augmentation, among other musical resources. By the end of 1972, he abandoned the gradual phase shifting processes, because "it was time for something new." [24]

This paper is concerned with a mathematical comparative analysis of *Clapping Music* and the bell rhythmic timelines of West African *Yoruba* music. This relation is not as distant as it might seem. During the summer of 1970 Reich traveled to Ghana where he studied African drumming. He learned *Gahu*, *Agdabza* and other musical styles, which influenced his music (later he also studied Gamelan music). Such an influence can be perceived to works like *Drumming* and *Clapping Music*, where the phasing is discrete rather than continuous, as in his previous works. More specifically, we study *Clapping Music* with regards to syncopation, inasmuch as it forms an essential part of that piece. Could not *Clapping Music* be considered as a piece where the first performer keeps a fixed metrical context which the second performer contradicts with a rotation of the same pattern? In other words, we almost have here the definition of syncopation (see [23]).

2 *Clapping Music*

Clapping Music is a phase piece for two performers clapping the same pattern throughout the duration of the piece. The phasing is discrete, with one performer advancing an eighth note after several repetitions of the pattern, while the other imperturbably remains playing the pattern without shifting. See Figure 1 for further details. In the following, variations produced by shifting are numbered in ascending order as $\{V_0, V_1, \cdots, V_{11}, V_{12}\}$, where $V_0 = V_{12}$ indicates that the two performers play the pattern in unison.

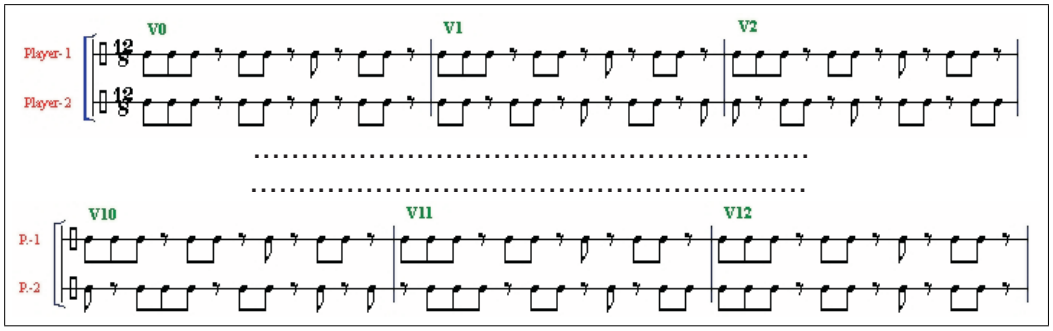

Figure 1: The first and last few bars of *Clapping Music*.

This piece, in spite of its apparent simplicity, does not lack musical interest. First of all, *Clapping Music* constitutes a synthesis and a refinement of Reich's ideas through a piece with very few elements, but very well combined. Secondly, *Clapping Music* enjoys a profound metrical ambiguity (something very common to Reich's pieces) as well as a great deal of interlocking rhythmic patterns. The analysis of those interlocking rhythmic patterns and its distribution along the piece is quite elucidating on its musical structure, as we will see later. Paradoxically enough, in spite of these rich structure, *Clapping Music* has deserved little musical analysis, in sharp contrast to the much more attention received from a mathematical point of view [10, 5, 11, 27].

3 Measuring Features of *Clapping Music*

When one listens to *Clapping Music*, a question that arises naturally is how Reich came to select that particular pattern. As the pattern shifts, a series of interlocking rhythms emerge, creating great variety. Furthermore, there is a sense of balance in the whole piece, between the resulting variations, as they create and release rhythmic tension. Once the pattern is defined however, the rulebook does not allow us to change it. Therefore, the pattern must be carefully chosen to begin with.

Phylogenetic graphs have been already used to analyze musical rhythms. In [27], a phylogenetic analysis of binary *claves* from Brazil, Cuba and some parts of Africa was carried out. *Claves* are rhythmic patterns repeated throughout a piece whose main functions include rhythmic stabilization as well as the organization of phrasing [18, 31]. Subsequently such an analysis was extended to ternary claves taken from the African tradition, and to the hand-clapping rhythms of Flamenco music ([28] and [6], respectively). In all cases, worthwhile conclusions were drawn from the phylogenetic analyses. In this paper we use the phylogenetic graphs to both analyze the structure of *Clapping Music* itself, and to compare it to the *Yoruba* rhythmic timeline.

The key mystery in *Clapping Music* is how Reich was able to find a pattern that would work so well within the constraints of process music. We believe that his inspiration for the pattern came

from his study of African drumming. In particular, we note an extraordinary resemblance between the pattern of *Clapping Music* and a clave bell pattern used by the *Yoruba* people of West Africa: only one additional seemingly inconsequential note has been added by Reich! The two patterns are shown in Figure 2.

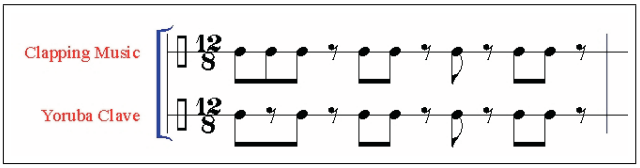

Figure 2: The pattern of *Clapping Music* and the *Yoruba* clave.

The *Yoruba* people live on the west coast of Africa, mainly in Nigeria, although they can be found also in the eastern Republic of Benin and Togo. Because most of the slaves were taken from West Africa, a diaspora took place and the descendants of the *Yoruba* people can also be found in Brazil, Cuba, The Caribbean, the United States and the United Kingdom. They are one of the largest cultural groups in Africa, and musically speaking are of great relevance. *Yoruba* music has exerted much influence on the music of the surrounding countries.

The clave considered here is widely employed as a timeline in the sacred music among the *Yoruba* people [22, 8, 1]. Bettermann [4] calls this rhythm the *Omele*. It is also found in Cuba, where it is used in several styles [19] like the *Columbia* [1].

It might be argued that there could likewise exist other clave patterns very close to that of *Clapping Music*. This is not the case, as we will be seen in the next section. Once we formally introduce the measure of distance between a pair of rhythms, we will verify that the *Yoruba* clave is the rhythm closest to the *Clapping Music* pattern among a great number of African ternary claves. These reasons constitute our primary motivation for comparing these two patterns. In fact, an intriguing natural question is whether the *Yoruba* clave itself would work just as well as the pattern employed in *Clapping Music*.

The musical effectiveness of *Clapping Music* is partly due to the way in which syncopation is dealt with. The problem of defining a mathematical measure of syncopation has not been addressed until recently. In [9], Gómez et al. reviewed several measures of syncopation, and proposed a new measure, the so-called *weighted note-to-beat distance* measure (*WNBD* measure from now on). That measure will be used here to analyze the syncopation of *Clapping Music* and the *Yoruba* clave pattern.

4 Phylogenetic Analysis

Phylogenetic graphs were originally used in Biology to determine the proximity and evolution of species. Biologists measure the degree of proximity between two species by comparing their genes. In our context, we substitute genes by rhythmic patterns, and, as a consequence, we have to define a new measure of proximity between rhythmic patterns, which now receive the name of similarity measure (measures used in Biology are not appropriate in the context of Music). The question of how to define similarity measures for rhythms has already been considered [27, 28, 30, 6]. Among the many existing similarity measures (Euclidean interval vector distance, interval-difference vector distance, swap distance, etc.), the most satisfactory one in these studies has been the directed-swap distance, first introduced in [6]. For further information on measures of rhythmic similarity the reader is referred to [30].

The directed-swap distance is a generalization of the swap distance to handle comparison of rhythms that do not have the same number of onsets. Let P and Q be two rhythms such that P has more onsets than Q. Positions of the rhythm that contain an onset will be referred to as occupied positions. Thus, the directed-swap distance is the minimum number of swaps required to convert P to Q according to the following constraints: (1) Each onset in P must move to some occupied position of Q; (2) All occupied positions of Q must receive at least one onset from P; (3) No onset may travel across the boundary between the first and the last position in the rhythm.

For example, the directed-swap distance between variations V_0 and V_1 is 4, since we have to perform 4 swaps in V_1 at positions $4, 6, 8$ and 12 to convert V_1 to V_0; see Figure 1. In our case, all rhythms will have the same number of onsets, and, therefore, computing the directed-swap distance is easy since it is then reduced to the computation of a sum with a linear number of terms [6, 30].

As mentioned before, one of the reasons for comparing the pattern of *Clapping Music* to the *Yoruba* clave is that this clave is the closest rhythm to it. The distance between them has been measured with the directed-swap distance, and the set of claves used in the comparison has been taken mainly from well-established African musical traditions. To obtain precise details about those claves consult [28] and the references therein.

The distance matrix corresponding to the directed-swap distance is shown in Figure 3. Box notation is used for the variations of *Clapping Music*. The bottom of each column indicates the sum of the swap distances to all other rhythms. Surprisingly, the sums take on only two values, 48 and 74, where V_0, V_3, V_6 and V_9 are the variations that obtain the highest score. Now we turn our attention to the diagonal below the zeros in Figure 3, that is, $\{4, 4, 4, 8, 4, 4, 8, 4, 8, 4, 4\}$. Such diagonal gives the directed-swap distance between consecutive variations. It only takes two values, 4 and 8, but it changes 6 times over a total of 12 variations.

Variations	V_0	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}
V_0=xxx.xx.x.xx.	0											
V_1=xx.xx.x.xx.x	4	0										
V_2=x.xx.x.xx.xx	8	4	0									
V_3=.xx.x.xx.xxx	12	8	4	0								
V_4=xx.x.xx.xxx.	4	2	4	8	0							
V_5=x.x.xx.xxx.x	8	4	2	4	4	0						
V_6=.x.xx.xxx.xx	12	8	4	2	8	4	0					
V_7=x.xx.xxx.xx.	4	4	4	8	2	4	8	0				
V_8=.xx.xxx.xx.x	8	4	4	4	4	2	4	4	0			
V_9=xx.xxx.xx.x.	2	4	8	12	4	8	12	4	8	0		
V_{10}=x.xxx.xx.x.x	4	2	4	8	4	4	8	2	4	4	0	
V_{11}=.xxx.xx.x.xx	8	4	2	4	4	4	4	4	2	8	4	0
$\sum$	74	48	48	74	48	48	74	48	48	74	48	48

Figure 3: The directed-swap distance matrix of the *Clapping Music* pattern.

In Figure 4 the phylogenetic graph associated to the above matrix is depicted. The graph returns a percentage of fit. If the percentage reaches 100%, then distances between nodes are exactly those of the matrix. The algorithm initially tries to impose a tree structure on the distance matrix. If it is not possible, it introduces extra nodes in order to keep a high fit percentage. See [13] for further details on the construction and properties of these graphs. Black dots correspond to the variations, while the rest of the nodes are in blue without dots; the central node is labeled as A.

This phylogenetic graph provides valuable information about the structure of *Clapping Music*. For

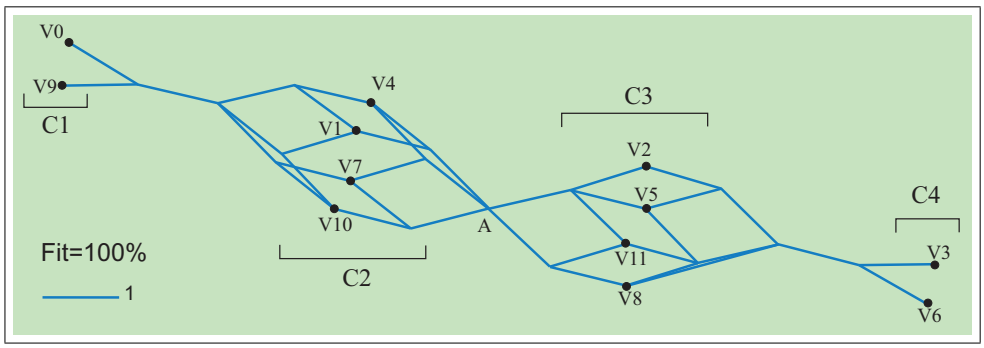

Figure 4: The phylogenetic graph of the *Clapping Music* pattern.

the moment, we consider the central node A. Such a node is an "ancestral" rhythm, and is also the center of the graph (i.e., it is the vertex that minimizes the maximum distance to any other vertex in the graph). Note also that the variations alternately go from from one side to the other respect to A. Therefore, it seems that this central node plays a key role in the piece. There is as yet no known algorithm to compute the "ancestral" nodes for rhythms in phylogenetic graphs constructed with our distance measure. However, in this case, given the small number of rather short rhythms involved, the "ancestral" rhythm can be reconstructed by hand without much difficulty. It turns out to be the rhythm in Figure 5:

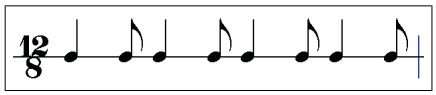

Figure 5: The "ancestral" rhythm of *Clapping Music*.

This fundamental rhythmic pattern is none other than a group of trochees. A trochee is a rhythmic grouping consisting of a long note followed by a short note. This "ancestral" rhythm has a a strong metric time-keeping character. The trochee, expressed in box notation as [x . x], is a common Afro-Cuban drum pattern, also found in disparate areas of the globe. For example, it is the conga rhythm of the (6/8)-time *Swing Tumbao* [15]. It is common in Latin American music, as for example in the Chilean *Cueca* [16], and the Cuban *coros de clave* [7]. It is common in Arab music, as for example in the *Al Táer* rhythm of Nubia [12]. It is also a rhythmic pattern of the Drum Dance of the *Slavey* Indians of Northern Canada [3].

The phylogenetic graph has four distinguishable clusters $C1, C2, C3$ and $C4$, as can be easily seen in Figure 4. When *Clapping Music* is performed these clusters appear in the order given by the following table in Figure 6:

Clusters	C1	C2	C3	C4
	V_0	V_1	V_2	V_3
		V_4	V_5	V_6
		V_7	V_8	
	V_9	V_{10}	V_{11}	
	V_{12}			

Figure 6: Clustering in *Clapping Music*.

From this sequence of clusters we may observe the evolution of the variations through time. There is a first section formed by variations V_0 to V_3; in it, each variation moves away further from V_0. In a second section, which goes from V_4 to V_6, variations are still kept away from V_0. In the third section, variations V_7 and V_8 remain around the center of the graph and represent a turning-point after which the subsequent variations move towards V_0. The variations in section four, consisting of V_9, V_{10} and V_{11}, tend towards V_0. Lastly, *Clapping Music* closes by coming back to the main pattern ($V_0 = V_{12}$) played in unison. This evolution may be detected, although less visually, on the diagonal below the zeros in the directed-swap distance.

There is another interesting property deducible from the phylogenetic graph. All rhythms in clusters $C1$ and $C4$ are at a distance of 6 from the central node A; those in clusters $C2$ and $C3$ are at a distance of 2 from A. However, rhythms to the left of A are converted into A by "pushing" their onsets to the right, whereas rhythms to the right of A are converted into A by "pushing" their onsets to the left. For example, to turn $V_0 =$ xxx.xx.x.xx $\in C1$ into A, 6 swaps are needed, but all of them are forward swaps. On the other hand, $V_3 =$ .xx.x.xx.xxx $\in C4$ is converted into A by performing 6 backward swaps (see Figure 7).

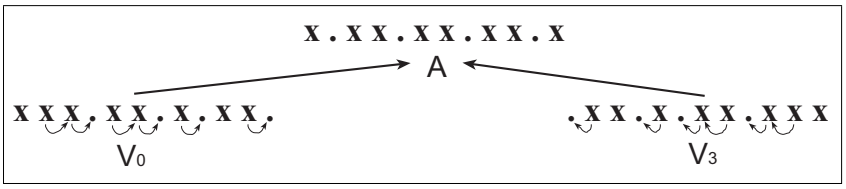

Figure 7: Converting V_0 and V_3 into the central pattern of node A.

Let us now compare the *Clapping Music* pattern to the *Yoruba* clave. To start with we present the swap distance matrix for the *Yoruba* bell pattern in Figure 8, and its corresponding phylogenetic graph in Figure 9. By looking at the bottom row of the matrix we see that the sums of the distances take many different values. The most similar rhythm is V_5 and the most different one is V_4. That does not surprises us: V_5 is the so-called *Bembé*, a very popular ternary rhythm. Toussaint [28] already proved that it is the most similar of an important family of ternary claves. Here we notice that the *Bembé* is the most similar rhythm in its own wheel (the wheel of a rhythm are those rhythms obtained by its rotations). The diagonal below the zeros is $\{5, 7, 5, 7, 5, 5, 7, 5, 7, 5, 5\}$. The difference between two consecutive variations is smaller than in the case of *Clapping Music*. Changes are more frequent in the case of the *Yoruba* clave.

The graph is a chain with a rather disappointing fit of 89%, with no ancestral nodes. Take into account that if the fit is not 100%, reasoning on the graph does not accurately reflect reasoning on the distance matrix, and accordingly, neither on the rhythms. For example, on the graph the distance from V_0 to V_2 is 2.5, but in the matrix it is actually 2. The role of A could be played by variation V_5 in this phylogenetic graph. It is the center of the graph, and as before, variations alternately go from left to right and from right to left around V_5. Nevertheless, this does not seem to unfold anything particular about the structure of the *Yoruba* clave. Hence, there is no remarkable clustering analysis to be discussed. In addition, the graph does not exhibit special symmetries or regularities of musical significance either. In reality, when the same musical process as *Clapping Music* is carried out, a rather awkward result is obtained.

Variations	V_0	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}
V_0=x.x.xx.x.xx.	0											
V_1=.x.xx.x.xx.x	5	0										
V_2=x.xx.x.xx.x.	2	7	0									
V_3=.xx.x.xx.x.x	3	2	5	0								
V_4=xx.x.xx.x.x.	4	9	2	7	0							
V_5=x.x.xx.x.x.x	1	4	3	2	5	0						
V_6=.x.xx.x.x.xx	6	1	8	3	10	5	0					
V_7=x.xx.x.x.xx.	1	6	1	4	3	2	7	0				
V_8=.xx.x.x.xx.x	4	1	6	1	8	3	2	5	0			
V_9 =xx.x.x.xx.x.	3	8	1	6	1	4	9	2	7	0		
V_{10}=x.x.x.xx.x.x	2	3	4	1	6	1	4	3	2	5	0	
V_{11}=.x.x.xx.x.xx	7	2	9	4	11	6	1	8	4	9	5	0
$\sum$	38	48	48	38	66	36	56	42	43	55	41	66

Figure 8: The directed-swap distance matrix for the *Yoruba* clave.

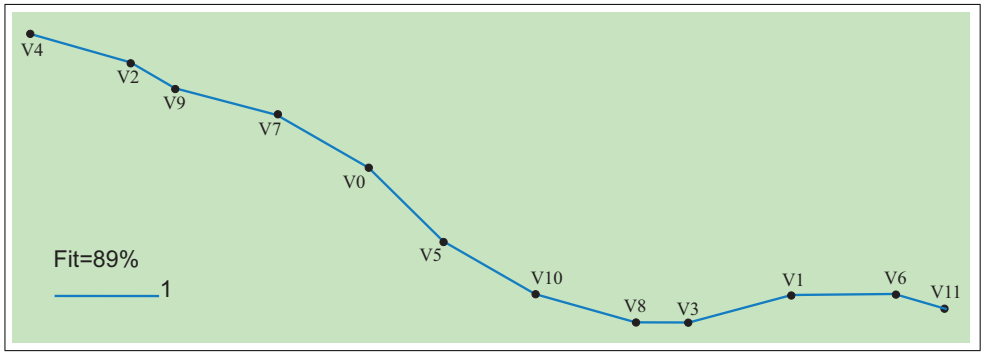

Figure 9: The phylogenetic graph for the *Yoruba clave*.

5 Syncopation Analysis of *Clapping Music*

The definition of syncopation includes the momentary contradiction of the prevailing meter [23]. According to this fact, the *WNBD* measure is based on the durations of notes and how they crosses the strong beats of the meter. This measure has a different approach than others, like Keith's measure [14], based on the structure of metrical levels, or Toussaint's off-beatness measure [29], based on the underlying polyrhythmic structure of the meter. The *WNBD* measure has proven to be more flexible and precise than the others [9].

Now we introduce the *WNBD* measure, which will enable us to analyse the syncopation of *Clapping Music*. We assume that a note ends where the next note begins. Let e_i, e_{i+1} be two consecutive strong beats in the meter. Also, let x denote a note that starts after or on the strong beat e_i but before the strong beat e_{i+1}. We define $T(x) = \min\{d(x, e_i), d(x, e_{i+1})\}$, where d denotes the distance between notes in terms of durations. Here the distance between two adjacent strong beats is taken as the unit, and therefore, the distance d is always a fraction (see Figure 10 (a)).

The *WNBD* measure $D(x)$ of a note x is then defined according to the following cases: (1)$D(x) = 0$, if $x = e_i$; $D(x) = \frac{1}{T(x)}$, if note $x \neq e_i$ ends before or at e_{i+1}; (2) $D(x) = \frac{2}{T(x)}$, if note $x \neq e_i$ ends after e_{i+1} but before or at e_{i+2}; and (3) $D(x) = \frac{1}{T(x)}$, if note $x \neq e_i$ ends after e_{i+2}. See Figure 10

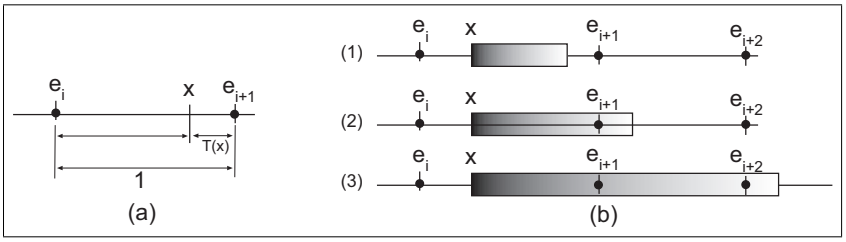

Figure 10: Definition of the *WNBD* measure.

(b) for an illustration of this definition. Now, let n denote the number of notes of a rhythm. Then, the *WNBD* measure of a rhythm is the sum of all $D(x)$, for all notes x in the rhythm, divided by n.

Figure 11 plots the *WNBD* measure of the variations in *Clapping Music* with respect to a 12/8 meter. The measure produces only three different values, namely, $24/8, 21/8$ and $12/8$, but the graph is quite revealing about how syncopation works in *Clapping Music*. Variation V_0 by itself has a high value of syncopation. Two identical ascending-descending cycles, $V_1 - V_2 - V_3 - V_4$ and $V_4 - V_5 - V_6 - V_7$, follow after V_0. From V_7, we find a symmetric cycle with respect to the previous cycle, namely, $V_7 - V_8 - V_9 - V_{10}$. Finally, we discover an ascending path to V_{12} (which is a half of the previous cycle). If variation V_1 were moved after V_{12}, then the resulting graph would have a perfect symmetry about V_7. Therefore, a strong symmetry in musical form is evident in *Clapping Music*.

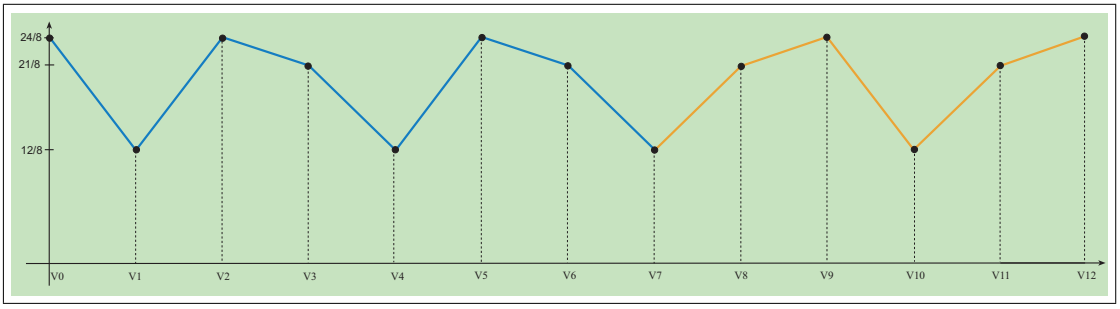

Figure 11: The graph of the syncopation measure for *Clapping Music*.

On the other hand, when looking at the graph of the *WNBD* measure for the *Yoruba* clave, depicted in Figure 12, several differences come out. As in *Clapping Music*, the measure only takes three values, namely, $21/7, 18/7$ and $15/7$. The range of the syncopation values is much smaller than in the case of *Clapping Music*, and consequently, so is its rhythmic variety. The smaller the range of the measure is, the less interesting the rhythms are from the syncopation standpoint. The graph of the *Yoruba* clave presents the same quasi-symmetry about V_7 too.

6 Concluding Remarks

Phylogenetic graphs have been already used for analyzing families of rhythms. In this paper we use them for studying the musical structure of process music, in particular Reich's *Clapping Music*. The resulting graph allows us to explore many musical properties of the piece such as the classification, evolution and transformation of variations or the structure of the musical form. We advocate the

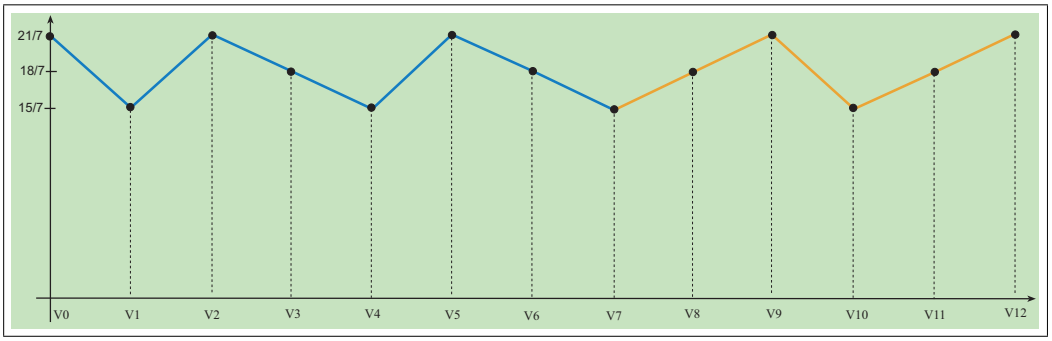

Figure 12: The graph of the syncopation measure for the *Yoruba* clave.

use of phylogenetic graphs as a useful tool for musical analysis, especially for musical styles as characteristic as Minimalism. Other Reich's pieces of similar style, like *Music for Pieces of Wood*, could be also analyzed in this way.

We have compared *Clapping Music* to *Yoruba* bell timeline since they are very close. One could expect that only one note would not make such a difference in musical terms. Quite the contrary. As we have seen, the *Clapping Music* phylogenetic graph has a richer structure than that of the *Yoruba* clave. This is a consequence of its inherent musical structure, and the phylogenetic graph is merely limited to show it.

The *WNBD* measure produces interesting conclusions too, the main one being that the rhythmic variety, at least from a syncopation standpoint, can be measured in terms of the range and distribution of values of syncopation.

Haak [10] proved that *Clapping Music* is unique from a combinatorial point of view. In this paper we have added more arguments, this time of geometrical nature

Finally, the properties exhibited by the phylogenetic graphs and the *WNBD* measure pose several open problems. For example, one may ask what rhythms give place to nice graphs, that is, graphs with good properties (symmetry, clustering, 100% fit, etc.) The *WNBD* measure gives poor results when it is used to measure the interlocking melodies (for doing that, we just substitute the meter by the pattern of *Clapping Music* and recompute the measure). Therefore, finding a function that measures the overall complexity of two rhythms is an open problem. Is still open the question of what other rhythms could work as well as the pattern of *Clapping Music*.

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ENGAGING STUDENTS WITH A CONTEMPORARY MUSIC – MINIMALISM – THROUGH COMPOSING ACTIVITIES: TEACHERS' APPROACHES, STRATEGIES AND ROLES

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ABSTRACT

A study inviting teachers at primary, secondary and tertiary level to introduce their students to composing activities through a resource album of minimalist projects noted that some teachers led their students to write "pastiche" compositions while others enabled their student composers to move beyond pastiche to an expansion of the given compositional concepts. Results examined compositions of music as imitating the style of an existing work, or whether teachers enabled their students to move beyond pastiche composition to an expansion of the given compositional concepts. This paper discusses the approaches, strategies, and roles adopted by both groups of teachers.

COMPOSING ACTIVITIES IN THE CLASSROOM

Several reasons are given for engaging students with composing activities: creative self-expression and empowerment (Burnard, 1995; Hogg, 1994; Paynter & Aston, 1970; Wiggins, 1989); developing musical and problem-solving skills and different ways of thinking (Davies, 1986; McMillan, 1991; Paynter & Aston, 1970; Plummeridge, 1980; Wiggins, 1989); influencing students in developing or maintaining a positive attitude towards the study of music (Scott, 1971); enabling students "... to understand music better; to obtain that pleasure which is inherent in the art" (Owens, 1986, p. 348, quoting Schoenberg, 1950). And by working with a contemporary aesthetic, minimalism, composition students are engaging with "... the art that is *most* relevant to us ... that of our own time" (Paynter & Aston, 1970, p. 4).

MUSIC AS A MEDIATOR OF SOCIETY

As music education increasingly engages with issues from a post-modernist perspective, discussion is often made of music and its cultural and social context. The view that music mediates changes in society, which, in turn, are reflected in the changes of contemporary musics, has been discussed since Plato, for whom some kinds of music practice were socially beneficial and others pernicious (McClary, 1987). For Attali (1985, p. 5), "art bears the

mark of its time," and music is "... a way of perceiving the world ... it reflects the manufacture of society; it constitutes the audible waveband of the vibrations and signs that make up society. *An instrument of understanding, it prompts us to decipher a sound form of knowledge* [and] ... provides a rough sketch of the society under construction ..." (pp. 4-5, author's italics). In the school environment "the music class is always a society in microcosm, and each type of social organization should balance the others" with a place for individual expression (Schafer, 1975, p. 4). Reimer (1994) found music educators responsible for illuminating the two essential dimensions of all music – first, that it is sonorous expressive form, not in isolation, but as culturally derived, second, that cultural values and experiences become music when given sonorous expressive form (p. 243). And within the expressive form of composing, Elliott (1995) noted that – "whenever individuals begin to compose, they are never acting 'alone.' Their composing is always 'situated' and social ..." (p. 162).

How minimalism "bears the mark of its time" has different interpretations. For Small (1980), the multi-repetition in Terry Riley's *A Rainbow in Curved Air* brings about a lack of tension, development, and drama; an ability to exist wholly in the present and not demand concentrated, steady listening, offering the human race recognition of its relationship to nature, where the time of clocks and the tyranny of the future can be transcended and the individual finds his or her proper relation to society. And Riley himself, (cited in Smith and Smith, 1995) has spoken of minimalism as part of the climate of the time which "... made people feel aesthetically something they hadn't felt in previous musics. ... The climate was one of hope, of deepening spirituality, as was the whole of the 1960s" (pp. 231-232).

Multi-repetition, however, can be heard as nothing more than pure escapism "offering the opportunity to flee from reality, sometimes in response to individual dissatisfaction with the dominant socio-cultural system, and sometimes as a result of the pressure imposed by the socio-economic system in times of crisis" (De Meyer, 1985, p. 395). For DeMeyer, the hypnotic-ecstatic experiences often associated with multi-repetition make minimalism into nothing more than a drug, and in musical-political terms, extremely conservative as it seeks neither to protest nor to take a political position. Writing of Australian composer Matthew Hindson's orchestral work *LiteSPEED* (1997), which incorporates sections using multi-repetition, Kouvaras (1995) found that the title and tempo play on an association with drugs such as speed/ecstasy, substances associated with "invincibility/ indestructibility, ecstasy, hyperactivity, paranoia, and . . .stamina" (Kouvaras, 1995. p. 3) by their users.

Discussion of music and its cultural and social context in music education has focused on musical cultures from outside the Western world, on popular musics and, less frequently, on Western art music. When the student's learning environment is based on the culture of contemporary art and popular musics through composing activities, connections between the student and contemporary society are activated.

A CONTEMPORARY AESTHETIC – MINIMALISM

Born in the 1960s, minimalism today, some 40 years on, is still strongly pervasive in the disciplines of fine art, interior design, architecture, dance, cuisine, and music. In music, minimalist characteristics can be heard in art and "non-Western" musics and in popular

musics, especially "trance" and "rave" dance music. Introducing student composers to the compositional techniques of minimal music brings about an engagement and interaction with a contemporary aesthetic which is relevant to their culture and society. Minimal music does not ask students to compose pretty tonal melodies with chordal accompaniments and therefore offers engagement in debate and conjecture in the contemporary arts.

Minimal music is often characterized by multi-repetition, unchanging pulse, fast tempo, slow-moving harmonies and gradually changing processes. Educationally, these musical characteristics offer student composers connections with their existing musical knowledge – tonality, tertian harmonies, pulse, repetition and ostinati – and new challenges of tightly constructed compositional processes and the effect of "vertical time" resulting from multi-repetition. Through the infusion of common musical characteristics, minimalism provides a bridge for discussion of, and compositional interaction with, art music, music of non-Western cultures, in particular African and Asian musics influential on established minimalist composers, and popular musics.

METHODOLOGY OF THE STUDY

The study aimed to investigate how teachers engaged their students in the age groups 9, 12, 15, and 18 years with minimal music composing activities drawn from a resource album of projects designed for the study and why they chose the approaches and strategies they adopted, and to examine associated student compositional outcomes. A methodology was sought which could gather information from teachers in a number of countries, working with students of different age levels and which would accommodate the fact that I was not an on-site observer and interviewer of the teachers in the study. Yet I also needed to draw insights and reflections from participating teachers on how and why they introduced minimal music to their students and the approaches and strategies they adopted.

PARTICIPANTS

My study sought teachers at primary, secondary, and tertiary levels who showed a glimmer of interest in contemporary music and/or minimalism. I frequently employed a strategy of network selection in which each successive participant was named by a preceding individual (LeCompte & Preissle, 1993, p. 73). This strategy is considered useful in situations where the individuals being investigated are scattered throughout populations and from no naturally bounded common groups (p. 74). Twenty-four teachers accepted my invitation to take part in the study, and, of these, 19 engaged their students with the album of projects and submitted information for the study. The participants lived and taught in Hong Kong (2), New Zealand (3) and different areas of New South Wales, Australia (14), and their responses provided the principal data for the study.

DATA GATHERING PROCEDURES

The study adopted two data-gathering procedures. The first was a kit of resource materials containing *The Pulse Music Album* (Blom, 2001), a booklet of eight projects with an explanatory introduction about minimal music. This resource booklet was designed from

my own teaching experience with minimal music in a Preliminary Study. The kit also included an introductory letter and a cassette containing nine excerpts of minimal music for teachers to use as they wished. The excerpts were from *Six Pianos* (1973) by Steve Reich; *Music in Twelve Parts* (1974) by Philip Glass; *Hoketus* (1976-77) by Louis Andriessen; *The Desert Music* (1984) by Steve Reich; "Open the Kingdom" from *Songs from Liquid Days* (1985) by Philip Glass; *In C* (1964) by Terry Riley; *Tehillim* (1981) by Steve Reich; *Skulumayele* by Amampondo; and Balinese gamelan music. Of the eight projects in *The Pulse Music Album*, six drew on minimalist processes found in works of established composers whose works are often described as minimalist – phase shifting (Steve Reich), isorhythmic overlap (Hugh Shrapnel, Anne Boyd, Robert Lloyd), additive (and subtractive) rhythmic construction (Philip Glass, Frederic Rzewski), repeated chord patterns (Philip Glass), the repeated cells of Terry Riley's *In C*, and canon (Steve Reich). Two projects were based on non-Western musics – the layered, multi-metric structure of the music of the Ewe tribe of Ghana, which influenced Reich's compositional procedures; and the Malay Trengganu gamelan, an Asian ensemble simpler in structure than those of Bali and Indonesia which influenced several American and Australian "minimalist" composers, built on similar musical characteristics of repetition of rhythmic figures, repetition of a small pitch set, heterophony, "belungan," and colotomic structure, however. Because of the range of age groups being targeted, the music exercises and pieces in the album offered for performance and as compositional models did not suit all age groups. Teachers had to be prepared to adapt and develop the project material, to write their own "models," to simplify or "extend" the music exercises and pieces, or to expand the material from the album exercises and pieces through their own or the students' compositions. The project material focused on structural processes with musical exercises and short pieces given descriptive titles as models. Teachers were asked to submit compositional outcomes on cassette or score in relation to their work with their students and the project material.

The second data-gathering procedure was a set of four open-ended questionnaires through which teachers responded in writing to their work with the resource projects. Open-ended written questionnaires are best suited for groups of people who are spaced geographically, and who may be expected to have an interest in the topic under survey (Mann, 1985), as was the case in this study. The questionnaires sought information about teachers' education, musical preferences and teaching experience; their teaching environment, including school music resources, class level and knowledge; teachers' teaching philosophy, aims and methods; strategies and approaches adopted to facilitate composition teaching with *The Pulse Music Album*; and responses of the teachers, plus their perspective on the students' reactions, to their work with the project material.

ANALYSIS

Information gathered from the open-ended questionnaires resulted in extensive individual teacher profiles being established. I then sought to understand the nature of the information from these profiles, plus the associated student compositions, through investigation of the process of each teacher. The written responses drawn from the teachers' questionnaires, plus submitted artifacts such as lesson handouts and lesson plans, were analyzed and coded

as relevant categories and sub-categories emerged (Ely, Vinz, Downing, & Anzul, 1997). I looked for what Tesch (1990) has referred to as commonalities and uniquenesses. For Becker (1998), uniquenesses or "unusual events" keep the researchers' eyes open and demand investigation into what obstacles prevent them from happening all the time.

By offering all teacher participants one resource booklet of projects, everyone was required to work with the same material. This offered an opportunity for analysis of the submitted compositions, mainly student works with some written by teachers, through comparison with the "models" in *The Pulse Music Album* projects. The compositions were submitted as scores and/or on cassette. While most compositions not submitted in score were transcribed, analysis and examination was also undertaken aurally as "the 'music' is what we hear [and] we should ask ourselves, 'What can I say about this *as music*?'" (Paynter, 2000, p. 8).

FINDINGS DRAWN FROM THE SUBMITTED COMPOSITIONAL OUTCOMES

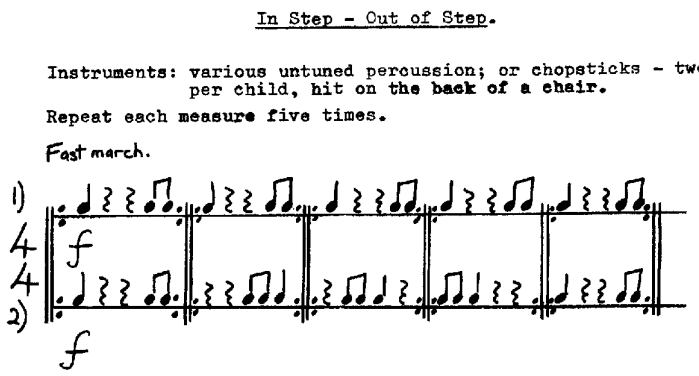
Through this comparative analysis, two groups of compositions were observed. The first group were pastiche works which copied concepts and ideas used in the "model" compositions given in *The Pulse Music Album* projects. The second group of compositions moved beyond the concepts introduced in the album projects and expanded upon the ideas of the "model" compositions. This expansion occurred in some, but not all, compositions submitted from across the four age groups of the study.

The focus of this paper was on the commonalities and uniquenesses drawn from the teachers' questionnaire responses, rather than on the compositional outcomes. However, some description of how this compositional expansion occurred will illustrate the difference between a pastiche composition and a work which has moved beyond pastiche to an expansion of the given concepts. Compositional manipulation and expansion of the construction process occurred through such changes as simplification of the phase shifting process, changing the tempo and adopting instrumentation to illustrate a programmatic theme (9 years); and through manipulation of tempo involving the combination of two processes in one piece with different tempi for each layer (15 years). Adoption by students of smaller devices, including anacrusis, syncopation, instrumentation, and drone often moved the feel and style away from those of the projects pieces, at the same time expanding and enriching the sound texture of the student compositions.

Frequently, the compositional expansion involved structural manipulation. At the nine-year age level, for example, one composition combined several phase-shifted rotations horizontally and vertically into a work substantially longer than the project models. In the 12-year age group, one composition incorporated a call and response structure into the phase-shifting rotated repetition.

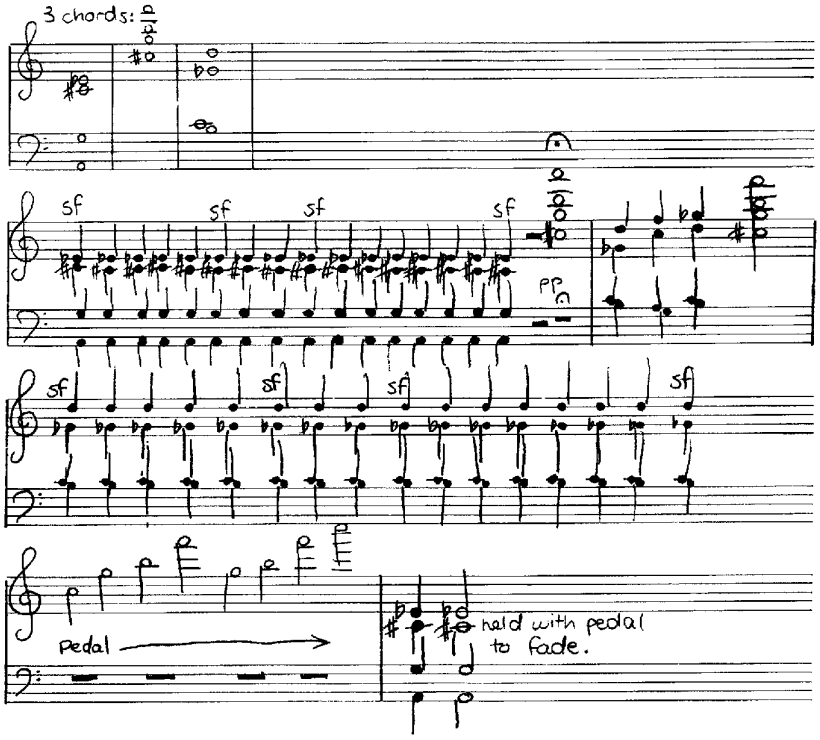
A student in the 15-year age group was introduced to multi-repetition as an integral part of the phase shifting (Figure 1) and additive processes.

Figure 1: PHASE SHIFTING EXERCISE FROM *THE PULSE MUSIC ALBUM*



She then employed multi-repetition as a textural device without a process in a short, freely-structured student composition (Figure 2).

Figure 2 *FREELY-STRUCTURED STUDENT COMPOSITION* (15 YEARS)



At the 18-year age level, compositional devices from minimal music and gamelan music were shaped into two extended pieces with unique structures and contexts.

APPROACHES, STRATEGIES, AND ROLES COMMON TO BOTH GROUPS OF COMPOSITION TEACHERS

Within the 19 participating teachers, two groups emerged. The first group comprised those who were able to lead their students to pastiche composition, copying the ideas and concepts presented in the "model" compositions. The second group were able to lead some, but not all, of their students beyond pastiche composition, to an expansion of the introduced concepts.

The range of approaches, strategies and roles adopted by the nineteen study participants illustrated the wealth of ideas being used in composition teaching, and many were common to the compositional teaching processes of both groups of teachers. The majority predicted that the project material would fit in with their current music teaching. In doing so they demonstrated flexible music programs which could accommodate material deemed to be new, interesting, and relevant, and then responded immediately to such material when offered.

Because most teachers chose projects based largely on the project order laid out in *The Pulse Music Album*, the first project, Phase Shifting, was most frequently chosen to introduce students to minimalism. This "first page syndrome" occurred despite the album introduction encouraging teachers to use the material in any order and how they liked. The first project was not always the best with which to start a class, and the teachers needed to understand that using a resource book not designed for sequential use requires a thorough reading and understanding of the material before it is employed in the classroom. The book needed to state this clearly.

Because Phase Shifting opened with exercises and pieces for untuned percussion, teachers in both groups often asked students to write for untuned percussion ("first exercise syndrome" within "first page syndrome"!). Students often found writing minimalist processes for untuned percussion too abstract and mechanical and therefore boring, and this was the reason why a number of teachers in the study (beyond the 19 discussed here) did not continue with the project material. A more positive response was often given, and titles employed, by students when their composing activities employed a pitch set.

The majority of teachers outlined common ground between the projects and previously held student knowledge. This could be as general as improvising, composing, and performing activities, material for an "integrated approach," or harmonic material, or as specific as ostinati, pentatonic composition, Reich's *Clapping Music*, canon, and rounds. Familiarity through common ground, deliberately sought or accidental, provided an anchor, psychological or practical, for teacher and students from which exploration with new material was undertaken, and which often led to composing activities with other musical concepts and styles.

Contextualizing the project material was undertaken by the majority of teachers in both groups working with the two older age groups but by none of the "pastiche" teachers working with the younger age groups. Contextualization took place in several ways:

1. discussing minimalism as an aesthetic;
2. introducing students to relevant music of living composers through recordings, live concerts, or the composers themselves;
3. integrating music with other subject areas (e.g. Asian studies);
4. exploring resources of contemporary music such as *The Pulse Music Kit*;
5. introducing students to relevant prerecorded music;
6. drawing on aspects of the students' society through text, humor and aspects of popular music, that is, evidence of the "personal voice"[1] of the student; and
7. giving concerts of compositions which placed student works into the wider contemporary society and offered opportunities to "disturb habitual ways of feeling and perceiving" (Small, 1980, p. 217) – thus making the composing process relevant to the student composer.

By making new material relevant to the contemporary society of the students, teachers were able to lead them more quickly to a deeper understanding of the material and on to a more satisfying and meaningful exploration and expansion of the material.

Several teachers from both style groups across all the age groups recycled material from one previously written composition to a new composition, using the strategy, at times, as an intermediary stage between playing the model and commencing original composing activities. This allowed material familiar to the students to be introduced in a different way, building on obvious common ground. At the same time, it gave students the opportunity to understand that manipulating and transforming musical material is at the heart of the composing process.

Recycling appeared in different formats:

1. Rhythmic material from one composition was used as the basis for another piece often through the addition of pitch, and one student employed a retrograde version of a pre-existing rhythm from a project model.
2. New texts were written for project models, bringing a relevance to the students' context.
3. A visual image from one project was recycled to serve as the programmatic inspiration for composing activities with a different project.
4. The opening of a project work was welded onto a newly composed or improvised continuation.
5. Instrumentation was changed from one performance to the next (e.g. voice to instruments), thereby introducing students to new and varied sound colors.
6. One teacher's worksheets included a number of compositions from my projects with subtle changes made, and acknowledged, by him.

The majority of teachers noted that recording student work, despite being time-consuming, was valuable for student self-reflection, enjoyment, evaluation of peers and self-evaluation, discussion of composition and performance, and it offered students opportunities to hear

[1] The term "personal voice" is used by my composition colleague, Dr Bruce Crossman, to describe the conscious and subconscious placement of the self and one's creative interests into the composing process. See Crossman (2002).

and consider their pieces holistically. Recording also lays a foundation for students to be able to record their work for distribution into the wider community.

Improvisation was often used as part of the composing process by teachers who moved their student composers beyond pastiche, and by some "pastiche" teachers working with older students. However, improvisation tended to be overlooked by teachers engaging younger students with composing activities. Teachers who chose the approach to improvisation most suited to their students and their composition task enabled some of their student composers to expand aspects of the project models. Effective approaches included (a) an improvised "gamelan" piece in unmetered time based on a pentatonic scale inspired by the prerecorded sound of a gamelan; (b) placing improvisation at the heart of the composition teaching process with students encouraged to adopt an empirical approach to composing whereby improvisation leads to creative decision-making on paper or tape, an approach Burnard (2000) found to be at the heart of many student composers' composing process; (c) adding an improvised layer to a phase shifted layer, recycling the opening of a pre-existing composition and continuing with new improvised material; (d) improvising echo or call and response patterns as an intermediary composition/performance stage; and (e) encouraging students to freely break into improvised sounds during performance.

A common series of steps in the composing processes emerged. This was adopted by the majority of teachers with some variation in order and options. This strategy sequence (Table 1) facilitated the introduction of material new to the students and, for many, new to the teachers as well.

Table 1: STRATEGY SEQUENCE FOR INTRODUCING CONTEMPORARY MUSIC NEW TO STUDENTS (AND NEW TO TEACHERS) THROUGH COMPOSING ACTIVITIES [2]

1.	(Contextualizing material – playing excerpts of prerecorded, relevant music for aural analysis)
2.	Performing a composition from the project
3.	(Recording the performance)
4.	Discussion of structure and other compositional concepts
5.	(Improvising and/or composing empirically)
6.	Undertaking composing activities based on a model – prescriptive task design
7.	Playing student compositions
8.	Recording the performances
9.	(Evaluating the compositions and performances)

A New Zealand-based composer-in-schools reversed the strategy sequence. She moved through discussion and composition to improvisation, guiding students as they composed, performed, recorded and evaluated pieces which moved beyond the ideas presented in the project. These were eventually performed (without notation) in a school concert. Because

[2] bracketed activities were employed by some, but not all, teachers.

of professional experience as a composer, she was able to absorb and distill the ideas in the projects and communicate them without channeling students through performance and analysis of project models.

The 19 teachers were student-centered, to varying degrees, relying on feedback from students to determine needs, interests, strengths, and deficiencies, thus allowing themselves then to monitor how effectively the course of study addressed these areas. This, plus giving students the opportunity to progress at their own rate, allows music to become an empowering agent (Stowasser, 1996).

Teachers introducing the project material to students in more than one age group, adopted similar but not identical approaches, strategies, and roles across the classes. These similarities in approach, strategy, and role, from one age group to the next, support and broaden Hogg's (1994) finding that a teacher's perspective shapes his or her teaching objectives, approaches, and strategies, and that these rarely change as they move from one activity to the next.

DIFFERENCES BETWEEN THE APPROACHES AND STRATEGIES ADOPTED BY THE TWO GROUPS OF TEACHERS

The teachers who enabled some of their students to move beyond pastiche composition ("expanders") adopted approaches and strategies seldom or never undertaken by the pastiche teachers. The expanders working with the 9- and 12-year age groups outlined aims for the project material focused on skills and concepts, while the pastiche teachers outlined aims focused on empowerment, improvisation, and performance. For the two older age groups, these focuses were reversed, with the expanders aiming for empowerment, organizing sound through composition and performance plus some skills knowledge, and the pastiche teachers focused on skills, notation, culture, and some composition. My evaluation of their teaching noted, however, that the majority of expanders focused their actual teaching on composition while the majority of pastiche teachers focused on other music activities including performance, notation, computer software, culture, and improvisation. In practice, therefore, the majority of expanders remained focused on the composing process while the majority of pastiche teachers were distracted by activities other than composition. This was reflected in the expanders' high ranking of composing activities as a music classroom activity, and the high ranking of music activities other than composition by the pastiche teachers.

All teachers adopted a prescriptive composition task design using one or more composition(s) from the projects as model(s). Burnard (1995) described this style of task design as having a "high degree of control operating on, and governing decision making" (p. 37). She found that compositions written under the guidance of this type of task design resulted in isolated instances of divergence, but overall a similarity of music was created. The prescriptive task design based on a template or model was useful for focusing beginner composers at all levels, through initial pastiche writing, on particular compositional techniques new to them which needed to be understood before a freer task design could be offered. The pastiche teachers with all the age groups retained a prescriptive single model task design, at times employing a template to control early composing activities, and this resulted in pastiche compositions.

Expanders worked with single- *and* multi-focused prescriptive task designs. Those who adopted a single-model prescriptive composition task design achieved expansion of the project models beyond pastiche in one of three ways: first, by the teacher leaving student groups or individual student composers to achieve expansion of the project concepts by themselves (often bright students); second, by teachers working as composers with the students through "composition by committee" (Webster, 1992, p. 273), an approach in which students compose melodic phrases individually and then vote for the best as a group, making decisions about compositional aspects and exploring, at times through improvisation, until a satisfying outcome is achieved; and third, by the teacher adding an improvisation layer over the students' pastiche phase-shifting line. A multi-focused task design immediately offered opportunities to make decisions and choices and enabled exploration beyond pastiche writing. When material was new, teachers using a task design which deliberately embraced common ground with previous knowledge provided a bridge and therefore a way of familiarizing and orienting the new material for teacher and students. However, at times, familiarity with material resulted in revision which negated the impetus to move forward, and the teachers needed to employ strategies leading to exploration of musical material through composition. There are composition task designs which can help this explorative forward impetus, and teachers need to be aware of the variety of styles of composition task design – for example, prescriptive tasks, choice tasks, and freedom tasks (Burnard, 1995) – and the potential compositional outcomes from each.

The majority of expanders and pastiche teachers working with the 15-year age group only highlighted, through analysis and discussion, how compositions are structured and the construction processes involved, process being one of the distinguishing characteristics of much minimal music. This encouraged students to consider exploration and expansion of these parameters in relation to the model offered as the basis of a compositional task design. Similarly, drawing attention to the composer's use of all musical parameters as they arise in the composing process marks them worthy of consideration for change and compositional expansion.

The majority of expanders working with the 9-, 12-, and 18-year age groups, and pastiche teachers working with the 15-year age group, submitted compositions with titles. These provided a stimulus and focus for compositional outcomes with young or inexperienced students, a finding noted previously by Davies (1986), especially when drawn from the students' interests. They can also indicate an involvement by students in the composing process, making the piece relevant to themselves and indicating self-motivation.

The relationship between time and compositional outcome was complex. Younger students who were set composition tasks which could be achieved satisfactorily in a short period of time within a time frame which allowed for more than one task, further exploration and self-evaluation to take place, expanded the compositional ideas. Expanders adopted strategies such as "instant composition" (MacGill, 1988, p. 42), in which ideas by students and teacher are written down quickly so that the raw material on the page can be altered, expanded, or discarded. This encouraged fast, simple, creative thinking and notation skills and moved students rapidly through introductory pastiche writing. It offered more experienced student

composers a way of exploring ideas in the preliminary stages of composition, and through class composition these were shaped and combined into larger pieces. Older or more experienced students required a longer time frame for engagement with sound exploration, empirical composition, or composing to symbol, and building more complex textures. The pastiche teachers said their students took a long time to compose yet worked with the material for shorter time periods, despite noting that their students were not all composing straight to symbol but requiring time to work from sound to symbol.

Most of the 19 teachers in the study wrote that they engaged with composing and arranging as a personal activity. This facility, however, emerged predominantly in the teaching of the expanders in the following ways: (a) composing with the project material themselves prior to introducing it to their students; (b) composing with the students in the classroom (mainly those working with the younger age groups); (c) working as teacher as composer, showing the students their own facility with composing as they taught; and (d) adapting project material according to the students' developmental levels through simplification, arranging and modularizing. The majority of pastiche teachers used material directly from the project.

This pointed to a need for teachers to learn to compose and arrange and become confident with the compositional process themselves in order to fully explore new musical aesthetics, styles, and genres through composition in the classroom.

The majority of expanders engaged their students in group and class composing activities, resulting in student interaction with others in the classroom and "composition by committee." At least half of the expanders in each age group also engaged their students as individual composers. The pastiche teachers also favored group and class composition, but three teachers, working with the two younger age groups, engaged students as individual composers. The most valuable composing environment was for inexperienced composers (of any age group) to work as a class or in groups rather than being offered individual composing tasks only. For older or more experienced student composers, the most valuable composing environment was working as an individual, with group or class composition being used as a workshop impetus to these individual activities. With composing confidence comes a desire to create as an individual at all ages and older students who are more intellectually in charge of the composing process can choose to work by themselves, engaging in group or class composition through workshops when new ideas are being explored.

Expanders submitted recordings of compositions which were, on the whole, accurate and strong performances. Many teachers across both groups commented on problems associated with performing minimalist compositions – keeping track of multi-repetition, maintaining a steady pulse, and not becoming confused by other contrapuntal lines. Few teachers in either group encouraged students to write for, and play, instruments on which they have facility and idiomatic knowledge – piano, instruments of the concert band, rock group and/or orchestral instruments, or recorders. Instead, tuned keyed percussion, which few students learn formally, were often used. Expanders, however, allowed students to play by ear, by memory, from notation, or a combination of all three rather than just notation. They suggested that student composers consider writing audible cues into their compositions rather than relying on visual conducting, and many deliberately left time for rehearsing in

order to reach a satisfying level of performance without striving for a perfection which may not be achievable. Several teachers took part in playing with the students, acknowledging mistakes when necessary and engaging in a two-way learning rehearsal process. I noted a need for teachers and students to be alert to unexpected aural outcomes resulting from inaccurate performances of notated scores, as these fresh, serendipitous ideas, different from those intended by the student composer, were often worth exploring.

The majority of expanders outlined an empowering, holistic music philosophy focused on fun, enjoyment, striving, links with the community, love of music, and holistic creative outcomes. This reflected a similar need beyond music education, in business, for example, where others have asked, "if you haven't got a philosophy about life, how can you manage people?. . . .You're managing lives; you've got to understand what people are about, what they need, what motivates them" (a finance director cited by Moodie, 2001, p.43). The strongly-stated music education visions voiced by these teachers as to why they were teaching music to (often reluctant) students had a sense of direction which, despite, at times, lack of experience with and knowledge of composition teaching and twentieth century music, provided an opportunity for self-reflection about why one teaches music.

ROLES FOR COMPOSITION TEACHING

Several different teaching roles were adopted. Despite very different backgrounds and teaching approaches, the majority of expanders were "enablers" (Cain, 1985), setting up conditions in which the pupils may discover music, with composition the most comfortable activity. Cain has suggested that this would probably dominate the teacher's curriculum, and while listening to compositions in process and offering advice, he or she would "... always shrink from actually telling the pupils what to do" (p.6). The expanders allowed and encouraged students to explore as they composed and move beyond the ideas presented in the project models to a deeper compositional experience.

Several teachers were experienced composers or experienced with teaching composition and actively guided their students to an expansion of the project concepts. Some, despite their composition experience, were unable to lead their students beyond the project material because they worked with the project material by themselves prior to entering the classroom rather than composing with the students in the classroom. Other composing teachers adopted a two-way learning approach (Nomura, 1996) using their experience with composition and composing with the students, guiding, exploring and learning from one another. The majority of pastiche teachers were largely "instructors" (Cain, 1985), passing on a body of received skills, information, and perhaps values (p. 6) and less able to lead students on to compositional exploration.

The roles of "enabler" and "teacher as composer" were the most valuable for teachers working with student composing activities as they allowed both students and teacher to reveal their potential. The role of enabler was heightened considerably when teachers had a spirit of creative adventure, were experienced with, and intellectually in charge of, the composing process themselves, and could see the potential of compositional material. They, in turn, were able to communicate this potential to their students and to facilitate student

exploration of sound and compositional techniques. Cain (1985) called this the teacher as "guide", providing opportunities for students to compose but also helping them develop their compositional techniques (p.10).

Because the material was new to them, some teachers worked quite overtly as "teacher as student", learning about the projects as they introduced ideas to their students. While this was often an impetus for triggering composing activities in the classroom, it could become self-focused and therefore less positive for the students when the teacher's learning curve was high and preparatory learning, which should have been undertaken before entering the classroom, took time and focus away from composing activities. Three teachers in the study adopted, in a small way, the role of "teacher as researcher" and submitted valuable reaction and response feedback from individual students to the project material which they read, and which could affect their future composition teaching.

CONCLUSIONS

While all teachers drawing on ideas from *The Pulse Music Album* for composing activities used many similar approaches, strategies, and roles when introducing their students to composing activities, those adopted by some teachers enabled them to lead their students beyond pastiche composition to an expansion of the ideas and concepts presented in the project compositions and exercises (Table 2). This has ramifications for the student composer who is always, to a greater or lesser extent, inextricably linked to the composition teacher, the "greater" link near the beginning of, and the "lesser" later in, the composing process (Martin, 2002).

Table 2: SUMMARY OF APPROACHES, STRATEGIES AND ROLES

	EXPANDERS	PASTICHE TEACHERS
Approaches & strategies		
Flexible music program accommodating new, interesting, relevant material	Yes	Yes
First page syndrome	Yes	Yes
Common ground with previously held knowledge	Yes	Yes
Contextualizing material	Yes (15 and 18 yrs)	Yes (15 and 18 yrs)
Recycling material	Yes	Yes
Recording student work	Yes	Yes
Improvisation	Yes (older students)	Yes (older students)
Strategy sequence	Yes (not the composer-in-schools)	Yes
Student-centered	Yes	Yes

	EXPANDERS	PASTICHE TEACHERS
Lesson focus	Composition	Other activities (plus composition)
Prescriptive task design	Single-model *and* multi-model/ multi-focus (and template)	Single-model (and template)
Discussion of structure and construction	Yes	15 yrs only
Titles for compositions	9, 12 and 18 yrs	15 yrs only
Time to compose	Long teaching time, short composing time, sound to symbol, 'instant composition' – (9, 12 and 15 yrs)	Short teaching time, long composing time, sound to symbol
Adapting material	Yes	Seldom
Composing as a class, in groups, as individuals	Class and in groups with younger or inexperienced student composers; Individual for older or more experienced student composers (group workshops)	Individual for younger students (and some older) Class and in groups for younger students (one teacher), older students
Teacher composing	Yes, usually in the classroom in front of/with the students	Composing undertaken prior to classroom work; material used directly from the projects
Performing	Tuned keyed percussion, audible cues, students playing by ear, memory, notation or combination of all three, time to rehearse = satisfying performance	Tuned keyed percussion, visual conductor, students playing from notation, insufficient time to rehearse = unsatisfying performance
Empowering, holistic music philosophy	Yes	Seldom outlined
Roles:	Enabler	Instructor
	Guide	Instructor
	Teacher as composer composing in the classroom in front of/with the students	Teacher as composer but composing undertaken prior to classroom work

	EXPANDERS	PASTICHE TEACHERS
	Two-way learning	One-way learning
	Teacher as student (some)	Teacher as student (some)
	Teacher as researcher	Teacher as researcher

The expanders adopted the roles of enabler, guide and teacher as composer, and often understood the compositional process through personal composing experience; focused students on composing activities without distractions; chose task designs which encouraged exploration; discussed structure and construction; allowed students to compose as a class; in groups and as individuals; encouraged students to consider giving their compositions titles; balanced various aspects of time within the composition lesson; and brought about strong, accurate performances. In doing so, they were able to lead their students to a deeper understanding of the compositional process.

This ability of some teachers to enable students to write pastiche compositions and other teachers to move student composers beyond pastiche composition indicates an ability to engage students in "surface [or] deep learning" (Ramsden, 1992, p. 42) with composing activities. These ways of learning are "concerned with whether the student is searching for meaning or not when engaging with a learning task" (p. 42) and whether he or she is focused on, and concerned with, "the significance of the task ... [and] what the task is about" (p.43). We can apply Ramsden's concept of surface and deep learning to the composition teaching process when teachers enable their students to compose pieces which manipulate and expand given concepts presented in composition models, lead them to understand the significance of the composition task, and search for meaning beyond the confines of the task design.

This search for meaning can be heard and seen overtly in the student compositions submitted for the study through the inclusion of tangible and relevant aspects of student society and culture, and evidence of a "personal voice". Younger students worked with images of pollution, the zoo, and a train. Older students included student humor in titles, texts, and musical content, and they drew on musical characteristics of popular music idioms. Some teachers encouraged students to write for instruments they had expertise on – piano, electric keyboard, recorder, or strings. There was evidence of personal journeys of musical exploration in some compositions of older students, and across all age groups teachers and students drew on the sounds and structures of non-Western musics, including those of the gamelan and African musics, at times changing the context to suit the school environment.

Teachers who can lead their student composers through pastiche composition, based on introduced concepts, on to compositions with tangible evidence of self-expression and ownership of the compositional material, offer students opportunities for personal creative satisfaction and empowerment. And if the introduced material is drawn from a relevant and contemporary music aesthetic, such as minimalism, then these teachers are facilitating in students a deeper engagement and dialogue with contemporary society and culture.

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ABSTRACTS

L'engagement des étudiants avec une musique contemporaine — le minimalisme — par des activités de composition: Approches, stratégies, et rôles des enseignants

Une étude invitant les professeurs des niveaux primaire, secondaire, et tertiaire à présenter à leurs étudiants des activités de composition à l'aide d'un album de ressources (projets de musique minimaliste) a noté que certains professeurs ont mené leurs étudiants à écrire des compositions en pastiche. Les résultats ont examiné si les compositions imitaient le modèle d'un travail existant, ou si les professeurs ont permis à leurs étudiants de se déplacer au delà de la composition en pastiche à une expansion des concepts compositionnels donnés. Cet article discute les approches, les stratégies, et les rôles adoptés par les deux groupes de professeurs.

Komponieren als aktiver Zugang zu einer Form Neuer Musik - Minimal Music – für Schüler: Annäherungen, Verfahren und Funktionen.

Die Untersuchung möchte Lehrer im Primar-, Sekundar- und Tertiärbereich ermuntern, ihre Schüler in das Komponieren unter Verwendung eines Albums mit minimalistischen Projekten einzuführen, wobei anzumerken ist, dass einige Lehrer ihre Schüler anleiteten, Stilkopien zu schreiben. Bei den kompositorischen Ergebnissen war zu prüfen, ob sie den Stil eines bestehenden Werks nur imitierten oder ob die Lehrer ihre Schüler befähigt hatten, über bloße Imitation einer Technik hinauszugehen in Richtung auf die Erweiterung eines vorliegenden

Kompositionskonzepts. Der Artikel untersucht die Verfahrens- und Vorgehensweisen, die beide Gruppen von Lehrern anwandten.

Comprometiendo a estudiantes con la música contemporánea minimalista, a través de actividades de composición: Las aproximaciones de los maestros, sus estrategias y roles.

Un estudio en el que se invita a maestros del nivel primario, secundario y terciario a introducir a sus alumnos en actividades de composición a través de un álbum de recursos de proyectos minimalistas permitió observar que algunos maestros condujeron a sus alumnos a escribir composiciones "pastiches". Los resultados examinaron las composiciones musicales como imitadoras de un estilo de una obra ya existente, o si los maestros permitieron a sus alumnos ir más allá de una composición pastiche hacia una expansión de los conceptos de composición dados. Este trabajo discute las aproximaciones, estrategias y roles adoptados por ambos grupos de maestros.

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WHAT IS . . .

What is a spiral curriculum?

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Introduction

In planning a curriculum there are many questions to be answered (Harden, 1986). Much attention has been paid to aims and objectives, the content of the curriculum, teaching methods, assessment, and educational strategies such as problem-based learning, integration and community-based learning. A relatively neglected area has been the question of the organization of the content and the overall structure of the curriculum. A traditional view of the curriculum is of a series of courses, each with its own programme and assessment. There is a growing tendency, however, to break down barriers or boundaries between courses and departments and to look at the overall aims or objectives of the curriculum. It is in this context that the concept of a spiral curriculum has particular relevance.

The concept of a spiral curriculum

A spiral curriculum is one in which there is an iterative revisiting of topics, subjects or themes throughout the course. A spiral curriculum is not simply the repetition of a topic taught. It requires also the deepening of it, with each successive encounter building on the previous one. This concept was described first by Jerome Bruner in 1960:

> I was struck by the fact that successful efforts to teach highly structured bodies of knowledge like mathematics, physical sciences, and even the field of history often took the form of a metamorphic spiral in which at some simple level a set of ideas or operations were introduced in a rather intuitive way and, once mastered in that spirit, were then revisited and reconstrued in a more formal or operational way, then being connected with other knowledge, the mastery at this stage then being carried one step higher to a new level of formal or operational rigour and to a broader level of abstraction and comprehensiveness. The end state of this process was eventual mastery of the connexity and structure of a large body of knowledge . . . .

The following are the features of a spiral curriculum:

(1) *Topics are revisited*: Students revisit topics, themes or subjects on a number of occasions during a course. They may return to a body system, such as the cardiovascular system or the respiratory system. They may revisit themes, such as clinical skills, or medical ethics. They may return to generalizable and transferable skills such as management or communication.

Bruner (1960), when he coined the term 'spiral curriculum', suggested that such a curriculum would be structured "around the great issues, principles and values that a society deems worthy of the continual concern of its members".

(2) *There are increasing levels of difficulty*: The topics visited are addressed in successive levels of difficulty. Each return visit has added objectives and presents fresh learning opportunities leading to the final overall objectives. Every visit can bring:

- new knowledge or skills relating to the theme or topic;
- more advanced applications of areas previously covered;
- increased proficiency or expertise through further practical experience.

(3) *New learning is related to previous learning*: New information or skills introduced are related back and linked directly to learning in previous phases of the spiral. Previous learning is a prerequisite for the later learning. Dowding (1993) described how "This prerequisite sequencing provides linkages between each lesson as the student spirals upwards in a course of study. As new knowledge and skills are introduced in subsequent lessons, they reinforce what is already known and become intertwined with previously learned information."

What is learned about a topic in early loops of the spiral is linked to what is learned in later loops. With a controlled introduction in the first loop of the spiral, the student is not overwhelmed with the subject.

(4) *The competence of students increases*: The learner's competence increases with each visit, until the final overall objectives are achieved. This progressive gain in competence can be tested through the assessment procedures.

Spirals in action

An example of a spiral curriculum is given in Figure 1. Students at the University of Dundee study normal structure, function and behaviour in phase 1 of the curriculum through a system-based approach (Harden *et al.*, 1997). They revisit the same systems in phase 2 when they look at abnormal structure, function and behaviour,

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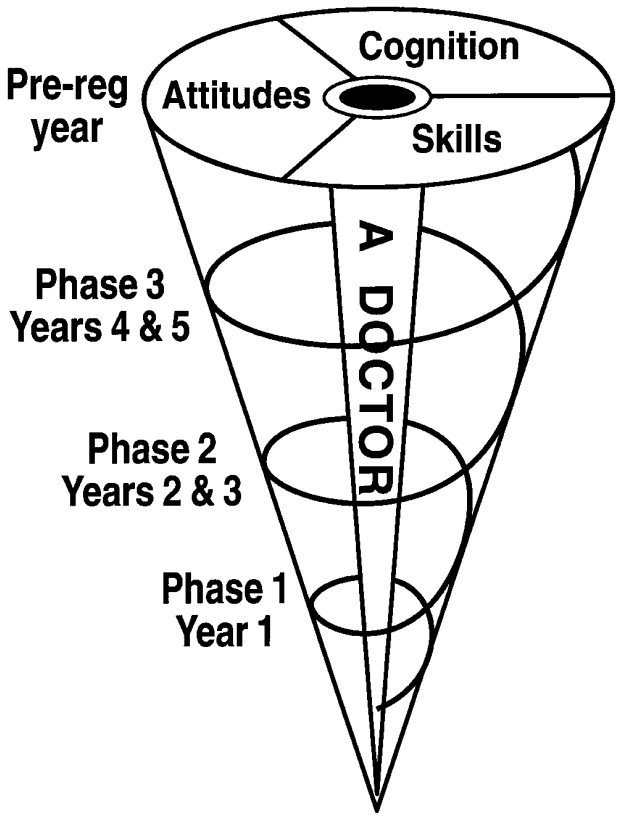

Figure 1. Four spirals in the curriculum.

building on what they have learned about the normal in phase 1. Students revisit the systems for a third time in phase 3, when they relate their studies to clinical practice, applying what they have learned in phases 1 and 2. The spirals broaden as the students pass from phase 1 to phase 3 in the curriculum. In a fourth spiral students, as pre-registration house officers, put the theory into practice.

An early use in medicine of the term 'spiral curriculum' was recorded by Kabara (1972) in a US college of osteopathic medicine. He described a 'spiral of information' with productive repetition and constant reinforcement of learned skills and facts. More recently, the concept has been described with community-based training programmes (Jira & Kaba, 1998). The idea of curriculum spirals was applied to nursing education to allow students exposure to a given area of content at a gradually increasing level of difficulty (Beattie, 1986). Practical nursing experience was planned to interlace with the revisiting and development of theory and reflected the gradual development of skilled practice (Jinks, 1991).

The spiral concept has been widely applied from optometry to arithmetic and from postgraduate studies to nursery education (LeeKeenan & Edwards 1992). Dowding (1993), concluded, however, that "although the concept of a spiral curriculum is good, it has not been successfully implemented on any large-scale basis over a substantial period of time". Factors likely to lead to an increasing application of the concept to medical education include the increasing emphasis on problem-based learning and integration (Harden et al 1984), on 'education for capability' and on-the-job performance, and on outcome-based education (Harden et al 1999).

Value of spiral curriculum

The value of a spiral curriculum lies in:

(1) *Reinforcement*: Once learned a topic or subject is reinforced if there is continuing exposure to it. A common complaint of teachers is that topics learned by students early in the curriculum are forgotten later. In the spiral curriculum students are continually looking back on subjects previously learned.

(2) *A move from simple to complex*: Students are introduced in a controlled way at a level at which they are not overwhelmed, and at which they can master the subject. They then go on to build new knowledge on prior knowledge. Students achieve a better understanding by exploring the same topics at deepening levels.

(3) *Integration*: Traditionally, a curriculum was viewed as a series of courses, each with its own programme and assessment, but this compartmental approach is inadequate. We must break down the barriers and boundaries that have grown up between courses and departments (GMC, 1993). This integration is greatly aided by the adoption of a spiral curriculum.

As Kabara (1972) suggests, "the spiral curriculum approach is usually alien to departmental teaching. Departmental course offerings to medical students are different and less holistic. Because the student's exposure to any discipline by a department is a one-shot affair, faculty feel justified to teach all in one dose. The method outlined above obviates this classical approach."

In the spiral curriculum there is continuity from one stage of the curriculum to the next and vertical integration between the different stages. The utility of the basic sciences becomes obvious to the teacher and student as competences gained in the early years are built on in the later years.

(4) *Logical sequence*: Attention is paid in a spiral curriculum to both the scope and sequence of topics. The spiral curriculum can help to bring some order to the increasingly complex nature of medicine and medical education.

(5) *Higher level objectives*: In a spiral curriculum students are encouraged to go beyond factual recall to an application of knowledge and skills. An understanding of thyroid hormone synthesis gained in early phases of the curriculum, for example, is applied in later phases to thyroid disorders and the management of patients with thyroid disease.

(6) *Flexibility:* The spiral curriculum is also a flexible one. It allows, for example, students to transfer directly to the second spiral of a medical course of study if they have mastered the first level in a science-based course.

Conclusion

The concept of a spiral curriculum merits careful consideration. The iterative revisiting of subjects throughout the course is particularly relevant in integrated and problem-based learning and in outcome-based education.

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Philip Glass and Michael Riesman: Two Interviews

Rob Haskins

On 21 July 2001, I attended the Philip Glass Ensemble's performance of *Music in Twelve Parts* (1971–74) in Avery Fisher Hall; the performance was part of the Lincoln Center Festival for that year, which was devoted entirely to Glass's music. I was struck by the contrast between the way in which the music was performed—the look of the performers, their dress, even the way in which they played—and the character of performances I had attended almost twenty years previously, performances that took place when minimalism was just beginning to make a strong presence in mainstream classical music venues. This contrast sheds some light on the history and reception of American minimalist music and, in particular, the stylistic shift that can be observed in much minimalist music composed after 1975.

In those older and arguably more exciting days, one had a sense that the minimalists were revitalizing classical music. I remember, in particular, a performance from October of 1983 at the Joseph Meyerhoff Symphony Hall in Baltimore, Maryland. Glass's road crew—for there is no other way to describe it—hauled in a large and robust sound system which was so loud in performance that symphony regulars, unaccustomed to such forceful decibel levels, sought refuge in the back of the auditorium. The ensemble members were dressed colorfully and unconventionally, and while they lacked the flair that would come to characterize such younger new-music ensembles as the Kronos Quartet, their clothing certainly offered a refreshing change from the formal black attire that usually graced the Meyerhoff stage. And the instrumentation of the Glass ensemble was hardly one typical of classical music: amplified saxophones or flutes, amplified soprano, synthesizers, sometimes even a drum machine. In my mind, amplification and electronic instruments brought the Glass ensemble closer to the world of rock than to the world of classical music.

It was only in the performance style that we could detect that other, more demure world. The musicians showed almost no emotion: in deep but relaxed concentration, they were icily precise, so precise that their playing seemed strangely to belie the emotional immediacy of the joyous, tonal music.[1] If their manner was calculated to ironically dis-

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tance the audience from the music's content, one had little sense that they had succeeded. The audience, which filled the Meyerhoff to its capacity, was noisier and more enthusiastic than usual. It had as many students and leftover hippies as it did older, more conservative, and more moneyed denizens of Baltimore society. This was a time in which many people from different backgrounds felt as if they had been united into a single audience by an updated kind of high art music that could make contemporary classical music a vital, living force to a large, young audience.

By the end of the 1980s, however, it became clear to me that this hopeful vision for the future of new music was as naive as it was shortsighted. For one thing, the dissonant, complex music that many minimalist composers openly challenged in their work had continued. In the United States, Milton Babbitt—perhaps the elder statesman of the post-1945 modernist mainstream—had been awarded one of the prestigious MacArthur Fellowships in 1986. John Cage, then in his seventies, had found himself the avuncular guru of American experimental music, the recipient of many commissions, and the distinguished appointee of Harvard's Norton Professorship in the 1988–89 academic year. Some younger composers, mistrustful of minimalism's diatonic certainty, reembraced more complicated idioms as surely as some of their contemporaries essayed a watered-down, more user-friendly brand of the classic minimalist rhetoric.

And indeed, classic minimalism found itself slowly coopted by the sensibilities of the concert hall. Steve Reich composed a number of orchestral "masterpieces"—including the brilliant *Variations for Winds, Strings, and Keyboards* (1979) and *The Desert Music* (1983–85), which is probably his best-known orchestral work—before returning to a leaner, more idiomatic ensemble dominated by percussion.[2] Around the same time, John Adams, then still a relatively unknown quantity, became beloved of symphony orchestras everywhere: after such shimmering, dramatic, and frankly emotional scores as *Harmonium* (1981) and *Harmonielehre* (1984), he settled into the more complex and chromatic idiom of the Violin Concerto (1991) and the Chamber Symphony (1992).[3] Finally, Philip Glass, having established his reputation with a string of operas, from *Einstein on the Beach* (1976) to *The Making of the Representative for Planet 8* (1985–88), began to turn his attention decisively to string quartets and orchestral music; in the latter genre, he began with cinematic program music like *The Light* (1987) and has since produced six symphonies.[4]

All this history made its presence known in the 2001 concert. Clearly, the musicians were older: Glass used reading spectacles, and

Michael Riesman, Glass's principal keyboardist since 1974, had gray hair. The performers' sleek black attire was uniform and sophisticated but decidedly conservative; the keyboards and keyboard stands smartly designed and unobtrusive; the amplification clean and tastefully attenuated from the deafening levels of the past. And strange to say, though the performance lacked some precision, the musicians were more conventionally joyful than before. Minimalism, in short, had grown up and learned to "play nice" in the venues of classical music; the outsiders of the past had become as familiar, and as homogenized, as the Beaux-Arts Trio. True, the audience size showed no chance of filling Avery Fisher Hall to its capacity that evening, and perhaps the average age was, on the whole, older—but there were plenty of young people there, and the spirit of the audience seemed to carry a bit of its former vigor and enthusiasm. Indeed, something remained that reminded me of minimalism's capacity to irritate; a young student of mine who had come to hear the second half of the concert received his ticket from an elderly woman on her way out. ("Would you like my ticket? It's rather repetitive," she said.)

I do not mean to imply that these developments are unfortunate. I am still young enough to hope that the classical institutions, ossified and closed-minded as they can sometimes be, might yet find a way to reinvent themselves in such a way that new audiences are created without alienating the older ones, bringing generations together once again. But the future is by no means assured. Younger, smaller ensembles like the Bang on a Can All Stars, the Ensemble Modern, and Alarm Will Sound seem to point the way decisively to a newer and perhaps more vital idea of "contemporary music" just as more and more symphony orchestras find survival increasingly difficult in today's musical marketplace.

Still, it gives one pause to note that Glass's music—and especially *Music in Twelve Parts*—should now find itself a classic so perfectly at home within the historicist tradition of the concert hall.[5] Has something changed? After all, in the notes accompanying the first commercial recording of the first two parts, the composer described his work in terms that suggest just the opposite:

> The music is placed outside the usual time scale, substituting a non-narrative and extended time sense in its place. It may happen that some listeners, missing the usual musical structures (or landmarks) by which they are used to orient themselves, may experience some initial difficulties in actually perceiving the music. However, when it becomes apparent that nothing "happens" in the usual sense, but that, instead, the gradual accretion of musical material can and does serve as the basis of the listener's attention, then he can perhaps discover another mode of listening—one in which neither memory nor anticipation (the usual psychological devices

> of programmatic music, whether Baroque, Classical, Romantic or Modernistic) have a place in sustaining the texture, quality or reality of the musical experience. It is hoped that one would then be able to perceive the music as a "presence," *freed of dramatic structure*, a pure medium of sound.[6]

Glass's ideal of a static, nonreferential music was, for many years, taken as the de rigeur definition of his minimalist compositions. The idea was taken up at greater length, for example, in Wim Mertens's classic study of the American minimalists, which considers their work up to around 1980, and a shorter essay a decade later by Elaine Broad.[7]

By contrast, Jonathan W. Bernard eschews the characterization of minimalist music as static. He sees more kinship between the process-oriented character of early works by Riley, Reich, and Glass and the serial approach of such visual artists as Dan Flavin, Donald Judd, Robert Morris, Sol LeWitt, and others, in which the arrangement of elements produces gradual changes that are perceived either within an exhibition space (in the case of sculpture) or across the space delimited by a canvas (in the case of painting).[8] However, Bernard reinscribes classic formulations of minimalism in his identification of the "problems with minimalism in music"—problems that, in his view, have perhaps accounted for the fact that minimalist music has not yet achieved the canonical status that minimalist art enjoys. Specifically, he sees the perception of "endlessness" in certain pieces as a detriment, weakening one's perception of a clear beginning and ending merely to the sensation of moments when the music starts and stops; and he suggests that minimalist composers no longer assume "that one will listen intently, with undivided attention, from beginning to the end of a work."[9]

It is somewhat ironic that Bernard speaks so authoritatively on the way audiences listen to minimalist music since, as John Richardson points out, his discussion hardly mentions the issues of "affect and reception" that have accounted for the broad audience appeal of minimalist music.[10] Indeed, with the advent of recordings and repeated concert performances of Reich's and Glass's music in particular, listeners have become increasingly familiar with many minimalist compositions and—in spite of such radical pronouncements as Glass's above—the traditional roles played by memory and anticipation seem to play ever stronger roles in this music. In Reich's *Piano Phase* (1967), the addition of the pitch A midway and the gradual compression of the original rhythmic figure from twelve sixteenth notes to four create a powerful accumulation of intensity;[11] likewise, listeners who have heard Philip Glass's *Two Pages* (1968) a few times cannot help but recall the work's opening when they hear the shattering return of all five pitches in their original configuration

near the end of the piece.[12] Later works, such as Reich's *Music for Eighteen Musicians* (1974–76)—*pace* Bernard—and Glass's *Einstein on the Beach* (1975, premiered 1976) have dramatic arcs even more traditional and powerful.[13]

Of course, the more conventional character of these later works has long been viewed as an indication of a stylistic shift away from minimalism. The composers have suggested that their music after 1974 or 1975 cannot be considered minimalist at all; writers such as Edward Strickland and Keith Potter have coined the word "postminimalist" to indicate this different music which, in Potter's words, recuperates the "melodic profile, timbral variety, and sheer sonic allure" that makes their music "richer and deeper."[14] However, the successful cooption of *Music in Twelve Parts* into the concert hall points to the possibility that the seeds of postminimalism might be discernible in Glass's early music. Thus, the transition from minimalism's early, avant-garde stance to its present form, particularly in Glass's case, suggests—if you will pardon the pun—a more "gradual process" than previous scholarship has described.

To explore these connections, we need more clarity on Glass's early music than we currently have. Some continuing stumbling blocks make this study difficult. For one thing, many important works—above all the extensive body of music written for the Philip Glass Ensemble—cannot be rented for performance and remain generally unavailable for study.[15] Even such simple matters as a reliable chronology for Glass's oeuvre remain a problem. For example, four important reference sources list the order of Glass's pieces in 1969 incorrectly, and the exact dating of such pivotal works as *Two Pages* continues to be somewhat controversial.[16]

And extended studies of Glass's early music are few and far between. The most extended published essay on Glass's music, Wes York's study of *Two Pages* (1968), suffers from errors unwittingly brought about by York's preparation of the score that he used for his analysis.[17] Potter's book has the most information on the early works, with generous analyses of many scores including the important *Music in Similar Motion*. Nevertheless, because Potter limits his study to Glass's avowed minimalist works (up to *Einstein*), he does not identify elements of Glass's early music that relate to his later, postminimalist scores. For example, within the four somewhat different pitch collections that articulate each of *Similar Motion*'s four sections, I find connections between Glass's minimalist and postminimalist music, connections that Glass himself confirms in his discussion of the work with me. Specifically, Glass remarks that his early music (previous to *Similar Motion*) had a uniformity of texture that precluded any sense of, in his words, "dramatic structure." With *Similar Motion*, however, he began to think of texture as a structural idea—surely a

move toward the dramatic structure that would become ever more central to his postminimalist concerns, and certainly a paradoxical statement in light of his observation that *Music in Twelve Parts* represented a music "freed of dramatic structure."

Another broad area of scholarly importance concerns questions of performance practice in this music. Up until very recently, the ensembles formed, respectively, by Reich and Glass were the *only* musicians performing the music, and the question of an appropriate performance practice for the music was largely irrelevant. However, many of Reich's earlier ensemble works—including *Phase Patterns*, *Drumming* (1971), *Music for Pieces of Wood* (1973), and *Music for Mallet Instruments, Voices, and Organ* (1973)—have been available for some time. A score and performing editions for *Music for Eighteen Musicians* and *Music for a Large Ensemble* (1978) are either published or in press, and a number of professional groups—including the Ensemble Modern and Bang on a Can—have released their own recorded versions of these or other classic Reich works. Happily, one can detect differences in performance style in multiple recordings of the same work—for example, *Music for Eighteen Musicians*—that allow us to experience a richness possible only when the composer releases his music for general performance.[18]

In the case of Philip Glass, however, only one of his ensemble works—*Music in Similar Motion*—can be performed outside his own ensemble.[19] Even his works for more conventional chamber ensembles have not been widely performed by others. The reasons for this, I believe, continue to be largely financial. Glass, ever the adept musical businessman, realized early on that operas and large orchestral works offered the most secure rewards for future performances, since the composer could easily control the financial details for them by reserving them strictly as rental items. For the ensemble works, Glass has simply restricted the availability of the scores to his own ensemble, thus controlling the number of performances and the fee such a performance can command.[20] There is, in addition, considerable reason to believe that the composer holds a sentimental attachment to the pieces, a conjecture that finds some support in his long-standing commitment to the Philip Glass Ensemble itself. When and if the ensemble works are released for general performance, the particular nature of that ensemble—whose keyboard instrumentation changed to reflect the explosive development of electronic keyboards between 1970 and the present—poses fascinating questions in the realm of performance practice. What instruments have been used for the Glass ensemble, and how were they used? What is the most appropriate instrumentation for this music, and how can it be realized?

The above questions principally motivated the two interviews here, which I conducted in 1991 as part of my own research into Glass's music between 1965 and 1975.[21] In my interview with Glass, I wanted to discuss the background of his transition from unison pieces to ensemble pieces and the implications that this transition had for his thoughts about aesthetics and compositional practice; I wanted to clarify the chronology of the early works, which at the time appeared in various orders with various dates; I wanted to get a clearer understanding of the personnel and contributions of the individual musicians in the Philip Glass Ensemble (particularly with respect to the role of improvisation in certain works); and I wanted to gain more insight into the actual instrumentation of these pieces—in particular, the way electronic keyboards were registered—since the sound of the music on commercial recordings sometimes seemed at variance with the scores I had had access to and since the timbres of the synthesizers were hardly ever conveyed by the scores themselves.

In the course of that interview, Glass advised me to contact Michael Riesman regarding any questions about the actual keyboard instruments. Riesman (b. 1943), who joined the Philip Glass Ensemble in 1974 and continues as its music director, had a decisive impact on the sound of the Glass ensemble, not only because of his amazing virtuosity, but also because of his skills in programming and maintaining the various electronic keyboards that have been used during the ensemble's history. Riesman's close association with Glass's music also shows in his work as conductor for performances of *Einstein on the Beach*, *Satyagraha* (1979), and other works, and as conductor and coproducer for the majority of Glass's recordings. My interview with Riesman concerned the electronic instruments used by the Philip Glass Ensemble during the period 1974–76; we also discussed other instruments used in subsequent concert and full performances, with special emphasis on the revivals of *Einstein on the Beach* at the Brooklyn Academy of Music (1984) and the Stuttgart Opera (1988).[22]

Interview with Philip Glass, 8 October 1991

Rob Haskins (RH): I am trying to trace if there was a definite break between when you first started doing unison works to works for more instruments. You described *Music in the Shape of a Square* [1967] as a duet. Was it distinctive in a particular way, or was there a reason you moved to unison music?
Philip Glass (PG): Bits and pieces.

RH: When you moved to writing just in unison, was there a motivation behind that?
PG: Yeah. I think so. The pieces that you referred to, like *Music in the Shape of a Square* and *In Again Out Again* for two pianos [1967], are pieces in which I was working with overlapping rhythmic patterns.
RH: In the same manner as the *Play* music?[23]
PG: Yes, exactly. It was an extension of that music. But I wasn't satisfied with the structural rigor of this way of working. What came out of it seemed to me, at the time, too unplanned. It was too mechanical a process without any internally motivating structure to make it happen. So when I began to do the pieces like the piece for Jon Gibson (the solo saxophone piece) [*Gradus* (1968)] or *Strung Out* [1967], what I tried to do was to take the idea of rhythmic variation and structure and to reduce it to something that was more, let's say, through-composed in a certain way. The difficulty with those pieces was that it took enormous numbers of pages to write the pieces out. *Strung Out* is fourteen to fifteen pages . . . Is that how long it is?
RH: Something like that, yes.
PG: Though I had been able to articulate an idea of rhythmic structure in a continuous way, I found that I had another problem, which was that the writing out of all this music simply was too tedious, and, in a certain way, it was also too tedious to perform. And that led to the idea of additive process, where I then looked for a more systematic way of developing rhythmic structure through variation, and I hit on the idea of addition.
RH: And you used repeating figures to make the process more clear as well as to reduce the notational difficulties.
PG: Yes. The first ones were like *Music in Fifths* [1969] . . . basically, *Music in Fifths* is just . . . it's really a unison piece, it's just two unison pieces played a fifth apart. It doesn't have any harmonic content to it. *Music in Contrary Motion,* in a certain way, is almost the same thing. Even though the left and right hands are moving in opposite directions, it still doesn't have any . . . I don't feel that the texture provides any dramatic structure to it. I was really going through very basic ideas of how rhythmic lines are associated.

With *Music in Similar Motion,* then it became possible to work with texture also as a structural idea. At specific points in the piece, when another line is added, that becomes a new texture, and it demarcates a new moment in the structure of the piece.

The next piece after that was *Music with Changing Parts,* where that idea was carried out in a grander fashion, perhaps. That was 1970. OK, does that help?

RH: Very much. Did, then, additive process begin with *One Plus One* [1967]?
PG: It began as *One Plus One* and then I applied it to the idea of ensemble playing.
RH: Is the music for *The Red Horse Animation*—
PG: Part of that? Yes.
RH: So that is a rhythmic piece?
PG: That's a piece that was rhythmically related to *One Plus One*.
RH: So when you talk about the floor in your book, the special floor, they actually tapped on that, and that was the music?[24]
PG: They actually tapped on it, and that's how . . . the performers used the floor as a percussion instrument.
RH: There are a number of lists of your works, and there are some differences between when you say pieces have been written.
PG: The problem is, Rob, I tend to forget when I wrote things and I tend to not write it down, so it depends on my memory, which is faulty. What are the problems?
RH: Well, your book says that *Two Pages*, for instance, is in 1968, and the photocopy that I have says "February, 1969."
PG: You see, another problem is that the date of copyright isn't the date of composition. Because what I did in those days, I didn't want to go to the trouble of copyrighting every piece separately; in those days, you could copyright six pieces on the same copyright form. So I would wait until I had six pieces together and then I would copyright them all together. So the copyright is different. I doubt whether *Two Pages* was written in 1969, simply because that would have meant an awful lot of pieces got written in 1969. That would have meant four big pieces. The four big pieces were *Music in Fifths*, *Music in Contrary Motion*, *Music in Similar Motion*, and another piece which was kind of withdrawn called *Music in Eight Parts*. That's enough for one year. So that leads me to think that *Two Pages* must have been the preceding year.
RH: Well then, the more difficult question is, What is the sequence of those big 1969 pieces? Is it *Music in Fifths*, then *Music in Contrary Motion*, then *Music in Similar Motion*?
PG: Yes, that's the order. And *Music in Eight Parts* comes between the third and the fourth piece, but it didn't survive.
RH: Because, you see, your book lists *Music in Contrary Motion* first in that year.
PG: I don't think so. I think it's the other way around.
RH: Because it didn't make sense to me.
PG: No, it doesn't. It's more logical that it was the other way, and, if nothing, I was logical at that time in my life.

RH: Now, regarding the long-held tones in *Music with Changing Parts*, was there a specific motivation to adding those additional textures?
PG: It was a textural idea. There were two considerations. One was to take a piece which was kind of theoretical and to add musical elements that would enrich it harmonically. The second part was to try and include—and I tried this several times (I *still* am trying to do it)—to include the idea of improvisation within a determined structure. Among the players I was playing with at the time were three saxophonists who were all very good improvisers, and they basically really wanted a little more freedom. I acknowledged that by trying to provide something in the piece where they could play out a little bit more. That was the expression they used—they called it "playing out." So in fact, the way they played out, I tried to keep it fairly, let's say, limited, but as a practical matter when we played, some of them just completely opened up and played wild jazz rhythms. It was very hard for me to keep them to the long tones. They rarely did stay to the long tones. That was my preference. And on the recording, there are more of the long tones. But there were performances that were completely wild, where they just kind of cut loose and left the keyboards to hold down the structure of the piece. And there was something to be said for that; I mean, I'm not sorry it happened that way, but it just wasn't my preferred way of doing it.
RH: So if you, for instance, prepared a final version of this score and published it, you'd very clearly . . .
PG: Well, I don't know; you know, I don't know whether I'd do that or not. I might just let other people figure it out. I'm not so doctrinaire, really, especially about early pieces. I must say there's a lot to be said for their idea. You know, it wasn't my idea, but my idea isn't always the best idea.
RH: Along those lines, then, in the improvisation in *Einstein*, you wouldn't necessarily have any strictures about that either?
PG: No, that's come to be fairly free and I've enjoyed that, actually. There's also another improvisation part in *Music in Twelve Parts*, in part 4—very much along the same lines.
RH: But in the recording it's so restricted it wasn't clear whether that was improvisation or not.
PG: It was.
RH: When did the number of players in the Glass ensemble become final?
PG: Well, it never changed very much from 1969 on. From 1969 we had three keyboard players and two or three winds. Dickie Landry and Jon Gibson and Richard Peck were the wind players (that was in 1970, I would say), and myself, there was a second keyboard player that was either Art Murphy and then later became Bob Telson, and later still it

became Michael Riesman. A little bit later, Martin Goldray joined the ensemble as the third keyboard player. Now the only significant change was that Joan LaBarbara began to sing with us in about 1971; that was the introduction of a singer into the ensemble, and there's been a singer ever since.

There've been transient players, people that came through. Let me see . . . Barbara Benary [b. 1949] played for a little while, not very long; she was a violinist and was in a group called Son of Lion, a gamelan group.[25] There was a trumpet player called Rusty Gelder that played with us for a while. Robert Prado played trumpet with us for a little while. Robert actually died in 1970; otherwise, he would probably have continued. Frederic Rzewski played one concert, Anthony Braxton played one concert. You know, people would come in and just sit for one concert; I never considered them real members of the group. By 1971, I no longer let people do that. The music required too much rehearsal and it was no longer possible just to sit in. So between 1969 and 1970 there were these people that would come in and play for a while, especially pieces like *Music in Similar Motion*. By the time I was working on *Music in Twelve Parts*, I no longer really wanted that.

RH: Let's talk a bit about the electronic keyboards. When did the synthesizer bass instrument get added?

PG: That would have been the Arp bass. It was a monophonic instrument. I think it came in around 1974, 1975. I was anxious to begin working with synthesizers, but until really polyphonic ones became available, they were just too limited. The Moog was too limited a keyboard to me, and it was uneconomical to travel around with one keyboard player who only played one line. So I preferred the Farfisas or the big Yamaha double keyboard that we used for a long time. The Prophet 5 was the first synthesizer that we considered acceptable. That began in 1975. I was anxious to do it; the technology was just a little slow in coming. As soon as it was available, we began to use them. I guess it would be 1975.

RH: I'm trying to figure out in the various sections of *Einstein* how to describe the timbral range on the organs and keyboards that you used, and I was wondering if you had any documentation of that.

PG: The person that knows about that is Michael Riesman, and I would suggest you call him. He has been around for all of the recordings and was responsible for most of the programming.

RH: In the *Einstein* score, there are a couple of places where the wind-part doublings of the keyboards are different than the recording.[26]

PG: Yeah, we changed it around. There's no real way. You have to look at the parts to be sure. And the parts are probably the same as they are on the recording.

RH: One gets used to the way the flute doubles one keyboard in Dance 1 and the new score has it with the piccolo doubling the other one.
PG: Yeah, my scores at that time . . . you know, there aren't real scores at all, they're just parts. I never wrote scores out. Even *Music in Twelve Parts* never had a score; *Einstein* doesn't have a score.[27] Even now, when I write ensemble pieces, I don't write scores. I only began writing scores when I was working with opera houses and conductors, and they needed to have a score. I'm much more in that tradition of the baroque composers who wrote pieces out and handed them out and people played them. Sometimes I would decide to change a part and I would just write a different part. If the scores were collated later by someone else and they didn't have all the parts, they didn't copy them out right. We're talking much more about a performance practice than a compositional practice. The performance practice sometimes changed what the composition was. With the ensemble, that's still true. We still change things. There's simply no need to codify it, because there exists no other ensemble but my own that plays a certain repertory of music.
RH: There are, in the *Einstein* score, shorter repetitions indicated in pencil. I was wondering whether that indicated concert versions, or whether those were cuts you made in the score.
PG: That must have been cuts for the recording. We had to cut down for the recording. In performance, we play the full version.
RH: And the last question: there are a lot of sections within *Einstein* in which fairly recognizable patterns recur within movements. There's a sort of refrain, for instance, that recurs several times in the "Train" section [act 1, scene 1]. I was wondering how you wanted to relate the appearance of those kinds of correspondences to the earlier theory you'd laid out in *Music in Twelve Parts* where there's a gradual accretion of material and one doesn't become aware of memory and anticipation.
PG: I think I was thinking along different lines at that point. I know what you're referring to in the Train. There are certain patterns that seem like fundamental ones that begin. I think of it more, in a way, as starting points, rhythmic developments, and sometimes I'd go back to the same starting point. I don't really have any good reason to give for that, it just seemed to make sense in the piece that it had that compositional idea.
RH: Thanks a lot.

Interview with Michael Riesman, 30 November 1991

RH: What I'm after is a good working history of electronic keyboards in the Philip Glass Ensemble and some information about them. What instruments were being used when you joined the ensemble?

Michael Riesman (MR): We had two Farfisa Minicompact Organs. That was it.
RH: And the sounds the Farfisas produce are just multiple octaves?
MR: They had several stops. They had the 16-, 8-, 4-, and 2-foot stops in terms of the octaves, and then they had another, maybe, four switches for the tone generation—the sound quality. I don't remember what the actual names of the switches were, but we had a couple of them turned on and a couple of them turned off. There was one called "String" that made the sound stringier, and that was turned off.

For most of the time that we used those instruments, we basically used just the one generic sound. We didn't change stops or anything, with one or two exceptions. For example, when we did the music from *North Star,* the album that was put together from the music that Philip wrote for the film about Mark di Suvero, sculptor, that was one of the few times that I can ever remember actually changing stops on the Farfisa (for example, adding vibrato or changing the sound).[28]

But for the entire period that those instruments were in the ensemble, the basic sound we used was the basic sound that they made. It was a very fuzzy sound with a lot of overtones, similar to what you'd get on an analog synthesizer with the filter wide open on a sawtooth wave. In fact, we imitated the sound of the Farfisas when we did the recent recording of the complete *Music in Twelve Parts.*[29] We remixed the recordings for the first six parts, which had used the actual Farfisas on them, and for the rest, we imitated the sound with a sampled Farfisa, Oberheim Matrix 6 Synthesizer, a Super Jupiter, and I don't know what else. But, anyway, I imitated the sound very successfully just using synthesizer sawtooth waves.
RH: So when the one setting on the Farfisas was used, it was a setting which coupled all the 16-, 8-, 4-, and 2-foot stops?
MR: Yes.
RH: What was the next instrument you added?
MR: The next instrument that was added was a Yamaha YC45-D dual-manual organ. This was added at the time of *Einstein on the Beach,* so that would have been 1976. So for two years, anyway, and for the entire period before that, there were no other keyboards. Well, that's not true. In *Music in Twelve Parts,* there was also an electric piano that was used, a third keyboard player. But other than that, there were no other instruments used.

Anyway, this Yamaha organ was capable of a great deal more than the little Farfisas. First of all, it had two manuals. It had percussive stops; it had a whole range of stops. There must have been a good thirty levers on the thing for different sounds.

On the lower manual, there was a limited range of things—16-, 8-, 4-, and 2-foot stops, and an in-between stop which sounded, I think, two octaves and a fifth above the principal note. There were one or two of those in-between stops on the lower keyboard.

The upper keyboard had, additionally, a number of other stops. It had, I think, about four percussive stops which added a percussive attack to the tone. One sounded two octaves and a fifth (or something like that) above the primary tone, and the others were 8-, 4-, and 2-foot percussive stops.

There was another control called "Attack" that I used quite a bit. It created a slight envelope on the note (like a percussive stop, but a separate stop), something that made the tones a little louder at their attack point. There was also on the upper keyboard a "String" stop that was quite bright, and a "Trombone" stop (something like that). I used these stops sparingly, but I did use them.

Also, the Farfisa stops were either on or off, but the Yamaha had continuous sliders for just about all of the controls, so that you could do very fine adjustments. So, during the whole rehearsal period for *Einstein,* I was tweaking the settings on that organ, because *Einstein* was a completely different kind of thing from anything we had ever done before.

First of all, it wasn't simply the ensemble just playing music, it was all different types of ensembles—voices and keyboards; solo voice and keyboards; keyboards and winds; winds, solo violin, and keyboards. There were all these different types of ensembles, so not only did the sound quality need to be varied, but also the sound levels needed to be changed depending on whether it was a full ensemble piece or, say, solo voice and keyboard, something like that. In my original score for *Einstein,* I had devised a sort of tablature for notating the settings for this particular organ, and it changed for pretty much every number in *Einstein.* In some numbers, it was very simple; I simply changed manuals or changed presets (there were a couple of presets that you could set up). And I arranged the progression of registration changes through the piece such that there would always be time to make them. But it was fairly complicated, and certainly very different from using the Farfisas.

But that was in the case of *Einstein* only. After that organ became an instrument that would go on the road with the Philip Glass Ensemble, the registrations would be much simpler, sort of reverting more to a basic registration that we would pretty much use for everything because of the more or less static nature of the Philip Glass Ensemble sound.

RH: So your score of *Einstein* contains all of these various settings, but to a certain degree, they're no longer useful because that instrument is no longer being used?

MR: That's right. We retired it. It traveled with us for about ten years. Actually, when we came back from *Einstein*, we didn't immediately start using the Yamaha to replace the Farfisas in the ensemble, and in *Einstein*, it only replaced one of the Farfisas. We still used the Farfisa as second organ. But we continued to use the Farfisas in the ensemble concerts after that, because the Farfisas are much smaller and lighter, and because the Yamaha didn't do that much for the Philip Glass Ensemble sound that wasn't also done by another instrument that we got shortly after the *Einstein* tour, which was an Arp synthesizer.

We needed some way to be able to do the bottom of the ensemble differently, to put a real bass on them. The Farfisas didn't have a real low end. The Yamaha had a longer keyboard, so you could play things down an octave; and it had a dual manual, so you could register two hands differently. The left hand could then become a separate entity with its own sound, and the bass could really emerge as a predominant aspect.

But when we got back from *Einstein*, we didn't really want to start lugging that organ around, because it's a monster—it's big. So we got a little Arp synthesizer which was called the Explorer, Model 2600, I think. It was monophonic; this was still in the days before synthesizers had memory banks. It was a single oscillator, multi-waveform, and multi-octave synthesizer. It had stops kind of like the Farfisa; it had the 16-, 8-, 4-, and 2-foot stops, and it had multiple waveforms—square, sawtooth, sine, and pulse waves. You could select all of those at once if you wanted to, or combinations. And it had dual envelopes for the filter and the amplifier. But it was a device that was very small and compact, and could sit on top of a Farfisa comfortably, since the Farfisas were little flattop jobs.

So this little Arp synthesizer then joined the ensemble and became something that did the bass sounds that we sort of discovered with using the Yamaha YC45-D as a bass; that's something we wanted to do.

We also added a Prophet 5 synthesizer to the ensemble around the time the ensemble started touring the music from *Glassworks*, about 1981–82.

RH: One more question about the YC45-D. There was a pedalboard on that instrument, too.

MR: Yes, that's right.

RH: How often was that used in the *Einstein* score?

MR: It was used only in a few places. None of the score is actually written for two hands plus feet.

RH: I know it doubles the bass clarinet in "Night Train"; that's easy to hear.

MR: We could have done that in the recording, but I don't think we did it in the live performance that way. I used it in "Dance 2"; that was one

of the places where I used it. "Dance 2" has a drone that goes all the way through the piece on an A, so it was just a question of pushing down that pedal and holding it all the way through. I used it in the "Building," where I doubled the lowest notes of my left hand part with the pedal part, sort of kicking out the rhythms, but that was something I introduced myself, and that didn't end up on the recording. I think Philip actually used to use the pedals to play the long tones at the beginning and the end, as well. I'm not even sure about that; he may have done that on a manual. The pedalboard had its own stops, but there's a switch that you could use to assign the bottom keys on the lower manual of the keyboard to the pedal, so that you could have a separate registration for those; it's just a one-octave pedalboard.

RH: Are those indications of when the pedal was used in the live performances actually indicated in your score?

MR: No, I don't believe so. The score itself does not require a pedalboard, I'll put it that way. Since the organ had one, we used it for a couple of things. For example, when I did the revival of *Einstein on the Beach* in Stuttgart two years ago, I didn't use any pedalboard at all; there's no need for it.

RH: Likewise, the indications of when it was used for the recording are also not written down.

MR: I don't think we used the pedalboard at all in the recordings. We might have used it for Dance 2; that would have been the only one.

RH: Well, there's a very low bass doubling the bass clarinet in "Night Train," and unless it's the split capability, nothing else sounds in that octave.

MR: Yeah, but we overdubbed things in the recording, and I'm sure that's how that got in there. I know we did some things with overdubbing some keyboards on that, so that was probably one of them, I'm sure.

RH: Was the rationale of overdubbing just to enrich the texture?

MR: Yeah, I think so.

RH: I have a few questions about the 1984 revival. By that time, you were using a number of different synthesizers. Which ones were specifically used for that production?

MR: Well, as I remember, we were still using the YC45-D organ in that production. We also used a Juno 106 synthesizer to do the bass, so the YC45-D became sort of a triple manual, and this is something that I'd been doing in the ensemble for a while. The Juno 106 is used as a bass instrument, resting on top of the Yamaha. The second keyboard station was replaced with a Prophet 5 synthesizer, and then we also had an Oberheim OBXA, and Roland JX3P. But the central tone generation was still that same Yamaha YC45-D.

RH: Is there any documentation of those programming patches?
MR: Well, there's documentation in the sense that there are cassette tapes that have the patches loaded onto them, so we can recover them. There's documentation of what patch was called up when in the score, but there's no other documentation. You could reconstruct it if we hauled out the same instruments. We could load them up with the sounds, call up the music, and reproduce it. That's the only sense in which there's documentation.

For the Yamaha sounds, there's the tablature that I devised to notate the registrations, so that could all be reproduced, too.
RH: And then you led a production in Stuttgart in 1988. What did you use for that performance?
MR: For that performance, we used two Yamaha TX802s and two Oberheim Matrix 6s, driven by a couple of Roland MKB-300s.
RH: And documentation exists for those patches? They're probably on a librarian program?
MR: Those are actually on MIDI floppy disks. Yamaha made a little librarian for programs that was a very small disk drive. That's where those are. Once it became possible to do everything with MIDI and saving stuff by MIDI dumps, that was a big step forward in convenience. I never documented any synthesizer patches by showing where the knobs were except for the original Arp Explorer, which had no other way to document that. But once synthesizers developed memories and cassette saves and loads, I didn't ever bother actually notating the positions of knobs or anything after that.
RH: In future performances of *Einstein*—and I don't know whether any are planned or not—would you reproduce your "orchestration" for the Stuttgart production?
MR: Well, for the Stuttgart, I started from scratch; I didn't use any kinds of tone generators in that production that had been used in any of the previous *Einstein*s, so I just had to start from scratch on that one. I did attempt to make it sound like it had sounded before—something like it—while also doing a few things to make it sound better than it had before, given the fact that I had a more flexible synthesizer apparatus to work with than I had used before.

The prior *Einstein*s had been pre-MIDI; the Stuttgart *Einstein* was post-MIDI, so I think that was the big change that happened there. I was able to use combinations of synthesizers, which is what I do now all the time. I almost never use a single synthesizer to make a single sound—I'll use an FM synthesis module plus an analog synth module; or an FM synth plus a sampler; or an analog synth plus a sampler; or all three, sometimes.

RH: I guess what I'm trying to determine is whether you view the Stuttgart reorchestration as a move toward a more definitive version, or whether you're still working on that.
MR: Oh, well, I'd say it's a more definitive version in the sense that I have a feeling that the sound generators that we used for Stuttgart will be around for quite a while, and are very popular. Therefore, you could replicate it in the future.

We are going to do another revival of *Einstein on the Beach*, interestingly enough, in 1992—in Spain, Japan, Europe, South America, and the United States, as it stands now.
RH: And you'll start with the Stuttgart version but you'll probably improve on it, I suspect?
MR: I think we may very well use the same version. I was very satisfied with the Stuttgart sound, and I think we may use virtually the same instrumentation of FM synth modules—TX802s, say—and analog synth modules. Anyway, it'll be pretty similar.
RH: And similarly, the different sounds are stored via MIDI dumps, and the scores indicate where the changes take place.
MR: Well, the sounds are archived by MIDI dumps. All the sounds that you'd need are on board the synthesizer for the show, so you just call up the different programs. The Matrix 6 has one hundred memory slots and the TX802 has sixty-four random memory slots, so that's plenty of memory. There are not that many sound changes in the piece.
RH: It's a very interesting issue, because, of course, the electronic keyboards give *Einstein* such a distinctive sound, and yet, if you look at the score, the score is almost transparent by comparison—it doesn't indicate at all the richness of sounds. I think there's more interest in understanding the sounds of the instruments themselves. Unfortunately, many people who are using electronic instruments are not, perhaps, as careful about authenticity as you. They don't need to be as careful about it because it's almost a pop music product for them; and in pop music, the goal is continual novelty of sounds, not a situation where there's a real ongoing repertory of older sounds.
MR: Along those lines, actually, one of the biggest programming jobs I did was when we retired the YC45-D organ in 1986, transferring all of the registrations from that into other devices. When it was retired, it was replaced by a TX rack (six TX802 modules) and a Roland Super Jupiter synthesizer, which is an eight-voice polyphonic analog synthesizer. That was what I was handed by our sound designer, Kurt Munkacsi, who said we had to retire the Yamaha. We retired it for physical, mechanical reasons; the thing had just taken a beating for too many years on the road. The sound guys had to have the cover off before every show because it

was full of hundreds of little delicate wires and stuff, and it was just getting too fragile.

So he said, Here, use this, and purchased TX modules in a TX rack and the Super Jupiter. I then used three TX modules on one side of the Super Jupiter (which is a splittable synthesizer) to replace one manual of the Yamaha, and another three TX modules and the other side of the Super Jupiter to replace the other manual.

And everyone said, Gee, it's a much better sound; it's much cleaner, it doesn't have the unevenesses of the Yamaha. So that was a very successful transition, but it was a lot of work to try to imitate a rather unique instrument with synthesizers, and got me into the nitty-gritty of FM synthesis programming. I guess you could say that's been a specialty ever since—imitating the sounds of other things like, for example, the Farfisas and acoustic instruments as well (say, for when we do the showings of the films with live performance). That was a big changeover when, finally, the last of the old-fashioned instruments in active use—the Yamaha—was retired.

Notes

1. Of course, one can easily identify parallels in performance style to such synth-pop bands as Kraftwerk and Gary Numan, where the sense of distancing seems more overt. The complex interactions between these different musical communities deserve a more thorough treatment than I can provide here.

2. In a symposium at the Eastman School of Music on 17 Feb. 1999, Reich indicated that his musical inclinations were more amenable to smaller ensembles and that he would concentrate on this medium in his future work.

3. See Rebecca Jemian and Anne Marie De Zeeuw, "An Interview with John Adams," *Perspectives of New Music* 34, no. 2 (Summer 1996): 88–104.

4. *"Low" Symphony* (1992), Symphony no. 2 (1994), Symphony no. 3 (1995), *"Heroes" Symphony* (1996), Symphony no. 5 (Choral): Requiem, Bardo and Nirmanakaya (1999), and Symphony no. 6, for soprano and orchestra (2002; Plutonian Ode). Jeremy Grimshaw discusses Glass's symphonies (with particular attention to the *"Low" Symphony*) in his article "High, 'Low,' and Plastic Arts: Philip Glass and the Symphony in the Age of Postproducton," see pp. 472–507 in this issue. I thank him for making a copy of his essay available to me.

5. The previous complete performance of the work, in 1990, also took place at Avery Fisher Hall.

6. Philip Glass, liner notes, *Music in 12 Parts: Parts 1 and 2* (London: Virgin Records, CA2010, 1977), n.p. (my emphasis).

7. Wim Mertens, *American Minimal Music: La Monte Young, Terry Riley, Steve Reich, Philip Glass*, trans. J. Hautekiet (New York: Broude, 1983); Elaine Broad, "A New X? An Examination of the Early Aesthetic Foundations of Minimalism," *Music Research Forum* 5 (1990): 51–62.

8. Jonathan W. Bernard, "The Minimalist Aesthetic in the Plastic Arts and in Music," *Perspectives of New Music* 31, no. 1 (Winter 1993): 110–15.

9. Bernard, 121–24.

10. John Richardson, *Singing Archaeology: Philip Glass's "Akhnaten"* (Hanover, N.H.: Wesleyan University Press, 1999), 28.

11. See also Paul Epstein, "Pattern Structure and Process in Steve Reich's *Piano Phase*," *Musical Quarterly* 72 (1986): 494–502. Richard Cohn counters the notion that minimalist music should not be analyzed with the elegant account of transformations and relationships in the rhythmic cycles of *Phase Patterns* (1970) and *Violin Phase* (1967) that he offers in his "Transpositional Combination of Beat-Class Sets in Steve Reich's Phase-Shifting Music," *Perspectives of New Music* 30, no. 2 (Summer 1992): 146–77. For a more recent study along similar lines, see John Roeder, "Beat-Class Modulation in Steve Reich's Music," *Music Theory Spectrum* 25 (2003): 275–304.

12. In fact, Jeremy Grimshaw, who has worked extensively on the music of minimalism's founder, La Monte Young, believes—as I do—that the antitelelogical characterization frequently given to Young's works strictly applies *only* to his installations and some of his conceptual works.

13. Bernard suggests that the individual sections of *Eighteen* are merely a "composing-out" (115) of the opening cycle of eleven chords. In fact, Reich varies and expands the harmonic material of the cycle in surprising ways. See Keith Potter, *Four Musical Minimalists: La Monte Young, Terry Riley, Steve Reich, Philip Glass* (Cambridge: Cambridge University Press, 2000), 233–45. I addressed *Einstein*'s harmonic variety in "Another Look at Philip Glass: Aspects of Harmony and Formal Structure in *Einstein on the Beach*," presented at the national meeting of the American Musicological Society, Minneapolis, Minnesota, in Oct. 1994.

14. For example, Glass is so quoted in Tim Page, "Music in Twelve Parts," in *Writings on Glass: Essays, Interviews, Criticism*, ed. Richard Kostelanetz, (Berkeley and Los Angeles: University of California Press, 1997), 99; Edward Strickland, *Minimalism: Origins* (Bloomington: Indiana University Press, 1993), 239–40; Potter, 15–16.

15. Nevertheless, to be sure, Glass has maintained a long-standing commitment to help scholars—including young doctoral students at colleges, universities, and conservatories—to undertake projects concerning his music. One of the most recent is Glenn C. Lemieux, " 'Music in Twelve Parts' by Philip Glass: Reconstruction, Construction and Deconstruction" (Ph.D. diss., University of Iowa, 1999). There is no systematic study, however, of Glass's music between 1965 and 1967, the period just preceding the breakthrough he achieved with the application of additive rhythm as a structural principle in his music.

16. The order of the 1969 compositions—*Music in Fifths*, *Music in Contrary Motion*, *Music in Eight Parts*, and *Music in Similar Motion*—is incorrectly listed as *Contrary, Fifths, Similar, and Eight* in Philip Glass, *Music by Philip Glass* (New York: Harper and Row, 1987); in Kostelanetz, *Writings on Glass;* and even in Edward Strickland's article on Glass for the second edition of *The New Grove Dictionary of Music and Musicians*. Strickland discusses the chronology of *Two Pages* in *Minimalism*, 215–17. Potter takes 1969 as the date for *Two Pages*, basing it on a score of the work in Glass's handwriting dated February 1969 (*Four Musical Minimalists*, 287–88). Glass comments on all these irregularities in my interview.

17. Wes York, "Form and Process," in Kostelanetz, *Writings on Glass*, 60–79. The analysis is problematic because York based it on his own transcription of a recording of the work that made cuts in the piece so that the recording would fit one side of an LP. York's rendering of the rhythmic patterns into quarter notes obscures certain motivic relationships in the work (Glass's notation is in eighths), and his discoveries about proportional relationships of the various sections in the work are suspect because he apparently did not realize that the recording contained cuts. An extended analysis is provided in Potter, 288–92.

18. Alan Pierson, conductor and artistic director of the ensemble Alarm Will Sound, has edited two of Reich's works—*Music for a Large Ensemble* and a new chamber orchestra version of *The Desert Music*—and is in the process of preparing a study that deals with questions of performance practice in Reich's music.

19. Even in this case, one receives a copy not of the ensemble version of the work, but rather of its 1981 chamber orchestra arrangement, which includes a performance note that the score can be adapted to any instrumentation.

20. Glass displays his business acumen at length in an interview published in Cole Gagne and Tracy Caras, *Soundpieces: Interviews with American Composers* (Metuchen, N.J.: Scarecrow Press, 1981), 222–23.

21. See n. 13.

22. Thanks to Jeremy Grimshaw and Payton MacDonald for their comments on this article, and to Cat Celebrezze of Dunvagen Music for her kind assistance in obtaining permission to publish the interviews.

23. In 1965, while Glass was still in Paris, he composed incidental music for a production of Samuel Beckett's *Play*. It consisted of short shifting patterns for two saxophones twenty seconds in duration, which alternated with twenty seconds of silence for the entire duration of the play, some twenty minutes. As Glass relates,

> I saw [*Play*] ten or fifteen times. The thing that struck me was that there would be an epiphany (. . . a heightened feeling) that would occur as I watched the play. It would happen several times throughout the course of the evening and *at a different time every night*. I thought this was very curious. My usual experience in the theatre was that the epiphany was built-in to the play so that it would always happen at the same time. . . . Now it's obvious to me—ten or twelve years later—what was going on but at the time I had no idea. I was in the presence of a piece of work which I couldn't enter in any way through simple identification. . . . Moreover, it seemed that the moment I gave up trying to be the thing that I was looking at, the possibility of emotion arising spontaneously between the two of us, that possibility arose.

The source for the information and Glass's observations on the *Play* music is Sylvère Lotringer and Bill Hellermann, "Phil Glass: Interview," *Semiotexte* 3, no. 2 (1978): 178–91, esp. 182–83. This fascinating and little-known interview shows Glass speaking at length about the aesthetic that informs his earliest and most radical work. The composer relates alternate versions of the *Play* story in *Music by Philip Glass*, 34–37, and the film *Einstein on the Beach: The Changing Image of Opera* (Los Angeles: Direct Cinema, 1987).

24. See Glass, *Music by Philip Glass*, 7–8.

25. She built the instruments for Son of Lion in 1974 and, in 1976, cofounded the ensemble with Philip Corner and Daniel Goode.

26. Philip Glass and Robert Wilson, *Einstein on the Beach*, CBS Records M4K 38875.

27. A score of *Einstein* was prepared for the 1984 revival of the work at the Brooklyn Academy of Music and subsequent productions.

28. Philip Glass, *North Star*, Virgin Records 91013-2.

29. Philip Glass, *Music in Twelve Parts*, Virgin Records America 91311-2.

BRENT HEISINGER

American Minimalism in the 1980s

The debate in recent years over the authenticity and viability of minimal music has stirred the "serious" music world in ways not displayed since the anarchistic revelations of John Cage in the fifties. Strong opinions have been expressed regarding the promise of the minimalist movement and the merits of its artifacts, and few musicians, I believe, are not without a stand. Value judgments and predictions abound, sides have been taken, and views expressed. Pierre Boulez, for example, has proclaimed, "Repetitive music appeals to an extremely primitive perception, and it reduces the elements of music to one, single component—periodicity. . . . It's simply like a detail of a painting enlarged many times, and there's no substance to it at all."[1] William Schuman in a 1985 interview explains, "I believe in the music of development, stemming from the aesthetic, basically, of Beethoven. I recognize that there are many other people that are intrigued by the music that requires sitting ability; the ability to respond to endless repetition."[2] John Adams, considered by some a minimalist composer, is not above criticizing the movement. In a 1984 article, he described some minimalist music as "those Great Prairies of non-event," and said that he admires most of Glass's work but has "grave reservations about the direction he has been taking recently—very commercial, very opportunistic, insincere."[3] On the other hand, John Rockwell, in a chapter on Glass in his timely and relevant book *All-American Music*, asserts, "People *like* this music. For a serious composer in the late twentieth century, that is no mean achievement."[4]

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American Music Winter 1989

Publications devoted to minimalists are growing in number; and reviews, recordings, and awards are attracting increased attention to the movement. A recent book by Wim Mertens, *American Minimal Music* (published in English in 1983), for example, discusses the minimalist school in detail, analyzing the background and contributions of Young, Riley, Reich, and Glass in historical and ideological perspective.[5] And music critics now seem to express their views with greater confidence and authority (although unfortunately in some cases with questionable fervor). The reviewer Richard Freed gave the Brooklyn Philharmonic recording of Steve Reich's *The Desert Music* very high marks but couldn't resist adding "Even some determinedly sympathetic listeners . . . are likely to respond to the whole minimalist phenomenon with thoughts of the Emperor's new clothes."[6] On the other hand, a *Sunday Times* review of the BBC Symphony British premiere stated without reservation that the piece was "a knockout." Linda Sanders in a review of a recent Philip Glass release by CBS Masterworks comments, "There are only two American operas I'd call masterpieces without reservation or irony. One is Gershwin's *Porgy and Bess*, the other is Philip Glass's *Satyagraha*,"[7] In an article titled "The Maturing of Minimalism," Michael Walsh calls Glass's opera *The Juniper Tree* (composed, incidentally, with Robert Moran, who received relatively little mention) "a stunning new opera from the American avant-garde."[8] In 1985, between *Time* magazine and *Stereo Review* alone, awards for outstanding recordings were granted three composers associated with the minimalist movement: John Adams for his *Harmonium*, Terry Riley for his *Cadenza on the Night Plains*, and Philip Glass for his soundtrack to the film *Mishima*.

In spite of the hyperbole, what is evident is that "the new kid on the block," minimalism, is now a genuine segment of mainstream contemporary art music. Questions of merit and longevity aside, the movement's impact and relative sustaining power are undeniable. No longer can it simply be considered a musical knickknack created to counter complex abstract music. With its presence in concert halls and opera houses throughout the world along with appearances in rock clubs and at universities, minimal music has unquestionably come of age. Walsh asks, "When the youthful goals of discomfiting elders and shocking the bourgeoisie have been achieved, what remains to be accomplished? Can an erstwhile avant-garde development settle comfortably into maturity and still avoid middle-age spread?"[9] Thus far the decade of the 1980s has answered yes. Witness, in addition to the above, the frequent programming of minimal music by the new music ensemble Solisti New York (formed in 1980); the establishment and success of Group 180, a Hungarian new music ensemble devoted solely to the performance and recording of repetitive music; the 1980 three-day festival of minimal music presented by Columbia University's radio station,

WKCR; the 1986 Pittsburgh International Music Festival with programs including the music of Reich, along with that of Boulez, Stockhausen, and Xenakis (among others); or the 1986–87 San Francisco Bay Area concert season featuring works by Glass, Reich, and Riley (world premier of Riley's *Salome Dances for Peace, Part II* for string quartet). The list goes on. Perhaps most symbolic is a recently published picture of three distinguished composers standing together in London with smiles and a "pleased-to-be-in-this-company" mien: Pierre Boulez, Elliot Carter, and Steve Reich! It is as though Leonard Meyer's words (from his exceptional book *Music, Arts, and Ideas* [1967]) have suddenly taken on meaning: "The time for partisan polemic has long since passed. It is foolish to assume categorical positions, invoke a priori arguments, and make absolute judgments, whether about the propriety of writing tonal music in the mid-twentieth century, about the legitimacy of the method and practice of serialism, or about the validity of the aesthetic goals of transcendental particularism. All these ways of making music are with us and . . . will probably continue to be with us for many years."[10]

The emergence and success of minimalism, it seems to me, was predictable—a natural episode in the history of American musical output (although Europe should get credit for its promotion). The 1960s and early 1970s in this country were particularly conducive to bold artistic reaction, with antiestablishment sentiments nurturing individualism, and technology and acculturation providing new modes and materials for expression. Leonard Meyer quotes James Ackerman as saying, "the pattern of [style] change is a product of the tension in society and in the artist between the instinct for stability and security of established schemes and the human capacity . . . for creating something unique and individualized. Change is slow when the former is stronger, and rapid when the latter prevails. As a rule the factor of stability gets more support from society and its institutions, and the factor of change from the individual imagination."[11] Certainly many influences contribute to the emergence and change of a style, but this concept seems to me pervasive. Our institutions and respective ideas and actions were questioned during this period, and individual notions in the arts reached levels of diversity and extremes never before realized. The setting was ripe for new modes of musical expression. With the music and thoughts of Cage and Babbitt representing distant opposites in the spectrum of musical aesthetics, it would appear that minimalism (as defined below) could live a life of its own, especially with non-Western, jazz, and/or rock elements serving as stylistic components. And the leading proponents—La Monte Young, Philip Glass, Steve Reich, and Terry Riley—were the perfect spokesmen: staunch, prolific, well trained, and uncompromising individualists who had always performed and thus could readily promote their own music.

Timely support also came from artists of other media (notably painting and dance) during a period when much of the established musical world was assailing minimalism as less than substantive, or, as Rockwell puts it, "damned by its enemies as so lacking in complexity and emotional range that it [could] hardly be called 'serious' at all."[12]

It is clear that the divergency of musical expression in the 1960s and 1970s continued into the 1980s. Rockwell's book illustrates this. In a very appropriate format, he offers twenty essays (chapters), each centered on a single composer representing a particular segment of this country's musical life. Postwar rationalism, experimentalism, neoromanticism, minimalism, "art-rock," electronic music, "public/site" composition, sound studio *musique concrète*, jazz, folk music (Latin), American musicals, and rock are topics that he discretely presents, demonstrating the plurality of America's musical world. (He also risks placing these styles in the "cultivated music to vernacular music" continuum.) Rockwell states, "In America today, the diversity seems greater than ever. Yet even as the separate styles maintain their vitality, they are also coming together in subtle and unexpected ways. That can be perplexing and disturbing, but can also be enormously exciting."[13] Bryan Simms, in *Music of the Twentieth Century*, agrees: "Since the mid-1960s the development of music has been neither consistent nor uniform. This period has witnessed a sporadic continuation of earlier approaches, with little consolidation into a mainstream and even less prospect for the emergency of a common practice."[14] In *Avant-Garde Music*, Paul Griffiths adds, "Music at the opening of the last quarter of the twentieth century presents a confused picture, one barely susceptible any more to historical discussion."[15]

But ideas of common practice, consistency of style, and historical continuity no longer serve as trustworthy references for the understanding of current musical trends. Nor are they especially helpful as criteria for the assessment of stylistic viability. Meyer's hypothesis (of 1967!) seems particularly suitable today, and that is that this "perplexing and disturbing . . . confused picture" of the art world is nothing more than a fluctuating dynamic "steady-state in which an indefinite number of styles and idioms, techniques and movements . . . coexist in each of the arts. There will be no central, common practice in the arts, no stylistic 'victory.' . . . Though new methods and directions may be developed in any or in all of the arts, these will not displace existing styles. The new will simply be additions to the already existing spectrum of styles."[16] Current widespread appearances and acceptance of different minimalist compositions and composers give evidence not only that minimalism in this decade is an additional style, but that it is a firmly entrenched school consisting of literature created by (1) prominent composers whose complete output is in a repetitive minimalist

style (for example, Reich, Glass), (2) composers who on occasion produce works using various minimalist techniques (Lentz, Rzewski), (3) those who make use of minimalist techniques in more dramatic settings (Adams), and (4) composers particularly interested in Indian performance practices, special intonations and improvisation (Young, Riley). These four categories are admittedly arbitrary and most certainly too confining; nevertheless, they serve to demonstrate to some degree the extent to which minimalist ideas have permeated contemporary composition and suggest that a branching out is taking place which is bound to promote a certain degree of permanence.

No word singularly defines this school of composition (and improvisation). "Minimal" was selected here because it has been used more than any other in connection with the work of Young, Riley, Glass and Reich—those most responsible for the movement—and because it suggests restriction or reduction which in the arts implies making the most of less. Under this rather encompassing definition, such different but representative works as Young's *Drift Study*, Riley's *In C*, Glass's *Satyagraha*, Reich's *"Come Out To Show"* can be listed. Unfortunately, non-minimalist pieces like Webern's *Six Bagatelles* or Cage's *4'33"* also fit. And the minimalist practice of producing pieces of extreme length hardly demonstrates restriction.

Minimal music, however, contains an unprecedented artistic redundancy that in the best of works is not superfluous (as contrasted to *Vexations* by Satie). It features reiteration (or as Peter Hamel puts it, "constant regeneration")—long sustained tones, repeated rhythmic, melodic, and/or harmonic patterns, cells, or phrases, or the like—that creates relatively static "drawn-out" qualities. For the most part, the four main composers of this style prefer prolonged sublety as an aesthetic ideal over dialectic drama. Each in one way or another at various times has commented on this aspect of his music. Glass, for example, explains his *Music in Twelve Parts:* "The music is placed outside the usual time scale, substituting a non-narrative and extended time sense in its place."[17] In *Writings About Music*, Reich comments, "To facilitate closely detailed listening a musical process should happen extremely gradually."[18] Terry Riley recently mentioned that he has been influenced "by the vast static mystic spaces created by my longtime friend La Monte Young."[19] And Young, describing "one of the most natural and important steps in my development," claims, "By listening to these long sustained tones, I became more and more aware of the relevance of harmonics, and what effect they have on music."[20] John Adams, a significant newcomer to the symphonic world, has adapted this aesthetic notion in his own way. In discussing approaches to changing harmony in *Harmonium*, Adams mentions, "One way was to bring in

a new key area almost on the sly, stretching the ambiguity out over such a length of time that the listener would hardly notice that a change had taken place (you find yourself in a new landscape but you don't know how you got there)."[21] More than most contemporary mainstream Western classical musics, this type of extended sublety allows for and encourages introspection on the part of the listener; perhaps more significantly, the style requires of the Western consumer sensitivity to a much smaller spectrum of contrast over a much longer time span. Detractors argue that this tendency dilutes musical power and reduces meaning. Others, however, feel that in minimal music "a wealth of small variations in detail . . . provide an endlessly fascinating carpet of sound when the ear has been redirected to listen for them."[22]

Making more of less, requiring of the listener attention to subtle occurrences in sound(s), demanding awareness of musical detail—all these notions can be linked to John Cage. However, as influential as his aesthetic outlook and music were on the initial products of this school, tenets of "transcendental particularism"—i.e., purposelessness, anonymity, natural object equals artistic object, less determinancy equals greater "artistic" realization—never took hold. Reich prefers to affect his listeners favorably and considers the emotional aspect of music primary. "It's really difficult to say anything specific about it, other than: It's number one, and without it, why bother?"[23] His music has become increasingly controlled and dramatic. In a 1986 interview, Terry Riley speaks specifically of distinguishing qualities in his style: "I think there's a particular way ideas are developed, and possibly some melodic ingenuity, undoubtedly due to my varied background in classical, jazz, contemporary, and Indian classical music. One thing that is peculiar to what I do is the way I blend these different elements."[24] Though much of his music is improvised, his intense study of Indian singing and his long hours of keyboard practice demonstrate a commitment to musical discipline in the traditional sense. Glass's purpose is simply put, "I don't care whether someone understands how the music is constructed. I'd much prefer that they just really *like* it."[25] He strongly claims his art and freely discusses his mode(s) of composing. La Monte Young's trust in his intuition most greatly influences his compositional process "where I've tuned into some greater force, some sense of universal structure that I try to tune into. This thing comes through me, it comes out, and this is the kind of music you hear."[26] The sounds that he uses in his music are preplanned through studied use of natural acoustics and resultant tunings. And regardless of the unmatched length of time some of his compositions last (or are lasting), they are not left to chance.

Beyond the practices of restriction and reiteration, virtually nothing is common among the "sub-styles" of various composers using min-

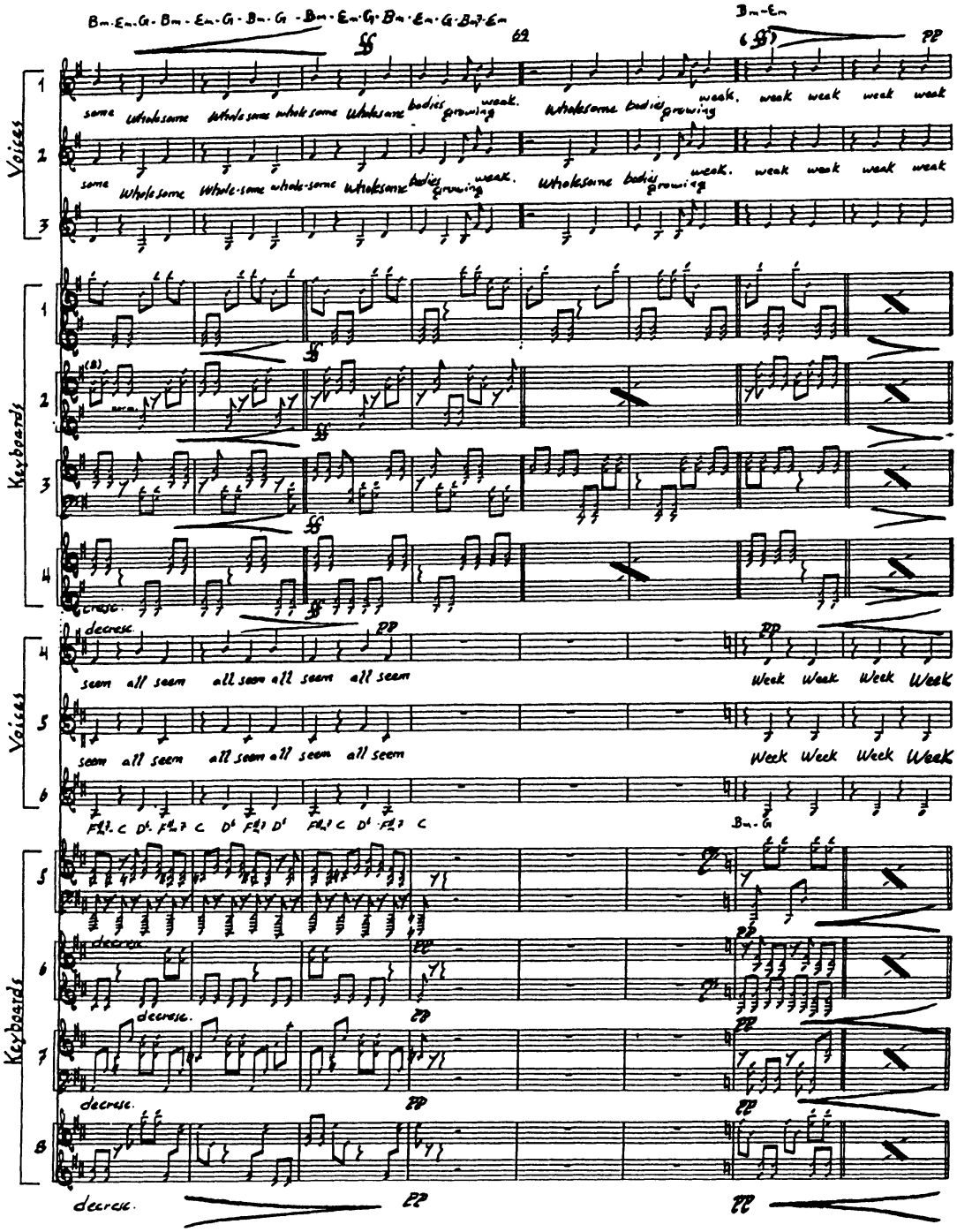
imalist ideas (other than the fact that acoustic instruments are generally favored now). Some parallels can be drawn—Young and Riley working in just intonation primarily through improvisation and influenced greatly by Indian teaching; Reich and Glass composing in notated equal temperament, based primarily on diatonic repeated patterns, etc.—still, each composer (and each work, for that matter) is unique. A brief look at a few works roughly paired according to medium and/or intention and approximate date of conception may serve to illustrate these points.

Young's *The Well-Tuned Piano* (work-in-progress since 1964) is an improvised composition for piano tuned in just intonation. Harmonics and combination tones that result from paired or sets of fundamentals produce, as Young puts it, a "powerful and at the same time harmonious effect that gives a whole that is greater than the sum of the parts. This phenomenon has . . . the ability to produce very profound psychological states. It is the goal of my music to produce these states in the listener."[27] This programmatic piece, which is his primary public performance work, is approximately five hours in length and is based on several chordal areas and themes. In a performance recorded in October 1981 a passage based on the "Romantic Chord" lasts about one hour. Within that chordal area are heard the Romantic Theme, Brahman Theme, Gamelan Theme (with harmonic "clouds" derived from the Gamelan Chord), Ancestral Boogie, and finally a cloud on the Gamelan Chord (the idea of utilizing extremely slow harmonic rhythm has since been employed by Reich and Adams). Relatively sustained sounds (melodic and harmonic), repeated arpeggios of limited range, occasional somewhat fast repeated notes and intervals, rapid "tremolos" that produce "clouds"—all of this in a diatonic non-dialectic setting—allow for a subtle richness of sound most are not accustomed to hearing.

Where subtlety is projected in Young's piano piece through harmonics and combination tones over great lengths of time, it is produced in Steve Reich's piano duet *Piano Phase* (1967) through the repetition and phase shifting of a pattern of twelve sixteenth notes comprised of five pitches. After beginning in unison the second player gradually accelerates until the next sixteenth note is reached, resulting in rhythmic synchronization. The new point of arrival projects a completely unique texture with its own rhythmic and melodic sub-patterns; this process continues until the full cycle returns to the unison "at which point the basic pattern is changed and the process happens again."[28] The number of pitches, rhythmic variety in each part, range, and dynamic contrast are limited; harmony is not a structural ingredient. Unique and compelling are the rhythmic and melodic sub-patterns, the "rattling" effect created during the phase shifting, and the unchanging rhythmic energy.

On the lighter side are two works: "Is It Love" from *On the Leopard Altar* (1984) by Daniel Lentz, and "Freezing" from *Songs from Liquid*

Example 1. Daniel Lentz, "Wolf Is Dead" (similar to "Is It Love") from *On the Leopard Altar*, 69. © 1982, Lentz Music (BMI). Used by permission.

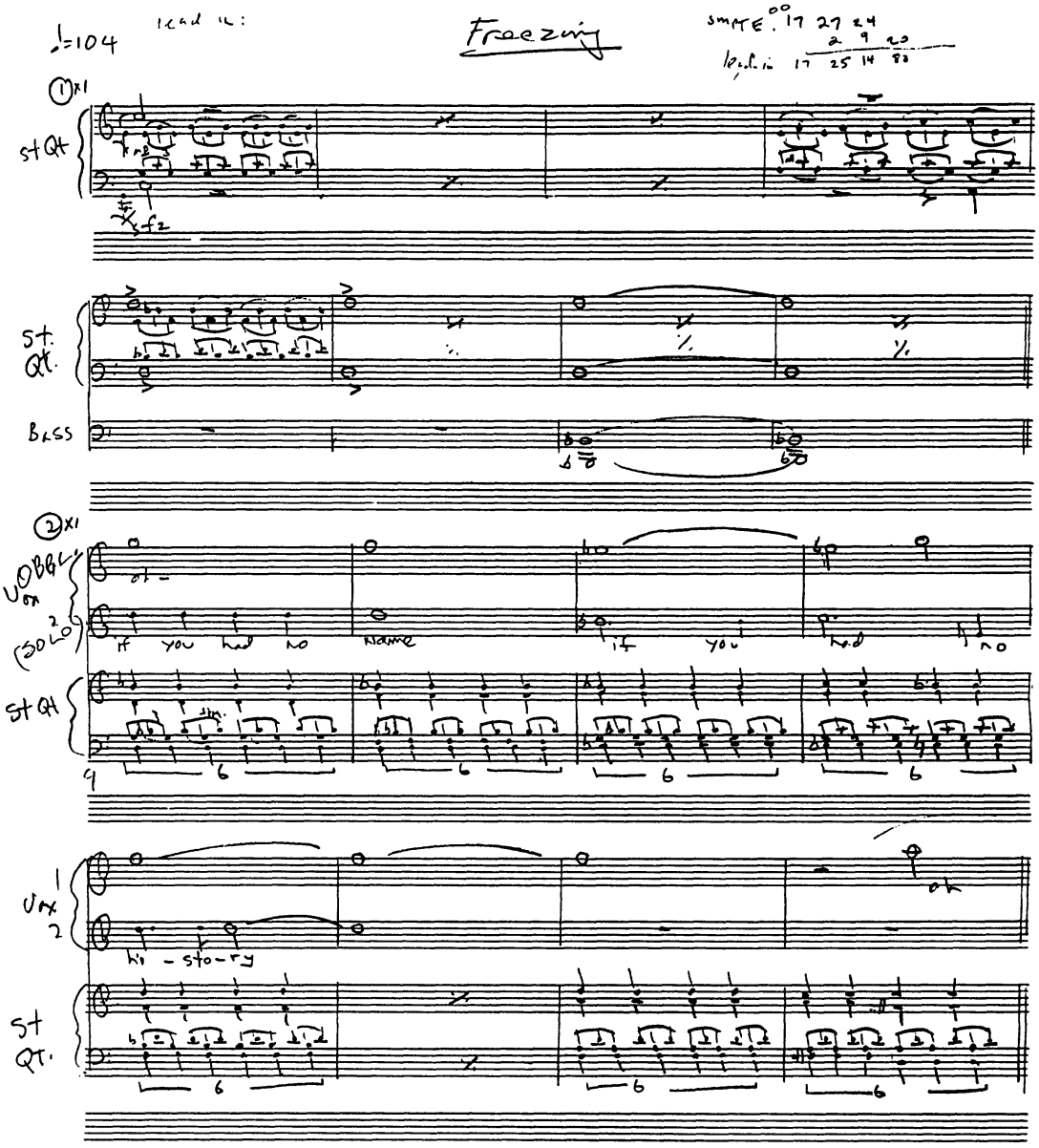


Days (1986) by Philip Glass with words by Suzanne Vega. Lentz, an eclectic composer of merit, creates in his piece a complex diatonic texture comprised of multiple vocal and electronic parts. An unceasing fast pulse—four notes per moderately fast beat—sets up the minimalist feel, with mallet instrument qualities reminiscent of Reich's *Music for Mallet Instruments, Voices and Organ* making the association even stronger. Very striking is the use of a vocal part—initially to reinforce the rapid pulsation of the electronic parts and then to provide juxtaposed sustained lines in contrast. The vocal strands are used more to complement the texture than to convey the meaning of Lentz's own text (an idea used earlier by Reich and Glass). Several abrupt shifts of mode and tonic lead to passages based on short repeated chord progressions comprised of parallel extended tertial harmonies. The complex texture (along with tonally oriented harmonic progressions, relatively frequent changes of dynamics, timbre, modes, and key centers) produces a piece more Western in concept—that is, one with dramatic musical direction. Constant (prolonged) pulsation in a diatonic context gives the work an unmistakable minimalist quality.

Glass's setting of "Freezing" is written for voice (Linda Ronstadt), the Kronos String Quartet, and keyboards. This relatively short song, just over three minutes, makes use of the patent Glass arpeggios in a texture possessing different levels of pulsation. Both features project the minimalist feel. However, the strong "functional" harmonic progressions and the relatively strict accommodation of the structure and meaning of the prose—no repetition of the text, paraphrasing, breaking down of the words, etc.—contrast with the Lentz work and reflect older, more traditional Western practices. And the comparatively lyrical (wordless) descant adds to musical momentum in rather conventional ways; it contrasts with the more static main melody and the driving rhythmic figures of the accompaniment, and reinforces tonal tension and repose. Certainly this is a departure from Glass's earlier artistic intention, about which he says, "When it becomes apparent that nothing 'happens' in the usual sense, but that, instead, the gradual accretion of musical material can and does serve as the basis of the listener's attention, then he can perhaps discover another mode of listening."[29] This collection of short works, and others, such as *Northstar, Glassworks,* and selections from the film *Mishima,* musically present an aesthetic position quite different from that quoted above—and certainly one based primarily on Western goal-oriented notions.

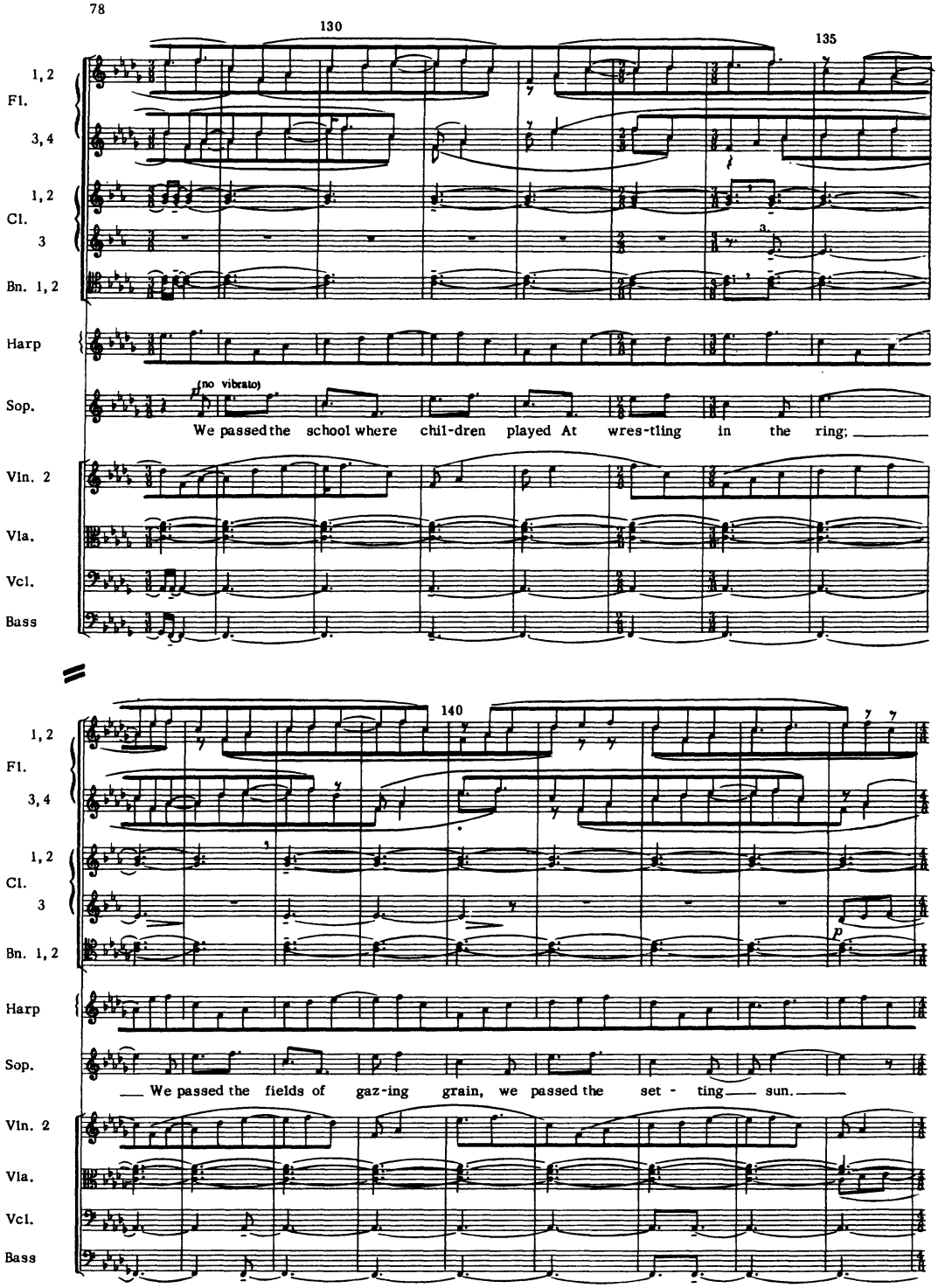
Two major symphonic works are John Adams's *Harmonium* (1981) and Steve Reich's *The Desert Music* (1984). Both are scored for large forces: orchestra and chorus in *Harmonium,* and orchestra with amplified woodwinds, three synthesizers, and amplified chorus in *The Desert Music.*

Example 2. Philip Glass/Suzanne Vega, "Freezing." Music composed by Philip Glass. © 1986, Dunvagen Music Publishers, Inc. Used by permission. All rights reserved. Lyrics by Suzanne Vega. © 1987 AGF Music Ltd./Waifersongs Ltd. Used by permission. All rights reserved.



Harmonium is a powerful, dramatic work over thirty minutes in length, in two parts, based on texts by John Donne (Part I) and Emily Dickinson (Part II). Contrary to most minimal music, it is a highly emotional composition with a clearly expressed text that exhibits the Romantic practice of enlisting musical contrasts to emphasize or reinforce text meaning. Prepared and unprepared points of arrival, sudden and gradual changes of character, and imaginative and diverse use of

Example 3. John Adams, *Harmonium*. © 1981 by Associated Music Publishers, Inc. (BMI). International Copyright Secured. Used by permission.



instruments and voices are unmistakable Western qualities. The extreme range of dramatic inflection, occasional wordless vocal passages, and virtuoso-like gestures are practices found in Western art music of this century. Perhaps it is because of these salient features that Adams feels he should not be considered a member of the minimalist camp. Nevertheless, his preference for diatonic relationships, his extended use of repeated cells projecting various levels of pulsation, and his interest in radically slowed harmonic rhythm, or as he describes it, "Large, harmonically stable key areas, often governed by a single mode or even a single chord . . . brought to life and impelled forward by an inner pulse and by a constantly evolving wave-like manipulation of the surface texture," link *Harmonium* unequivocally to the minimalist movement.[30] The connection is especially clear, for it is the presence of these features that gives the work its uniqueness. For the most part, however, Adams's pulsating effects are unlike others. First, they change character more readily and with greater extremes; second, they do not exist throughout the work; and third, they often become secondary to or supportive of more prevailing musical features. The first section of Part II, for instance, begins and ends without typical pulsating patterns, while the canonic middle section contains gentle pulses that clearly serve the meaning of Dickinson's words:

> We passed the school where children played
> At wrestling in a ring . . .

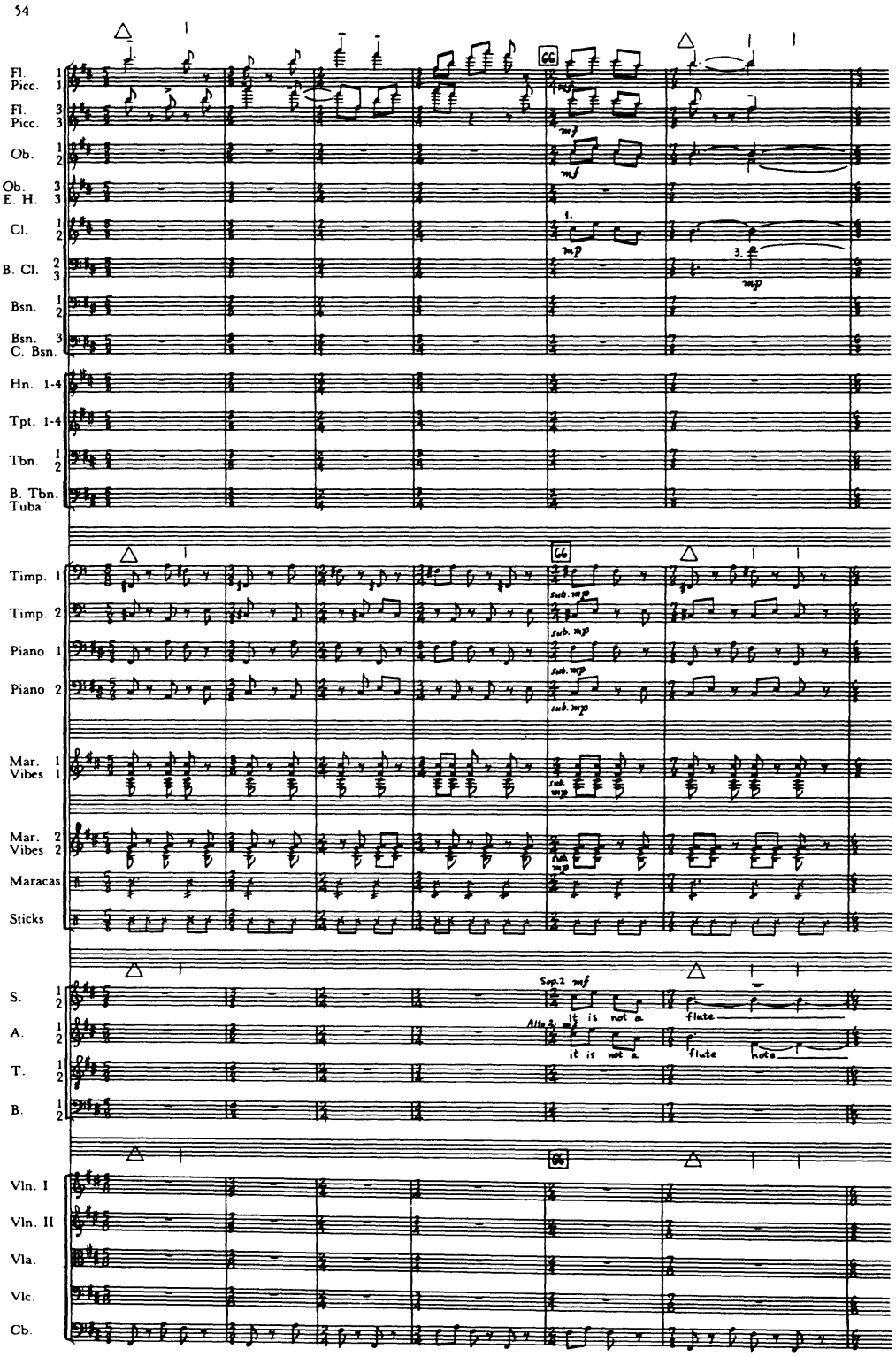
Similarly in the last section of the work, a prolonged pulsating figure, set up by female voices on the word "Rowing," highlights the final words of Dickinson's "Wild Night":

> Rowing in Eden–
> Ah, the sea!
> Might I but moor—Tonight—
> In thee!

Adams's use of minimalist practices in a dialectic, dramatic, and thus, Western context, may well be an example of things to come. Certainly, the manner in which he has been able to adapt and adopt these practices and maintain his individual style points favorably to the potential of the minimalist school.

Approximately fifty minutes in length, *The Desert Music* by Steve Reich is based on words by William Carlos Williams: "Orchestra" and "Theocritus: Idyl I—A version from the Greek," from the collection titled *The Desert Music*, and "Asphodel, That Greeny Flower," from another collection. The work is in arch form (a structure favored by Reich after studying the Bartók string quartets), with the following

Example 4. Steve Reich, *The Desert Music*. © 1984 by Steve Reich. Reich Music Publications, publisher. Hendon Music, Inc. (a Boosey & Hawkes Company), exclusive agents. Reprinted by permission of Hendon Music, Inc.



tempo relationships: I-fast, II-moderate, IIIA-slow, IIIB-moderate, IIIC-slow, IV-moderate, V-fast. Movements I and V share the same tempo and harmonic cycle; sections II and IV and sections IIIA and IIIC the same text and tempo. Tempos between movements are produced through metric modulation (3:2). These structural decisions clearly emanate from composers trained in the Western art music tradition, namely Béla Bartók and Elliot Carter.

As in the Adams piece, voices are used to produce independent wordless lines that contribute to the overall texture, and to project clearly the meaning of the text. Vocal parts are treated in ways typical of earlier eras, e.g., traditional choral part writing, metric-syllabic accent compatibility, no unusual vocal effects, polyphonic and homophonic settings, canonic writing, "word painting." Also common is the relationship of instruments to voices, the former serving primarily to accompany, to provide interludes, and to prepare for the latter. Melody is not the generator of form in either work, but rather an extension of the musical texture. As Adams explains, melody "is born out of the ongoing harmonic and rhythmic flow of the continuum."[31] These features, along with the prevalent use of repetitive gestures (produced a number of ways), rather loosely place the two works in the same fold. Differences, however, are many.

Reich's music on the whole is less goal-oriented and, to me, less dramatic than Adams's. Once a passage is launched by Reich, the style or "process" remains relatively constant. While passages change musically with text meaning, and vocal parts change depending on words, stanzas, or poems, the underlying pulsations of the moment create a feeling of stasis—an important aesthetic principle of Reich's expression: "*The Desert Music* begins with this pulsation in order to set up the feeling, structure, and harmony of the entire piece."[32] The difference in this work, however, is that passages, sections, and subsections generally change more frequently and noticeably than in his earlier works.

Although the comparison of dramatic impact here is a debatable matter, there can be little argument that *The Desert Music* is by far Reich's most dramatic piece. The practice of setting up a process allowing for gradual, subtle change over a long period of time is missing in this work. Fresh elements are the use of unusually fast harmonic rhythm in a chromatic setting, more pronounced dynamic changes, and considerably shorter passages that differ distinctly from one another. The style of vocal writing (as compared with that in such works as *Drumming* and *Tehillim*) is also new: it changes appropriately to accommodate the meaning and feeling of the text. In some instances word painting is employed. The soloistic use of flute and percussion, for example, introduces the words

It is not
a flute note either; it is the relation
of a flute note
to a drum. . . .

A canonic passage sung by women in staccato style emphasizes the following text:

it is a principle of music
to repeat the theme. Repeat
and repeat again,
as the pace mounts. . . .

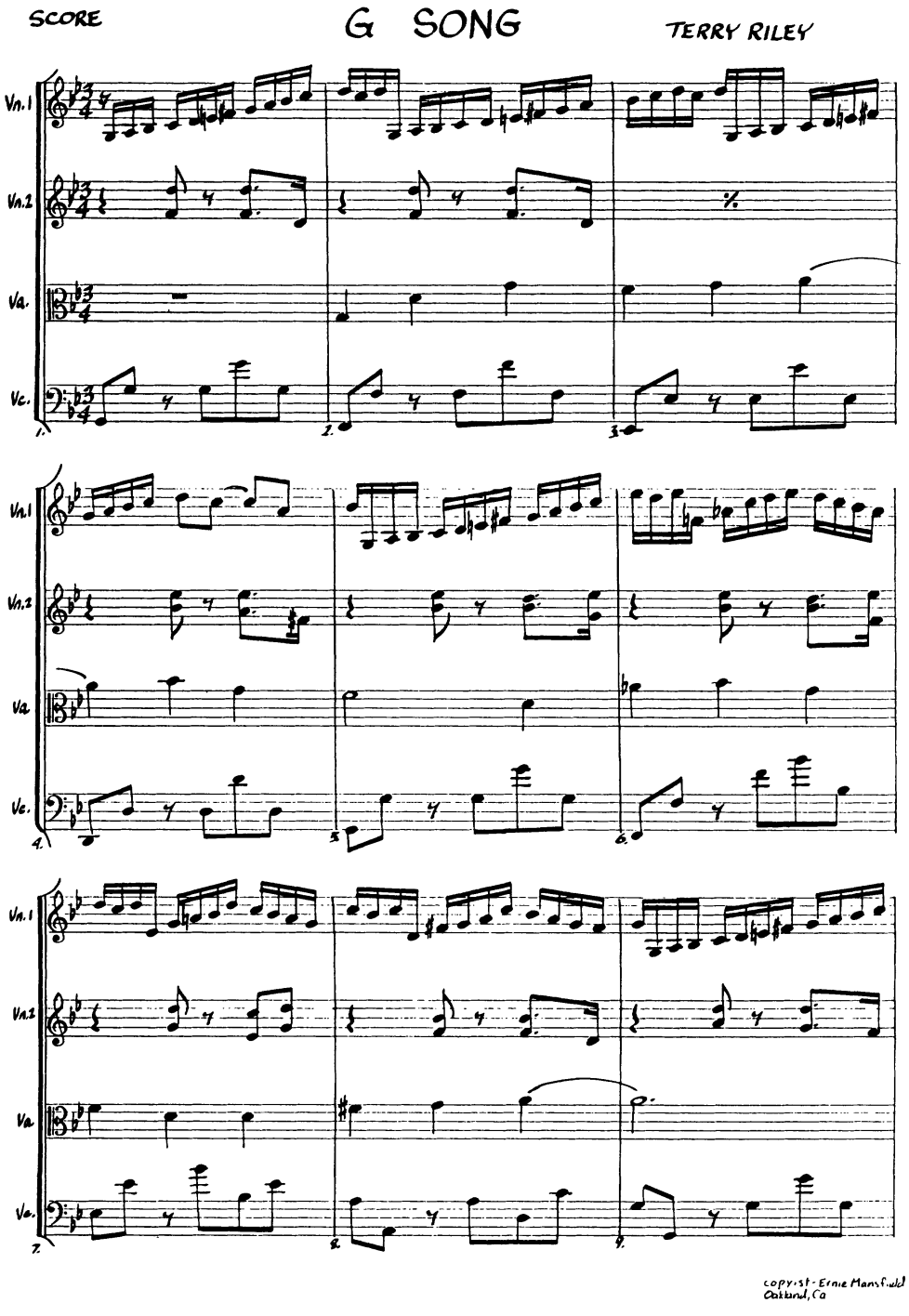
And a siren effect by the violas anticipates the text

"Man has survived hitherto because he was too ignorant to know how to realize his wishes. Now that he can realize them, he must either change them or perish."

Still central to the work, however, is Reich's trademark, the repeating, highly syncopated interlocking rhythmic figures about which he says, "If you want to write music that is repetitive in any literal sense, you have to work to keep a lightness and constant ambiguity with regard to where the stresses and where the beginnings and endings are. . . . In this way, one's listening mind can shift back and forth within the musical fabric, because the fabric encourages that."[33] While Reich uses repetition to greater extent than Adams, in *The Desert Music* (as in *Variations for Winds, Strings, and Keyboards* [1980]), musical features other than sounds generated through the repetition of short cells reach new levels of prominence. His patent sustaining qualities, for example, are brought more to life through attractive harmonic progressions; instrumental and vocal color are more noticeable because of greater frequency and abruptness of timbre and register changes; and motives seem increasingly memorable because of their more compelling melodic-rhythmic content. Where traditional Western musical syntax is more pronounced with Adams (and at one time of little concern to Reich), it now appears more important to Reich than before. The power and complexity of the exceptional fifth movement of this work are exemplary.

If the six pieces discussed above are any indication, there was a trend in 1980s minimalism to reduce subtlety and to integrate minimalist gestures into more dialectic settings. Progression, that is, musical teleology, seems to be replacing mere succession. "G-Song" from Terry Riley's *Cadenza on the Night Plain* for string quartet is also illustrative. The growth in complexity, the exquisite counterpoint, the sophisticated deviations used in variations that lead to an "expected" cadence are

Example 5. Terry Riley, "G Song." © 1973 Ancient Word Music (BMI). Worldwide administration rights controlled by Celestial Harmonies, Tucson, Arizona. Used by permission.



notated features of this work that differ considerably from the somewhat indeterminate gestures of his now famous *In C*. Even his recent improvisations on acoustic piano tuned in just intonation (following the influence of La Monte Young) are dramatically filled with contrasts and the unexpected. And the few repetition pieces by European composers that I have had a chance to hear are likewise conceived. Clearly, use of the terms "trance music" or "meditation music" to describe contemporary minimalist style is far from accurate.

Perhaps this reduction of redundancy and incorporation of the more dramatic in so many recent works by composers associated with this movement signal a later stage of minimalism. It is this stage that Meyer calls "mannerist," and defines as "marked by an active and often explicit pursuit of the less common and probable facets of syntax and structure. . . . Compositional redundancy is drastically reduced. Sensitive, accurate appreciation demands considerable experience and training."[34] But has the eloquence of earlier extended works, which perhaps demand even greater perceptual acuity, been lost to what we as a culture are more conditioned to hearing? Have practices of Western dramatic expression become victorious over the original minimalist aesthetic? Answers to these questions may be revealed this decade. But even if they aren't, it is increasingly evident that minimalism is not ready to relinquish its place in the musical mainstream nor to leave with us anything less than a valuable, indelible artistic style.

NOTES

My thanks to a colleague, Professor Allen Strange, for use of his tape library.

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Review
Reviewed Work(s): Terry Riley's In C. Studies in Musical Genesis, Structure, and Interpretation by Robert Carl
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Gatherin', Children's Day, and Communion. But he rightly says that 'Ives' usual motivations were more autobiographical than theological' (p. 75). Gale Sherwood Magee also connects Ives's intensive use of hymns with a religious approach to the serious health problems he and his wife had to face at that period (pp. 93–9).

Ives added what he called 'shadow lines' at certain points in the score. These are extra scraps of melody inserted softly and usually conflicting with the harmonic context. Ives was uncertain about them, thinking they might be misunderstood, but as late as 1945 he told Herrmann that 'a few measures in some of the braces were crossed out but ought to go in' (p. 24). However, they were probably not used in the premiere, nor included in the early scores or the first recordings. James Sinclair's recording with the Northern Sinfonia (Naxos 8.559087, 2000) makes judicious use of the shadow lines with characteristically Ivesian effect. Henry Cowell, in his edition (Associated Music Press, 1964) discussed the end of the last movement and says: 'Ives was very unsure about the bells. I do not think he really wanted the sound of orchestra bells. He wanted a distant church bell.' Sinclair uses recorded church bells rather than the notated triads of the first editions, which were what may have prompted the old percussionist to recall this work to Wooldridge.

It is interesting to compare Ives's song *The Camp Meeting* with the last movement of the Symphony. The song, which is very rarely performed, makes cuts but reflects the orchestral textures with changes. To take one example, there's a curious passage one bar before figure 9 where the lower second violin part in the second half of the bar has D and E♮ against flats for the rest of the orchestra, contradicting triadic consonance. The song does not have this conflict. Is it a shadow line or perhaps a mistake? What is a wrong note in Ives? See my discussion of these issues in H. Wiley Hitchcock's edition of 129 Songs (Music of the United States of America, 12; A-R Editions, Middleton, Wis., 2004) in *Music & Letters*, 87 (2006), 606–13.

Lou Harrison seems to have suffered so much from the pressure of work on Ives's manuscripts that he had an extended nervous breakdown—Ives paid medical costs and gave Harrison half his Pulitzer Prize cash. All the same, Harrison could say: 'Mr Ives has left us the most wonderful of playgrounds, a kind of people's park in which we are all arrangers of lovely things' (p. 49) (Zobel points out that there really is a People's Park in Berkeley, California). But this episode shows that Ives, perhaps more than any other composer in history, made extortionate demands on his intending performers. David Tudor's unstinting dedication to Cage could be another example.

Zobel draws extensively on what Burkholder has called 'cumulative setting' in accounting for Ives's structural layout, where full statements are reserved for the end of movements. He follows his main text with a bibliography; a list of recommended recordings, with deservedly high praise for Sinclair; an index of tune usage; and a selection of reviews. A few details: the penultimate bar of the first movement ought to have been identified simply as a perfect cadence in G flat major inserted between the two bars of E flat major (p. 54); the word 'flat' fails to make sense, five lines from the bottom (p. 58); Wilfrid—not Wilfred—Mellers, 62 n. 14; the text contains some repetitions and includes some description of the obvious. At the end Zobel seems pessimistic about the arts in the USA and therefore the future for Ives—'as a pastoral vision of the inner life, alas, [the Third Symphony] awaits discovery' (p. 78).

In his thesis-derived study Mark Zobel has demonstrated the difficulty of finding new things to say about Ives but he has raised some pertinent issues and from that point of view alone *The Third Symphony of Charles Ives* is worth having.

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Terry Riley's In C. By Robert Carl. pp. xiii + 146. Studies in Musical Genesis, Structure, and Interpretation. (Oxford University Press, New York and Oxford, 2009, £31.99. ISBN 978-0-19-532528-7.)

The American composer Terry Riley has better reason than most of us aged over 50 to remember what he was doing when he heard that President John F. Kennedy had been shot. Playing the piano in US Army clubs in Paris, his livelihood came to an abrupt end when these clubs closed for a long period out of respect; Riley returned to the USA and, in March 1964, composed his most famous work, *In C*. Its fifty-three modules notated on a single page, this work has frequently been viewed as the beginning of musical minimalism.

The Columbia recording of *In C*, released in 1968 with a curiously effusive essay (by conventional classical standards) by Paul Williams of

Crawdaddy! magazine and the complete score of the composition reproduced on the LP's cover, became an iconic Sixties artefact. So much so, in turn, that many of us aged over 50 can remember what we were doing when we first heard it (in my own case, as an impressionable schoolboy who encountered the LP via a more clued-up friend). Like me, Robert Carl, the author of this new monograph on Riley's *In C*, was seemingly more confused than exhilarated by his initial encounter.

Younger readers of this review have more reason to regard all this simply as history, or merely irrelevant anecdote. Yet the fact that only in the last decade or so has musical minimalism joined what Carl calls 'the serial or aleatoric versions of avant-gardism'—alongside the American performance-art movements of the 1960s and beyond—as a widely accepted subject of scholarly scrutiny raises some interesting questions. Where, for instance, should the borderlines be drawn between documentation presented for 'scholarly' purposes and the presentation of material that is merely of 'anecdotal' or nostalgic interest? Ten years ago, when my own *Four Musical Minimalists* was published by Cambridge University Press (a source that Carl generously credits several times, though he refers to it consistently as 'Four American Minimalists': a slip that I'll readily forgive him), to reprint the artwork for an original LP would have been considered inappropriate by most *bona fide* academic publishers, at least for texts on Western classical music. A decade on—and doubtless influenced by practice in the expanding field of popular music scholarship—Carl is permitted by Oxford University Press to include, as appropriate scholarly evidence, not only Columbia's 1968 cover design but also photographs of the house in which Riley wrote *In C* and of the space in which the work's pair of premiere performances took place on 4 and 6 November 1964, together with the single-page programme for the concert itself.

Such broadening of focus is, most importantly, reflected here in Carl's mixture of methodologies: from cultural and oral history to musical analysis, technological exegesis, and issues of performance practice, and the analysis of performance from recordings. (Malcolm Gillies, current editor of the series in which this book appears, writes tellingly in the Preface of its change of name to 'Studies in Musical Genesis, Structure, *and Interpretation*' (my italics), reflecting the admission of 'post-natal circumstance', what is often called the 'performative turn', to these now well-established volumes.) Only the higher reaches of cultural theory—as tested out, notably, on American minimalism in Robert Fink's 2005 book, *Repeating Ourselves*—are avoided in Carl's approach. He is well read, too, and commendably up to date (though I was surprised not to see Janice Ross's 2007 book on the dancer and choreographer Anna Halprin in the bibliography).

This variety of methodological tools is sensitively deployed to permit Carl to unfold, in six short chapters and an appendix, both the genesis and something of the reception history of *In C*. A composer himself, Carl estimates the significance of Riley's work with a composer's-eye view, but also with a taste for musical analysis that Riley would surely regard as merely 'number crunching', and something of the assiduousness both of the anthropologist tracking down subjects to question and the historian tracking down source documents permeates his discussion.

The introductory chapter establishes the Western Modernist, US West Coast, non-Western, and other contexts for *In C*: usefully, if in tone a little too close to that of an undergraduate lecture. Chapter 2 is a twenty-five-page life-and-works survey, taking the stories of Riley's biography and musical output, improvised as well as composed, up to 1964, including the crucial influence of La Monte Young (for most scholars, the true pioneer in the field of musical minimalism, a view that Riley would readily endorse). This is a story that has been told several times before by others, as Carl is happy to acknowledge. But he has more space here than most have previously been allowed for musical analysis and uses it well. Both the early String Quartet (1960) and the String Trio (1961), and the later *Keyboard Study No. 1* (1964 onwards), receive astute and detailed commentary with music examples; and even though his argument for 'harmonic progression' in the Quartet doesn't seem much more persuasive to me than Young's own for a C-major sonata-form basis behind his *Trio for Strings* (a work that influenced Riley's Quartet), Carl gets further with all three scores than other writers before him.

Documentary evidence enhances Carl's examination of the premiere performances of *In C*: itself an occasion bristling with a roster of composer-performers, in many cases now well known in their own right, including Pauline Oliveros, Steve Reich, and Morton Subotnick. Chapter 3 is also much enlivened by an account of the light show by Anthony Martin that accompanied these performances of *In C*

and by quotations from interviews that the author has conducted both with Riley himself and with other participants in these two concerts. The fact that these musicians are now mostly in their seventies emphasizes another aspect of the 'moment' in which such scholarship finds itself: we are already coming to the end of the period in which such fieldwork will be possible for studying the pioneering generation of American minimalists. The inclusion here of the original score of *In C* (lost by its composer but still in the possession of William McGinnis, the Tape Music Center's recording engineer; though in truth hardly revelatory) and the reproduction, with sensitive commentary from Carl, of Alfred Frankenstein's review of the second performance in the *San Francisco Chronicle*, in addition to the documents mentioned above, represent older historical-musicological methodologies.

Detailed analysis of *In C* is divided over two chapters. Chapter 4, entitled simply 'Analysis', offers what Carl terms an 'endogenous' view of the score's 'materials and structures'. Chapter 5, 'The Columbia Recording: A "Second Premiere"', actually includes discussion of much else besides analysis of the 1968 recording itself: of other music by Riley up to 1967 (I think, by the way, that the correct title of one of these post-*In C* works here is *Tread on the Trail*, not 'Tread on Trail'); of the history of how the recording was made (some fascinating material here); and of three of the recordings' first reviews, all liberally quoted (surprisingly, Jane Rotter's review for *Glamour* magazine turns out to have some real insights, and Carl teases out its present significance well). At twenty-six pages, this is the longest of all chapters, though only two pages of text, and three of graphic analysis, are actually devoted to the 'exogenous' interpretation based on a close reading of the multi-tracked performance in question.

In practice, it proves impossible, and indeed undesirable, to exclude from chapter 4 all discussion of how the fifty-three individual modules of *In C* might overlap in performance. The distinction between the different analytical approaches is well made, nevertheless. It leads to some perceptive analysis of the score, not least the insistence on a modal interpretation rather than a more conventionally functional tonal one; though some will doubtless baulk, for a variety of reasons, at the invocations of Western classical precedents and methodologies, including Schenker, elsewhere in this chapter. Probably more valuable, since it goes further than most have done previously—though one of the many estimable things about Riley's *In C* seems to be the variety of analytical approaches that it can embrace legitimately—Carl turns in an account of the Columbia recording that indulges 'number-crunching' with the best of them (including a three-page chart showing, as precisely as possible, how long, and exactly where in the performance, each module features). In addition, he proves able to draw some shrewd and sensitive conclusions about how the multitracking of this first recording 'does inherently box in the music, in a manner that contradicts the moment-to-moment close exploration of musical relationships that *In C* encourages' (p. 94).

The final chapter's attempts to summarize *In C*'s 'legacy' draw fascinatingly upon interviews: mostly with composers from Riley and Reich to younger Americans, but also, for instance, with the musicologist David Bernstein, editor of an important recent book on the San Francisco Tape Music Center (cited by Carl), who has some very pertinent points to make. I wish that Bernstein's raising of 'the whole idea of the distinctions between pop and classical being irrelevant... *In C* is the prototype of that' (p. 102) had been pursued further, with the inclusion of comments from popular musicians. And though the author could, in general, have tapped much further into Riley's legacy in the field of popular music, and is perhaps a little too reliant on direct quotation from his oral-history source materials, his own concluding remarks provide something of a conceptual framework for appreciating not only the divergent recorded performances of the piece but also *In C*'s own history, and possible future, as 'the product of a master musician who saw an elegant solution to the challenges creative artists were confronting throughout "new music" in the second half of the twentieth century' (p. 109).

An appendix is devoted to more detailed description and evaluation of fourteen of those further recordings of *In C* that have followed the Columbia disc: indications of its importance, popularity, and openness to varied interpretations, and a register of its role as a barometer of changing musical tastes. Nine of these recordings, it can be noted, date from 1997 onwards; two have been made by what the author describes, respectively, as 'punk/art-rock' and 'trance-rock' musicians.

Provocatively, if perhaps a mite ingenuously, Carl suggests at the end of chapter 6 that the score of *In C* would prove the best possible 'seed from which a new creative tradition could grow', were almost everything else destroyed in

the collapse of civilization as we know it (p. 109). Don't be put off, however, the idea of reading his study by such unscholarly speculation. *Terry Riley's* In C is a book that all musicians, music scholars, and music students should read.

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Kaija Saariaho. By Pirkko Moisala. pp. viii + 130. Women Composers, 1. (University of Illinois Press, Urbana and Chicago, 2009, $40. ISBN 978-0-252-03277-6.)

Kaija Saariaho (b. 1952) is now widely established as a central figure in contemporary classical music. Her recent operas in particular have been acclaimed across Europe and North America, while her earlier works, exploring sound and its mechanisms of production, are increasingly popular as paradigmatic examples of certain trends in late twentieth-century modernism; a number of studies have discussed the roles of gender and regional identity in the development of Finland's most successful female composer. With Saariaho featuring more and more prominently across a range of scholarly discourses, a foundational, comprehensive account of her life, and of musical developments through her prolific and varied output, has long been overdue. This is precisely what Pirkko Moisala provides in a rigorously researched and informative composer study.

The book's five chapters strike a balance between biography and the discussion of compositional techniques and aesthetic preoccupations. Moisala begins with a detailed and well-paced account of Saariaho's life. There is much of broad interest here, including Saariaho's childhood exposure to Steinerian pedagogical methods—the internalization, through dance and drawing, of different forms and their metamorphoses (speculative linkages with later musical shapes are hard to resist). We learn of the young composer's anxieties about over-reliance on literary stimuli (p. 6) and 'computer-crutches' (p. 8), and of the reasons behind Saariaho's decision to settle in Paris from the early 1980s onwards. The frustrations (and occasionally the blessings) of being a female composer are a recurrent theme; yet they represent less of a unifying strand than one might expect given that Moisala's previous work on Saariaho has tended to push gender to the fore—and that this is the first book in a 'Women Composers' series (we learn, incidentally, of Saariaho's continued frustration with precisely the label that this series reinforces). Sibelius, often a strong presence in accounts of contemporary Finnish music, is mentioned only in passing, in connection with gender ('the Finnish national hero who was always pictured as a sturdy old man with a big cigar', p. 5). Moisala generally advances a nuanced and wide-ranging perspective on the numerous conflicts and anxieties that have shaped the formation of Saariaho's identity. A perhaps regrettable result of this breadth, however, is that numerous issues are thrown into the air, often to be explored all too briefly.

The second chapter, 'Developments', focuses more specifically on Saariaho's musical production, from her first publicly performed work, *Bruden* (1977), to the opera *Adriana Mater* (2005). In a book published in 2009 and claiming comprehensiveness, one might reasonably expect coverage of more recent major works like *Notes on Light* and *Mirage* (2006 and 2007 respectively). Though the former will appear briefly in subsequent chapters, it seems that Moisala has made opera the endpoint of her narrative (as we will also see in her final chapter). Certain problems common to career narratives are readily apparent in 'Developments': an uncritical attraction to neat phases; a scarcity of reference to other narratives that intertwine with Saariaho's; and an occasional suggestion that creative rigor mortis has set in at a time when a contemporary composer is still in her prime.

Following a concise summary of this career narrative (pp. 26–7), Moisala embarks on a chronological survey of a number of key works and the technical or aesthetic concerns they exemplify. Her explications of complex procedures are aimed at the general reader, drawing on illuminating quotations from newspaper reviews, Saariaho herself, and the performers most strongly associated with her music. It is a relief that, while Saariaho was quite closely involved in the writing of the book—she gave several interviews and read through the final text—her words are generally not afforded a status above those of other commentators (indeed, the composer's often striking observations ensure that her input is, on balance, more of a blessing than a curse). There is, however, insufficient room for what is promised in the book's preface—an approach interested in the 'heterophony of meanings given to musical works' (p. vii) (another minor preface-related gripe is that interviewing a few musicians in this context surely does not constitute 'ethnographic fieldwork' in either aim or method-

by Kirt Saville

Strategies for Using Repetition as a Powerful Teaching Tool

Abstract: Brain research indicates that repetition is of vital importance in the learning process. Repetition is an especially useful tool in the area of music education. The success of repetition can be enhanced by accurate and timely feedback. From "simple repetition" to "repetition with the addition or subtraction of degrees of freedom," there are many forms of repetition that can be successfully adapted to music education. Descriptions of each form of repetition are provided, along with accompanying rehearsal strategies that can be implemented in the classroom. Music teachers can avoid the pitfalls of boredom and mindless repetition by constantly shifting teaching strategies and including new goals and framing techniques. Using these strategies wisely, music educators can provide meaningful, refreshed, and powerful teaching and learning opportunities for both themselves and their students.

Keywords: chorus, band, high school, orchestra, practice, rehearsal, repetition, strategy

A useful strategy in music education for a wide variety of learners, repetition can be made engaging through creative and improvisatory teaching techniques.

Repetition is one of our most essential learning tools. It is by repetition that we learn to recognize the letters of various alphabets, associate appropriate animal sounds with the correct animal, and memorize names, addresses, phone numbers, multiplication tables, and a host of other information that is fundamental to conceptual learning. Brain research reveals that repetition strengthens neural connections.[1] Music education typically emphasizes repetition because of its success in the development and refinement of psychomotor skills.

The most basic type of repetition is that of simple imitation. Imitation is easily observable in infants, who, when exposed to an observable action, begin to imitate the action. Imitation involves the process of trial and error. Early trials of imitation are often inaccurate, but through repetition, the psychomotor skills increase and become more precise. This is especially true in the field of music, where the first attempts to perform on a musical instrument usually bring inferior results. As students strive to imitate correct musical skills through repetition, they learn through personal trial and error what actions produce the best results.

However, simple imitation is not the most effective strategy for learning through repetition. If we want to increase the effectiveness of learning via repetition, feedback is the key to success. Feedback can be either positive or negative. Negative feedback lets students know which options do not work. Positive feedback can focus students on the options that will bring optimum results. Research indicates that we learn by allowing our brain to sort through many options, eliminating those that do not work and choosing those

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that are most correct.[2] The process of giving feedback to our students when they are engaged in repetitive exercises is therefore of prime importance.

Accuracy and timeliness are critical factors in feedback. If feedback is inaccurate, students repeat and learn bad habits. If feedback is nebulous or too generalized, the students may not receive enough information to choose behaviors that will ultimately improve their performance. Timeliness is critical because the longer the delay, the greater the opportunity for students to disassociate their actions from the feedback. Providing accurate and timely feedback is the best way to increase learning through repetition. This is why some educators believe that "accurate feedback may be the single greatest variable for improving learning."[3]

Some conductors, after having an ensemble play a long section of music, attempt to provide an extensive list of things that need to be fixed in the music just performed. This is a common form of delayed feedback. Delayed feedback separates performance problems from the corrective options that need to be considered. The longer the delay before feedback is given, the less impact there will be on learning. Unless a performer receives the opportunity to isolate a performance problem and immediately experience the solution through performance, the chances for personal improvement are greatly reduced. Learning will be more effective if we can give immediate feedback that is specific to one problem at a time.

Break It up to Learn It

Chunking is a word often used by educators to describe the process of breaking large bodies of information, such as musical works, into smaller parts. Chunking provides smaller, discrete musical elements to the ensemble that can be repeated, refined, and eventually reassembled back into the original context of the music. Experienced music teachers become adept at chunking and sequencing the reassembly of difficult musical passages as a means of solving complex performance problems. By chunking, we eliminate the delayed feedback inherent in a long list of items to be fixed after the performance of a long passage and instead focus on more useful and immediate feedback. Repeating the two most critical measures of a sixteen-measure phrase will solve more problems than the repetition of the entire phrase. Likewise, chunking the three troublesome interval leaps in a four-measure phrase will increase rehearsal efficiency and productivity.

To be effective in the process of chunking, the educator must identify the critical elements of the phrase that are challenging for the students, and then create a repetition exercise that focuses on the smallest pattern that addresses the identified problem(s). By focusing on the specific problem(s), the educator will be able to give immediate feedback on the specific elements that are problems, and the students will have the opportunity to immediately experience the solution through performance.

Recognizing that repetition is a powerful teaching tool, one must acknowledge that repetition can also become one of the most significant causes for boredom, frustration, and musical stagnation. Incorrect repetition can create poor habits that are difficult to break, and excessive repetition of any skill can become monotonous, tedious, and boring. Research indicates that simple repetition without purpose does not result in better performance.[4] The brain's natural tendency is to learn from new experiences and then to slowly lessen the response. Brain research indicates that one solution is to use the principle of repetition, "but under the guise of completely different approaches."[5] This clarifies the need for effective educators to become adept at

finding new ways to imbue purpose into alternative approaches.

Darren Johnson describes teaching strategies that either simplify the task or "reframe" it so that it can be experienced in a new way. He states that "Reframing techniques are particularly effective because they create a sense of novelty and avoid the sense of boredom that can lead to meaningless repetition."[6] By creating new frameworks for the time-honored strategy of teaching through repetition, we can provide the repetition that is needed to produce improvement while at the same time finding purpose for each reiteration.

The following list is a toolbox of teaching strategies and reframing techniques that have been gleaned from my colleagues and in the course of thirty years of personal experience in music education. When imbued with purpose, each exercise can be used to strengthen and vary learning activities that are based on repetition. Except where noted, each of these strategies presumes that the teacher has already used chunking to select a music excerpt of appropriate length and that students will be given accurate and timely feedback.

Simple Repetition (Imitation)

The process of modeling music requires students to develop the ability to listen analytically and to refine their ability, through each repetition, to more closely approximate the modeled example. Although some teachers worry that this can lead to rote learning, careful listening and imitation play a critical role in the development of musical perception and achievement.

a. Identify one issue that needs to be improved, and model the solution through singing or playing an instrument.
b. Ask the class to perform the passage and imitate the modeled passage.

Disguised Repetition (Where Content Does Not Change)

Disguised repetition implies that each teaching strategy will reframe the exercise so that each repetition will appear to be new. The following strategies do not require the instructor to change any portion or element of the passage that is to be repeated, but it does require the instructor to provide accurate and timely feedback so that the purpose for each repetition is clear.

Performer-Switching Repetition

Repeat a phrase with different students:

a. Everyone with blue eyes
b. Everyone with brown eyes
c. Everyone who has shoelaces
d. Everyone who has a birthday on an even number
e. Everyone on your right/left

Surprise Repetition

Consider the analogy of opening the refrigerator door, and every time you reopen the door, you find something totally new and unexpected. For each repetition, you must open the refrigerator door for your students and find something new.

a. Change your tone of voice.
b. Add drama to your body motion or conducting.
c. Give a dramatic pause before you give feedback, or ask for the next repetition.
d. Ask students to stand up and perform.

Call-and-Response Repetition

Call-and-response is a powerful teaching device. Let your modeling speak for you—do not try to explain the "how" and "why."

a. Model the correct performance, and indicate to the students (nonverbally) to repeat the excerpt back to you. Each repetition will invite the students to become more discerning listeners and refined performers.
b. Model the passage incorrectly. Ask the students to identify the incorrect element (e.g., wrong note, wrong rhythm, unfocused tone).
c. Use call-and-response with short verbal feedback or questions (see discovery repetition) after each repetition to guide their listening.

Competitive Repetition

a. Everyone stands up and repeats the passage. When a student makes a mistake, he or she must sit down. Increase the level of challenge with each repetition by increasing the tempo or changing the dynamic level. Repeat until only a small group remains standing. Do not let this kind of competition go on for too long, or those who have made a mistake will tune out and lose interest in the proceedings.
b. Section versus section, for example, brass versus woodwinds, sopranos versus altos, trumpets versus trombones, or tenors versus baritones.
c. Challenge the class to see which individual/section can perform the passage correctly at the fastest or slowest tempo.

Class/Peer Assessment

a. As the tuning note is repeated throughout the ensemble,
   - if the player is sharp, students point their index finger downward to show how to resolve the sharpness;
   - if the player is flat, students point their index finger upward to show correction;
   - if the player is in tune, students make a fist; or
   - if students do not know which direction to go, they hold both hands in "palm-up" position.
b. Rate the quality of performance while independent sections or individuals perform repetitions of the same passage. Ratings are given without verbal comment from the students: one finger for *best*, two fingers for *okay*, and three fingers for *needs improvement*.

Paired Assessment

a. Ask each member of the class to identify an adjacent partner. Partners are designated as "A" or "B." The A group performs the passage while the B group listens. The B partners will have sixty seconds to assess their partners' performance. Talking is permitted only during the assessment interval (no performance).

b. The roles are reversed on the next repetition. B partners perform and A partners will provide the assessment (sixty seconds). Instruct students to give feedback to their partners and, when finished, to return to silence. When the class is quiet, move to the next repetition.

Inquiry/Discovery Repetition

a. Ask the class for input on how they might perform the musical passage more successfully. Once identified, repeat the passage.

b. Model the passage and then ask students to identify differences between their version and the modeled version. Once differences are identified, repeat the passage.

c. Ask seated students to stand up when they perform the melody (or the countermelody).

d. Have students write one thing that they feel needs to be improved on a blank sheet of paper. Ask random students to share the item that they have written down. Base your next repetition on one of the items that was identified.

Guided Discovery with Repetition

a. Ask questions that will lead the students to discovery:
- What sections/instruments are singing/playing the melody at this point in the musical composition?
- Which instruments/voices are in unison?
- When does this vocal unison passage add harmony?
- Which instrument has the identical rhythm that is being performed by the snare drum?

b. Ask questions that require students to perform if they know the correct answer:
- Everyone who has the melody at measure *xx*, please perform it.
- Everyone who has the countermelody at measure *xx*, please perform it.

Disguised Repetition (Where Something in the Content Is Altered)

The following teaching strategies are based on the concept that musical excerpts have many levels of complexity. By simplifying the passage, or by bringing fundamental elements of the excerpt into focus, the educator may help students identify and refine the performance problems that are hindering progress. Accordingly, the following teaching strategies involve the manipulation or alteration of content during the repetition exercise in order to simplify or clarify performance issues.

Conducting Repetition

a. Conduct correct style and tempo first time. With each repetition. change one important musical element through your conducting gestures (e.g., dynamics, tempo, phrasing, style).

b. Have a student conduct the excerpt and ask him or her to change the tempo (power sharing).

Chunking Repetition

Through the process of dissecting and stacking, the instructor may create repetitions that build increased skill.

a. Dissect a phrase by dividing it into several small pieces. Repeat each segment as a separate exercise, and then recombine the separate pieces once the individual segments have been learned.

b. Learn a pattern by starting with two notes, then three, then four (stacking).

c. Perform the last measure of the phrase, then add the second to last measure, and then continue stacking backward until the entire phrase is complete.

Rhythmic Repetition

a. Count the rhythm out loud while clapping once for every note, then perform the rhythmic passage on the next repetition.

b. Ask vocalists to speak the words in time with the correct rhythms without trying to sing pitches.

c. Use a *tss* sound with air between the teeth to indicate each attack and continue the air hiss to show the duration of each note in the rhythmic passage.

d. Articulate the exercise: Have students speak the rhythms with articulation syllables (e.g., *ta*, *too*, *tee*, *dah*, *dat*).

Bopping Repetition

Play or sing only the attack of each note (all notes will be short) while still accounting for the full rhythmic value of each note. This process, often referred to as "bopping" the notes, will clarify individual rhythmic precision and illuminate ensemble precision problems.

a. Perform a chorale by singing/performing only the initial attack of each note.

b. Use a short percussive *tss* with air between the teeth to signify the attack of each note for a difficult rhythmic passage (air rhythms).

Association Repetition

Through this method, students learn to associate symbols with sound.

a. Edward S. Lisk gives the following repetition exercise for the development of scale mastery.[7]

1. Recite the pitch names of the target scale at the tempo of quarter note = 60 (mental).
2. Recite the pitch names while simultaneously fingering the associated note at quarter note = 60 (mental-physical).
3. Mentally recite silent/internal pitch names while playing instrument at same tempo (mental-physical-auditory).
4. Mentally recite silent/internal notes while playing instrument and reading the notation (mental-physical-auditory-visual).

b. Students will develop the ability to perform a crescendo or decrescendo.

1. For an eight-count crescendo, students will count out loud for eight counts (1, 2, 3, 4, 5, 6, 7, 8), speaking each number louder than the preceding number. Reverse the order for decrescendos (8, 7, 6, . . . , 1), with each successive number diminishing in volume.
2. Students perform the eight-count crescendo/decrescendo while mentally thinking of the dynamic counting exercise.

c. Students perform evenly spaced groupings of odd-numbered note flourishes (groupings of five or seven).

1. Students recite "1, 2, 3, 4, 5–1" against a steady pulse until the five-note grouping is even and controlled for the appropriate number of counts (i.e., five notes to one beat).
2. Students recite the appropriate numbers while fingering the notes.
3. Students play the note grouping while mentally reciting the five-note grouping.

Power-Sharing Repetition

Power sharing provides students the opportunity to use their creativity to shape the activity while providing additional opportunities for disguised repetition to your students.

a. Put variations of articulations on the board, then ask one student to point to a new articulation for each new repetition.

b. Put the following dynamics on the board: *pp*, *p*, *mp*, *mf*, *f*, and *ff*. Invite a student to stand at the board and point to a new dynamic level for each new repetition. If the passage is of sufficient length, the student can point to a new

dynamic level for each measure of the excerpt.

c. Put a crescendo and decrescendo on the board. Have a student show which one to play and follow the length of the symbol to indicate speed of crescendo/decrescendo.

d. Have a student draw a dynamic graph on the board of his or her own design.

Example:

Ask the ensemble to perform the passage while the student follows along the shape of the line with his or her finger. The ensemble will follow the dynamic contour of the line in real time.

e. Place a grading criteria rubric on the board. Ask one student to assess and indicate the level of achievement on each repetition.

Contrasting Repetition

a. Perform a fast passage in a slow chorale style.

b. Perform a slow legato passage in a fast, marchlike style.

c. Play a slurred passage all tongued or an articulated passage slurred.

Repetition with Addition or Subtraction of Degrees of Freedom

Music performance requires the simultaneous synthesis of many musical elements. These elements could be called *degrees of freedom*. The more degrees of freedom that exist in a passage, the more difficult the passage. Conversely, by reducing the degrees of freedom, you may be able to identify and remedy the individual parts of a passage that are not working. Degrees of freedom may include tempo, rhythm, articulations, intervals, dynamics, rubato, and so on.

a. Slow the tempo or eliminate the tempo and conduct one note at a time.

b. Eliminate all interval leaps by reducing the passage to its rhythmic content only. Perform the rhythm on a single pitch.

c. Eliminate all dynamic shapings. Repeat the excerpt at a single dynamic level.

d. Eliminate all articulations, and slur the passage at a slower tempo.

Looping Repetition

When a short phrase (one to two measures) needs many repetitions, it may be helpful to create a loop of the phrase.

a. Create a loop by designating a short excerpt to be repeated without stopping. Loops can be created that have a two- or four-count rest between the repetitions. The loop continues until the students show improvement or gain mastery.

b. Use looping to solidify articulations or establish accurate large interval leaps or any other discreet item that needs multiple repetitions.

Looping Repetition with Shifting Focus

a. Add one item to focus on in each new repetition. This requires a two- or four-count rest between each loop. Between each repetition, ask the ensemble to focus on one new element. Students could be asked to articulate a new way, sit up straight, breathe deeply, change the attack, form better vowels, release together on beat *x*, lift the soft palate, perform with a darker tone, sing or play softer/louder, and so on.

b. Between each repetition, ask the ensemble to remove one item for each new repetition (see eliminating degrees of freedom).

Framed Repetition (Setting the Stage for Learning)

One of the most effective ways to enhance repetitive learning is to create a challenge or goal that creates a clear set of expectations for the learning activity. It can also be an invitation that provides a mental hook for students' curiosity.

Goal Setting: Instructor

Setting goals before a repetition begins will add motivation and purpose to the exercise.

a. Set a goal of repeating a phrase three times without any mistakes.

b. Set a goal of repeating a passage at a slower tempo with all dynamics played correctly

(eliminating various degrees of freedom).

Goal Setting/Power Sharing: Student

a. A student is asked to determine the "tempo goal" for a difficult passage.

b. A student is asked to set a goal to sing or play *x* number of measures with only one breath.

c. Students set a goal of their choice.

Context Framing

Context framing is the process of creating a "hook" that allows the students to experience a sense of wonder and invokes curiosity. It provides the emotional invitation to learn.[8] Examples might include explaining the historical context of a piece, talking about the life of a composer, sharing anecdotes regarding your personal experiences with the piece, sharing the composer's own written thoughts about the music, or creating an imaginative story line to illustrate the form of the piece. Examples include the following:

- Explain how scale mastery proved to be a critical step in your own personal development.
- Explain the story behind "March to the Scaffold" by Hector Berlioz.
- Prior to playing the Holst Suite No. 2 for Military Band, read (or sing) the texts of each folksong. Discuss how

each text might have affected Gustav Holst's setting of the melody.
- Explain how "The Stars and Stripes Forever" by John Phillip Sousa became America's official national march.

Choose Your Strategy

The foregoing list of rehearsal strategies and reframing techniques is not an exhaustive list. Effective educators will use the strategies best suited to their own personalities, teaching styles, and the developmental levels of their particular ensembles. The outlined strategies are designed to enable educators to use repetition as a fundamental teaching tool in the learning process. Research has demonstrated that "when neural connections are stimulated repeatedly, they strengthen significantly."[9] We strengthen these neural connections via repetition by using accurate and immediate feedback. We can avoid the pitfalls of boredom and mindless repetition by constantly shifting our teaching strategies and employing new goals and framing techniques. If we use these strategies wisely, the repetitive nature of our craft can provide meaningful, refreshed, and powerful teaching and learning opportunities for ourselves and our students.

Notes

1. Eric Jensen, *Teaching with the Brain in Mind*, 2nd ed. (Alexandria, VA: Association for Supervision and Curriculum Development, 2005), 28. http://site.ebrary.com/lib/byuprovo/Doc?id=10089220&ppg=3 (accessed June 20, 2009).
2. Ibid., 38.
3. John A. Hattie, "Measuring the Effects of Schooling," *Australian Journal of Education* 36, no. 1 (1992): 5–13.
4. Robert Woody, "Learning from the Experts: Applying Research in Expert Performance to Music Education," *Update: Applications of Research in Music Education* 19, no. 2 (2001): 11–14.
5. Jensen, *Teaching*, 37–39.
6. Darren Johnson, "More than Just Minutes: Using Practice Charts as Tools for Learning," *Music Educators Journal* 95, no. 3 (2009): 63–70.
7. Edward S. Lisk, "The Rehearsal: Mastery of Music Fundamentals," in *Teaching Music through Performance in Band*, vol. 2, ed. L. Blocher and R. Miles (Chicago: GIA, 1998), 20–21.
8. Jensen, *Teaching*, 147.
9. Ibid., 40.

by Rachel Whitcomb

Teaching Improvisation in Elementary General Music

Facing Fears and Fostering Creativity

Abstract: Improvisation is a vital part of an elementary general music education. While some music teachers successfully include improvisation in music instruction, others have fears and face challenges when attempting improvisational activities in the classroom. This article acknowledges obstacles facing music educators when attempting to incorporate improvisation in elementary general music, such as lack of instructional time, lack of experience improvising as part of personal musicianship, and lack of training to teach improvisation. Suggestions to address these challenges are provided, and practical lesson plans have been designed to help teachers get started with classroom improvisation. Ideas include combining improvisation with other musical skills while maintaining the integrity of all endeavors, starting with simple lesson ideas, setting guidelines that can be loosened as improvisational skills develop, using familiar methods and materials, and connecting improvisational activities with music that is desirable to students outside of school. Lesson plans that can be adapted for various classroom settings are included.

Keywords: activities, creativity, elementary, general music, improvising, lesson plans, standards

How can music teachers best help their elementary students learn to improvise? Here are some ideas to get started modeling the behaviors you want to see.

Improvisational activities are beneficial to children in many aspects of their lives. Spontaneous musical activities allow children to express feelings and ideas in musical ways and simultaneously combine the musical skills of performing, listening, and analyzing. Improvisation gives students outlets to create unique and different musical ideas. Teachers can foster creativity in the classroom by modeling improvisational processes, providing a safe and welcoming environment that honors the ideas of the learners, and allowing opportunities for students to rhythmically or melodically improvise in a variety of musical styles. Support for creative endeavors, such as improvisation, has been evident in the music education community. Perhaps the most widely known example of this support is the inclusion of improvisation in the National Standards for Music Education, published in 1994.[1] Standard 3, "Improvising melodies, variations, and accompaniments," and its corresponding

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achievement standards provide educators with practical suggestions for including improvisation in instruction.[2]

While some music teachers successfully include improvisation in music instruction, others have difficulty knowing where to begin. The goals of this article are to (1) acknowledge common fears and challenges facing music educators when attempting to incorporate improvisation in elementary general music classrooms, (2) suggest possible solutions to these challenges, and (3) provide practical lesson ideas to help teachers get started with classroom improvisation.

Common Fears and Challenges

When we consider some of the common fears and challenges faced by music teachers as they attempt to include improvisation in instruction, themes have emerged in recent research that can provide a context for practicing educators. Teachers' overall attitudes toward inclusion of improvisation are positive, but finding time to include improvisation remains a challenge. While professional development opportunities, such as teaching demonstrations by fellow music teachers, have been reported to assist teachers in including improvisation in instruction, lack of experience improvising as a musician and lack of training to teach improvisation hinder teachers' efforts. Findings from three research studies relating to these themes are described in more detail in the following.

A 2007 study based on a survey I did in the state of New York was designed to help better assess the status of improvisational activities in elementary general music classrooms.[3] Teachers were asked to report not only the extent to which they include improvisation in instruction but also the factors that assist and inhibit their attempts at improvisational endeavors. A promising 94 percent of teachers surveyed reported that they have included some form of improvisation in music instruction. In addition, 96 percent of respondents believe that improvisation should remain in the National Standards for Music Education. In a similar study in England, researcher Theano Koutsoupidou surveyed teachers, both nonspecialists and those specializing in music, to determine improvisational musical practices in classrooms.[4] Results were positive, with 81 percent of teachers reporting use of improvisation in instruction. Of those teachers, all use instrumental improvisation, 56 percent use vocal improvisation, and 59 percent use movement or dance improvisation.

In the survey described in the same 2007 study, I asked teachers to rank ten activities based on the instructional time devoted to each, with number 1 indicating the activity that is allotted the most instructional time and number 10 indicating the activity that is allotted the least time in the classroom.[5] The activities listed paralleled the content standards and also included movement. Improvisation ranked near the bottom of the list, with ninth place as its most common ranking (or mode). Similarly, in a 2002 study designed to investigate use of class time in thirty elementary general music classrooms, Evelyn K. Orman found that although all nine of the content standards were addressed during instruction, those that required creative or artistic skills on the part of the students received less instructional time.[6] Given findings from these studies, it seems that while teachers are supportive of including improvisation in the classroom, they are not always able to find time to include it in instruction.

In the 2007 study described above, New York teachers were asked to indicate factors that assist their inclusion of improvisation as well as factors that may inhibit them from including improvisation more often in instruction.[7] Among the reported factors that may assist teachers as they attempt improvisational activities are observing teaching demonstrations by fellow music teachers (according to 89 percent of respondents), in-service teacher training focusing on improvisation (86 percent), offerings at professional conferences devoted to improvisation (85 percent), and more time scheduled for music instruction (72 percent). Some common inhibiting factors include a lack of instructional time (60 percent), lack of experience improvising as a musician (53 percent), and lack of training to teach improvisation (42 percent). Koutsoupidou found similar results in her study of teachers in England, who reported inhibiting factors such as lack of practical experience improvising (77 percent), lack of theoretical knowledge of improvisation (69 percent), concern about a reduction in classroom discipline (62 percent), and lack of instructional time (54 percent).[8]

With consideration of these reported inhibiting and assisting factors, it is now possible to provide strategies for including improvisation in elementary general music in ways that allow teachers to feel comfortable and successful in these endeavors. Some solutions are offered in this article, and many others are available on the Internet, including in My Music Class at www.nafme.org.

Solutions to Consider

The teachers in the studies described above indicated that a lack of instructional time inhibits their inclusion of improvisation in the classroom. Many music teachers desire more time with students and continue to advocate for music as a regular part of each school day. In addition to these ongoing efforts, there are also strategies that can assist teachers in including improvisation in existing class schedules. One way to address this issue is for teachers, researchers, and methods instructors to develop strategies that will enable teachers to incorporate opportunities for children to improvise within the limited contact time often provided for general music instruction. Techniques are needed that combine improvisation with other skills while maintaining the integrity of all endeavors. For example, teachers can continue to reinforce proper singing while children create spontaneous melodies using solfège. The quality of singing can remain intact while improvisational skills are developed. In addition, teachers can encourage students to listen to, analyze, and evaluate improvisational endeavors occurring in the classroom, thus developing skills in Standard 6,

"Listening to, analyzing, and describing music," and Standard 7, "Evaluating music and music performances."[9]

Music educator Kimberly Inks points out that improvisation does not need to be the primary objective of a lesson but can be incorporated into a lesson that focuses on a particular musical concept.[10] By combining improvisation with other activities and making it a part of the *process* of learning music, teachers can foster the creative endeavors of all children and provide an environment that embraces their musical ideas. This combination of activities does not mean that teachers need to create an entirely new set of lesson plans. Rather, teachers can consider the activities already occurring in their classrooms and adapt lessons to include an improvisatory component.

Similarly, teachers do not need to abandon their methodological choices or teaching approaches in order to include improvisation. Many educators are inspired by specific approaches and methodologies in elementary general music, such as Orff Schulwerk, Gordon Music Learning Theory, Dalcroze, and Kodály. Each of these established approaches/methods includes improvisation within its foundations or can be adapted to include improvisation, and most provide the melodic and rhythmic vocabulary necessary for students to improvise. For example, the *prepare–present–practice* sequence in the Kodály method can be adapted to include *improvise* as a final step, allowing students to demonstrate their true understanding of a rhythmic or melodic concept previously learned by incorporating it into spontaneous musical creation. The lessons included at the end of this article incorporate a variety of ideas and can be adapted to complement the approaches and methodologies already implemented by the teacher. Furthermore, a number of authors have described ways to maintain the integrity of the improvisational process while also maintaining the beliefs inherent within various methods and approaches. Table 1 contains suggested resources for further study, including those focusing on specific approaches and methodologies common in elementary general music.

TABLE 1

Selected Resources for Further Study

Abramson, Robert M. "Dalcroze-Based Improvisation." *Music Educators Journal* 66, no. 5 (1980): 62–68.

Azzara, Christopher. "An Aural Approach to Improvisation." *Music Educators Journal* 86, no. 3 (1999): 21–25.

Brophy, Timothy S. "Developing Improvisation in General Music Classes." *Music Educators Journal* 88, no. 1 (2001): 34–41, 53.

Burnard, Pamela. "Into Different Worlds: What Improvising and Composing Can Mean to Children." *Orff Echo* 24, no. 2 (2002): 28.

Hamilton, Hilree J. "Improvisation, Composition, and Peer Interaction: Music Learning in a Cultural Context." *General Music Today* 11, no. 2 (1998): 4–8.

Mickolajak, Mary T. "Beginning Steps to Improvisation." *Teaching Music* 10, no. 5 (2003): 41–44.

Sexton, Lucinda, and Erin Rosa. "I Is for Improvisation: A Classroom Primer." *Kodály Envoy* 36, no. 2 (2010): 16–20.

Stamou, Lelouda. "Spontaneity–Creativity–Improvisation–Composition: A Developmental Process." *Orff Echo* 24, no.1 (2001): 8.

Whitcomb, Rachel. "Step by Step: Using Kodály to Build Vocal Improvisation." *Teaching Music* 10, no. 5 (2003): 34–38.

Results from the survey studies also indicate that music teachers lack experience improvising as musicians and therefore do not feel qualified to teach improvisation. Teachers who feel they can improvise will certainly be more comfortable teaching improvisation, but this does not necessarily mean that years of experience improvising are needed before it can become at least a small part of the classroom. Inks suggests that teachers go through the process along with their students by stating, "When setting up the experience, play the role of the student . . . experiment with a pentatonic melody in an eight-beat phrase while your students count for you. If you have little or no experience improvising, learn with the students."[11] When students become aware that the process of improvising is honored, they may show greater understanding and forgiveness for novice improvisers in the classroom environment.

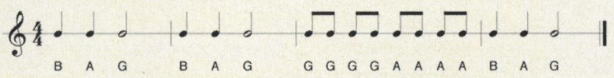
According to John Kratus, a professor of music education at Michigan State University, improvisation begins with exploration, which includes trying out different sounds on a particular instrument or in a particular style.[12] Kratus states that exploration is followed by process-oriented improvisation, which includes the development of musical patterns. If a teacher is new to improvising, it is perfectly acceptable to start with exploration and move on to process-oriented improvisation, just as children do. These experiences can begin with the teacher's own musicianship in the styles most personally appealing to the teacher. When teachers include creative musical endeavors in their daily lives, they will have a context when asking their students to go through similar processes. Improvisational experiences, then, become more authentic for both teachers and students. Teachers can anticipate the challenges and fears that students bring to the experience because they themselves have gone through similar feelings and have learned to work through them. In the preliminary stages, emphasis can be placed on the process rather than the product. For instance, a

Lesson A: "Hot Cross Buns" with a Secret Ingredient

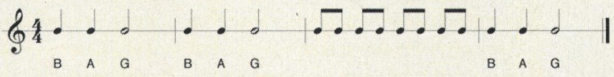
Grade Level: 3

Procedures:

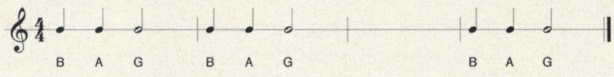
1. The students sing and play "Hot Cross Buns" as a review, either aurally or using visual representation, as in the example below. The students identify the measure that is different from the others.



2. After discussing the different measure and what "hot cross buns" are (e.g., how they are made, how they taste), the teacher eliminates the letters for the third measure and says that the students are going to add a "secret ingredient," which will be their own choice of letters, to the already-existing eighth notes in the measure, using a visual representation similar to the one following:



3. The guidelines can be adjusted on the basis of the abilities of the students and past learning experiences with the recorder as follows:
   - Students choose one note (B, A, or G) and play it using the given rhythm within the measure.
   - Students use the notes B, A, and/or G in any order within the measure as long as each note is repeated for a given pair of eighth notes.
   - Students play any combination of B, A, or G in any order within the measure.
   - Students use any notes previously learned on the recorder.
   - Students use any notes previously learned on the recorder as long as the newest note is included in their improvisation.
4. The teacher explains that they will improvise the letters, which means they are going to make them up as they go along. Before playing, students are invited to clap the third measure and say any letters they would like (based on one set of guidelines listed above). To point out the important element of individual choice, the teacher asks, "Since we are all going to make it up as we go, will we all be saying the same letters at the same time?" The students will realize that the letters being said may all be different, so the chaotic sounds they will hear will be somewhat expected. Once the letters have been said, the students are invited to play the rhythm with their improvised letters on recorders, with a similar reminder from the teacher that it will not all sound the same because each student may make different choices—and this is okay!
5. The teacher plays measures 1, 2, and 4 and invites the class to improvise the letters for measure 3 as a class. Once the class is comfortable with this process, the majority of the class can play measures 1, 2, and 4 while small groups and/or individuals improvise measure 3 with the given rhythms.
6. The rhythm in the third measure is then taken away so students can improvise both melodically and rhythmically.



teacher can describe the processes that he or she has gone through to develop his or her own improvisational skills, including those endeavors that did not always sound polished or particularly desirable at first.

If the teacher shares personal stories that illustrate continued efforts to improve improvisational singing or playing in particular styles (such as jazz or rock), students might feel more comfortable taking musical risks and working through challenges to attain improvisational goals. Since many teachers will be more comfortable (and perhaps more successful) in improvising within their favorite styles of music, it is apparent that students will be more likely to succeed when attempting spontaneous musical creation if they are asked to do so in the context of familiar music that is attractive to them. In today's musical world, teachers should consult their students' iPods for guidance. Lessons D and E at the end of this article provide specific examples of how teachers can incorporate improvisational activities into music that interests students outside of school.

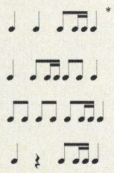
Findings from the survey studies also indicate that music teachers have not been provided with pedagogical guidance when attempting to teach improvisation. Unfortunately, improvisation was not included within their undergraduate methods courses. While efforts are being made to include improvisation in undergraduate music education programs both as a musicianship skill and as a teaching method, practicing teachers require

Lesson B: Call-and-Response Rhythmic Patterns

Grade Level: 4

Procedures:

1. Rhythmic patterns are displayed, as indicated below. The teacher snaps the steady beat and cues the students to say the patterns using familiar rhythmic solmization.



2. Each student chooses one pattern. The teacher snaps the steady beat and cues the students to say just their chosen pattern as a group simultaneously. Each student then chooses a different pattern, and this step is repeated until students show comfort with the process.
3. The students say their chosen patterns individually after the teacher provides a spoken call, creating a call-and-response progression. The spoken call will always be four beats long and include the eighth-and-two-sixteenth-note rhythm, but the call can vary or stay the same depending on the abilities of the students. Students are reminded to say their pattern immediately after the call, without any wasted beats in between. Students having difficulty choosing a pattern quickly can say the fallback pattern, indicated with an asterisk (*). To put all learners at ease, the teacher invites all students to say the fallback pattern in unison as a review.
4. After the first call-and-response progression when all students have individual turns choosing and saying patterns, all patterns are erased except for the fallback pattern. The students will improvise a pattern after the teacher provides the rhythmic call; the patterns created by the students should have the eighth-and-two-sixteenth-note rhythm and be four beats long. The students take a moment to improvise patterns simultaneously a few times to alleviate any fears and allow for improvisational practice. The teacher reminds the students that the fallback pattern can be used.
5. The students carry out the call-and-response rhythmic progression with the teacher once again, with each student individually improvising a four-beat pattern using the specific rhythm concept.

meaningful professional development opportunities in this area. Since survey participants indicated that observing teaching demonstrations by fellow music teachers and in-service training would assist them in including improvisation more often, steps can be taken locally, regionally, and nationally to provide these types of opportunities for teachers to learn improvisational teaching techniques. Teachers experiencing successful endeavors with improvisation can share their techniques with colleagues. Due to the spontaneous nature of improvisation and the need to be "in the moment" while teaching improvisation, the best ways to share teaching techniques include live teaching demonstrations and video clips that can be viewed online. This is especially true given that student responses vary during improvisation, and similar techniques can create very different outcomes between groups of students. Furthermore, teachers can get together and improvise as musicians in a safe and nonthreatening environment in order to go through the improvisational processes necessary to be prepared to teach. If some teachers have more experience improvising than others, the group can account for differences in abilities within the group by having the more experienced improvisers playing on secondary instruments. This may allow teachers to go through the same frustrations as their students, which will lead to a better understanding of their students' challenges when being asked to improvise.

Through a willingness to combine improvisational activities into established routines and methods, take musical risks with students, share ideas with fellow music educators, and improvise as musicians in a variety of styles, elementary general music teachers can succeed in incorporating improvisation in instruction. The sections that follow provide a few general suggestions for teachers to get started with corresponding improvisational lessons that can be adapted for immediate and future use.

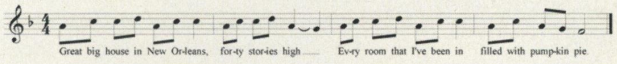
Suggestion 1: Start Simple and Set Guidelines

Improvisational activities do not need to add complexity or angst to the teaching process. To make the most of instructional time and to acknowledge a lack of experience improvising on the part of the teacher, it may be helpful for everyone to begin with a familiar song and add improvisation to the mix. Since the piece "Hot Cross Buns" is consistently included in recorder and instrumental methods books and is quite simple to learn, it serves as a good starting point for improvisational endeavors. Refer to Lesson A for the lesson sequence, which is written for recorder but can be adapted for other classroom instruments. The idea behind this lesson is to remove as much complexity associated with playing the recorder (fingerings, note-reading) as possible in order to focus on the spontaneous creations of the students. Since B, A, and G are often the first notes learned on the recorder and the song "Hot Cross Buns" can be learned by rote or with notation, measures 1, 2, and 4 can be reviewed quickly and played

Lesson C: Spontaneous Folk Song Rondo

Grade Level: 2

Great Big House in New Orleans



Procedures:

1. The students sing the song "Great Big House in New Orleans" as a review from previous lessons. Before going to instruments, the teacher sings the first measure of the song, and the students sing the second measure, and this continues for the third and fourth measures, respectively. The teacher then claps the rhythm of the first and third measures, with the students clapping the rhythm of the second and fourth measures in succession with the teacher.
2. With xylophones set up in F pentatonic, the teacher plays the first measure of the song and invites the students to play the rhythm of the second measure on any notes in the pentatonic scale. The teacher models this process a few times first to give students musical ideas, depending on the objectives of the lesson (e.g., playing with both mallets, using three or more tones, repeating specific tones).
3. The teacher plays the first measure of the song and the students, as a group, play the second measure. This continues in real time with the third and fourth measures.
4. Improvisational efforts of the students can be enhanced by the teacher saying one of the following:
   - "Play something different this time."
   - "Choose only one note."
   - "Start with lower notes, and end with higher notes."
5. The same process is carried out individually, with each student getting a turn to play the second and fourth measures while the other students listen. The teacher can continue to play the call each time, or the students can learn the simple call and play it for each other.
6. A discussion can take place about the improvisational choices made by the students, where the group analyzes individual efforts and determines which responses were favorites and why. The process can be repeated on the basis of what was learned from this discussion. For example, some students may play a different rhythm than what was expected for the second and/or fourth measures. The teacher can ask, "What do we think about that? Let's all try a different rhythm this time, as long as it is the same length." The guidelines can be loosened, depending on the improvisational products of the students, to honor their ideas and encourage them to make their own musical decisions. Similar processes can take place for any song with ABAC form.

successfully by the entire class. Measure 3 provides an opportunity for improvisation. By having the entire class play all but one measure, the teacher is providing a familiar aural palette for the learners, which takes away anxiety often associated with improvisation.

The National Standards for Music Education indicate that teachers should provide opportunities for children to compose *within specified guidelines*, and this same idea can be applied to improvisation.[13] Philosophically, each teacher will need to decide where the guidelines begin and when they can be loosened to foster more creativity on the part of the students. A friendly debate continues within our profession regarding the need for guidelines in creative processes. For the purposes of this discussion and to assist those just starting to include improvisation, a good rule of thumb for teachers creating guidelines is "Specify, gradually loosen up, and then get out of way!" Since improvisation is a creative endeavor, it will be necessary for teachers to figure out how to control certain aspects of creation while at the same time working to avoid stifling students' original ideas.

Teachers can address guidelines in multiple ways. The teacher must first provide the musical context, including tonality, meter, and mood. This can be done using the melodic and rhythmic vocabulary already addressed in previous instruction. Once the musical context is established, the teacher can guide improvisations of students by providing them with guidelines, such as number of beats or measures, specific pitches and rhythmic values, rhythmic or melodic patterns, and expressive elements. As beginners become accustomed to taking musical risks while remaining within the guidelines, the teacher can provide opportunities for children to more freely improvise by loosening up the guidelines. For instance, if the children have improvised the third measure of "Hot Cross Buns" using the rhythm provided without hesitation, perhaps they can decide the rhythm for their improvisations and explore notes other than B, A, and G for their creations. If this is done gradually, the teacher can remove himself or herself from the process more and more, allowing the students' ideas to be at the forefront of musical endeavors.

Teachers can extend Lesson A to include other familiar songs with more complexity as the improvisational skills of the students improve. In addition to improvising during class time, students can be encouraged to improvise specific measures at home while practicing. Sometimes it is necessary for students to have some time alone to hear their own improvisational efforts in order to make them more pleasing and musically relevant with the chosen repertoire.

Suggestion 2: Use What You Know

As stated earlier, teachers can use the rhythmic and melodic vocabulary

developed within their chosen approaches and methodologies to assist in the improvisational process. Lesson B provides an opportunity for students to spontaneously apply rhythmic knowledge in a call-and-response format. The eighth-and-two-sixteenth-note rhythm is the focus of the lesson. A teacher using the Kodály method would have *prepared*, *presented*, and *practiced* this concept in previous lessons and can now provide an opportunity for students to improvise patterns that contain that rhythm. Rather than creating a separate set of activities for improvisation, the process can be embedded into existing skill building activities. The materials used (in this case, rhythmic solmization, with a focus on *ti-tika*) have previously been learned, and the teacher and students are already familiar with the methodological sequence, so improvisation becomes a logical next step, both for continued conceptual development and assessment of skills.

All groups of elementary students are unique, and individuals in each group learn and grow at various paces. Improvisation can be a welcome outlet for some students to express their creativity and at the same time can be a source of anxiety and fear for others. The teacher can set different guidelines for individual students based on their various levels of ability and comfort. The teacher can indicate a *fallback* pattern within improvisational activities that can be used in case of a musical emergency when rhythmic or melodic ideas do not necessarily come spontaneously to certain students, as indicated in Lesson B at the end of this article. Since improvisation occurs in real time, the fallback pattern also allows for a consistent flow of musical ideas. The teacher provides the rhythmic call within this call-and-response lesson, so it can be changed at the teacher's discretion and used to differentiate instruction. A student struggling with rhythmic concepts may benefit from a simple call from the teacher to allow that student to remain focused on his or her own creation. However, a student ready for more complex rhythmic concepts can be provided with a more challenging call that might provide that individual with inspiration to create a more sophisticated pattern.

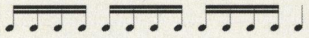
Teachers comfortable with folk songs can go with what they know while still providing outlets for student improvisation, as outlined in Lesson C. A number of folk songs have an ABAC form melodically, rhythmically, or both. As in Lesson B, the teacher can provide the call and the students can improvise responses. The form of the song provides structure for the activity, and the lesson extends song study by adding different aural flavors.

Lesson D: "Who Says" You Can't Improvise?

Grade Level: 3 or 4

Procedures:

1. The students listen to a recording of Selena Gomez and the Scene's "Who Says?" (written by Priscilla Renea and Emanuel Kiriakou) and keep the steady beat by mimicking the teacher as he or she patsches, claps, and steps the steady beat.
2. The students echo the following portion of the song (without visual representation):



na - na - na - na na - na - na - na na - na - na - na na

3. The students identify the rhythm of the words and say the pattern using rhythmic solmization (at the time of year when four sixteenth notes have already been introduced). Once the pattern has been identified, it can be used as the fallback pattern and written on the board. The teacher will acknowledge (with much enthusiasm) that actress and singer Selena Gomez uses the same rhythms in her song that the students have been learning in music class. What an exciting coincidence!
4. The students come up with a four-beat pattern using body percussion (or unpitched percussion instruments) that incorporates the sixteenth-note rhythm. The teacher invites the class to simultaneously perform their patterns on the spot as a practice session. The students are reminded of the fallback pattern and that each has a turn improvising patterns at specific times during the recording.
5. The students listen to the recording again and are cued at specific times. Since the recording includes multiple layered instrumental and vocal tracks, it may be difficult to hear the students' patterns. Therefore, the teacher may want to create a loop of the basic beat and chord progression from the song on Garage Band software to use during the students' improvisations.
6. To develop students' improvisational products, the teacher can change the guidelines by suggesting things such as the following:
   - "This time, put the set of sixteenth notes on a different beat."
   - "Add a rest to your pattern."
   - "Include two sets of sixteenth notes next time."

Note. Ideas are adapted from a lesson written by Erika Coyne and are used here with permission.

Suggestion 3: Try Student Favorites

While there are benefits to students when a teacher is comfortable with methods and materials used in the classroom, improvisation calls for music educators to step out of their comfort zone and take musical risks. Sometimes, this requires that educators become familiar with the music students find appealing outside of school. When teachers choose popular music for improvisational activities, students may bring more enthusiasm and open-mindedness to

Lesson E: Improvisational "Skating"

Grade Level: 6

Procedures:

1. The students listen to a recording of "Skating" by the Vince Guaraldi Trio. The students may be familiar with the music from the animated film *A Charlie Brown Christmas.*
2. The students listen again to the portion of the music that repeats the harmonic progression of the chords C–F–G–F while the teacher sings the root letter of each chord in time with the music. The students join in to sing the chord roots as well.
3. Xylophones will be set up with only C, F, and G bars. The chord progression is replayed using either the original recording or a prerecorded loop. The teacher will then demonstrate how to play the root of each chord in time with the music while also improvising the rhythm on the xylophone. The teacher will point out that each chord only occurs for three rapid beats at a time, so the rhythmic improvisation must be done quickly and spontaneously. The teacher will make sure to demonstrate interesting and varied rhythms while improvising to inspire the students.
4. While the chord progression is replayed, the students improvise together as a class. Once the students have become comfortable with the chord progression, each individual student is cued to improvise over the progression.
5. The class will discuss the rhythmic improvisations they created and what they might do to improve them on the next try. Descriptions of specific aspects of individual improvisations can serve as a starting point for meaningful discussion.

Note. Ideas are adapted from a lesson written by Adam Reyher and are used here with permission.

improvisational processes, thus creating improvisational products that are more creative and memorable. Lessons D and E include musical selections that might not otherwise be included in the classroom but are familiar and desirable to elementary students. The ideas outlined in these lessons can be adapted to fit other songs and selections in the future.

A Unique Opportunity

Challenges, such as limited instructional time, lack of experience improvising as musicians, and lack of familiarity with teaching techniques that foster spontaneous musical creation, can sometimes hinder teachers when attempting to implement improvisational endeavors in the classroom. Elementary general music educators can face common fears about improvisation by incorporating spontaneous music-making into the activities already occurring in classrooms. When teachers go through the improvisational process as musicians within familiar musical styles, they are able to work through processes associated with improvisation and can then relate to their students with better understanding. Teachers can start with simple additions to existing lessons, use the methods and materials with which they are familiar, and stretch their musical boundaries to include music that students are listening to outside of school.

Strategies such as these will benefit students by developing improvisational skills that will give them confidence in their own musical ideas and creativity in the future. Music teachers consistently serve as musical models for performance endeavors, such as singing and playing. In some cases, music teachers are the only professional musicians that students encounter in their lives, particularly at the elementary level. Therefore, music teachers have a unique opportunity to serve as models for improvisational music-making as well, allowing students to see how spontaneous musical creation can be embraced and included as part of personal musicianship.

Notes

1. Consortium of National Arts Education Associations, *National Standards for Arts Education* (Reston, VA: MENC, 1994).
2. Ibid.
3. Rachel Whitcomb, "Elementary Improvisation in New York State: Survey Results," *School Music News* 71, no. 2 (2007): 31–33.
4. Theano Koutsoupidou, "Improvisation in the English Primary Music Classroom: Teachers' Perceptions and Practices," *Music Education Research* 7, no. 3 (2005): 363–81.
5. Whitcomb, "Elementary Improvisation," 33.
6. Evelyn K. Orman, "Comparison of the National Standards for Music Education and Elementary Music Specialists' Use of Class Time," *Journal of Research in Music Education* 50, no. 2 (2002): 155–64.
7. Whitcomb, "Elementary Improvisation," 31.
8. Koutsoupidou, "Improvisation," 369–70.
9. Consortium of National Arts Education Associations, *National Standards.*
10. Kimberly Inks, "Standard 3 Is Risky Business: Practical Ideas for Improvising in the Classroom," *Teaching Music* 12, no. 5 (2005): 22–26.
11. Ibid.
12. John Kratus, "Growing with Improvisation," *Music Educators Journal* 78, no. 4 (1991): 35–40.
13. Consortium of National Arts Education Associations, *National Standards.*