

Downtown Beats for the 1990s: Rhys Chatham, Mikel Rouse, Michael Gordon, Larry Polansky, Ben Neill

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Influenced by the rhythmic structures of John Cage and the continuously articulated beat of rock, many of Manhattan's Downtown composers are turning toward rhythmic structures based on or implying a simultaneous multiplicity of tempos. Among those born in the 1950s, Rhys Chatham has created melodies from repeated notes with different durations; Mikel Rouse bases his music on Schillinger's "interference of monomial periodicities"; Michael Gordon pits varying tempos in conflict with each other; and, like Conlon Nancarrow before them, Larry Polansky and Ben Neill have written tempo canons. Many aspects of this new music were foreshadowed in Henry Cowell's *New Musical Resources*, and constitute an undercurrent of the American experimental tradition.

KEY WORDS rhythmic structure, tempo, Downtown, Schillinger technique, number ratios, postminimalism.

Music in Downtown Manhattan has entered an era of controlled complexity. That complexity is neither the haphazard jumble of free group improvisation nor the discontinuous frenzy of serialized rhythm. Instead, it is a continuum of simultaneous, or sometimes successive, competing tempos. The era of the steady pulse (as in 70s minimalism) has given way to a music of many pulses, fighting, blending, differentiating, and blurring into scintillating textures.

The new rhythm has two primary sources and a number of secondary ones. The first is John Cage, who insisted that rhythm, rather than harmony, should be the structural basis of music because rhythmic structure can integrate silence, while harmonic structure cannot. This insistence, along with the beautiful example of Cage's time-structured music of the 1940s, led to minimalism's emphasis on arithmetical rhythmic structure. That idea of structure - form conceived in terms of section-length proportions, tempo contrasts, and cumulative rhythmic processes - has survived into the *postminimalism* of the 1990s, but with far more complexity. The rhythmic structure of minimalist works tended to be one-dimensional, whereas postminimal rhythmic structure is usually multi-layered. In many postminimal works, rhythm is the primary structural force, while pitch might play a secondary or even decorative role.

The other primary influence is rock. All of the composers discussed in this article have played either in rock clubs or with rock ensembles, and all believe in the power of a continuous, articulated beat. Yet, surrounded by a rhythmic wealth of jazz and ethnic musics, they also scorn the simplistically straight tempo of neoromanticism or minimalism. Complexity in Downtown postminimalism often comes from "polytonal" rhythm, the simultaneous layering or succession of diverse pulses.

The use of contrasting tempos also connects the composers discussed here to a tradition that not all have looked to as a direct influence. Henry Cowell, in his *New Musical Resources* (written in 1916-17, published 1930), launched an exploration of rhythm on an analogy with pitch relationships, and created a notation designed to facilitate simultaneous tempos related by whole number ratios. "The purpose of *New Musical Resources*," Cowell wrote, "is . . . to point out the influence the overtone series has exerted on music throughout its history . . . , and how, by various means of applying its principles in many different manners, a large palette of musical materials can be assembled."¹ For Cowell, application of the overtone series to rhythm meant potentially dividing any rhythmic unit into 3, 4, 5, 7, 9 or more equal parts, just as the 3rd, 4th, 5th, 7th, and 9th overtones were drawn from divisions of a sounding string or air column. Contrasting those divisions is the equivalent of implying different tempos.

A number of composers have put Cowell's ideas to the test: most exhaustively Conlon Nancarrow (who read *New Musical Resources* avidly in 1940), but also Charles Ives, James Tenney, Ben Johnston, and Joseph Schillinger (on whom more below). Many have stumbled across Cowell's ideas without having read his book (regrettably out of print). At present, New York postminimalism finds itself involved in a thorough investigation of tempo contrasts and rhythmic number-ratios. The five composers discussed below may have come to these rhythmic ideas from diverse directions, but they are pursuing common techniques and developing a common language of which Cowell was the prophet. (I regret the absence of women in this article. There are many excellent and influential women composers working in New York, but none I know of use the kind of rhythmic concepts I discuss below.)

Rhys Chatham

Slightly older than the other composers here (born in 1952), and active in New York since the early 70s (formerly as music director of the Kitchen), Rhys Chatham represents an earlier stage, a transition between minimalism and postminimalism. He was one of the first to incorporate the rhythms and materials of rock into longer compositions, and notationally his rhythms often have the simplicity of rock. But in *An Angel Moves Too Fast to See* (1989) for drummer and one hundred electric guitars, Chatham created a rhythmic structure based on pulses at different rates, a model that has been generalized and expanded in other postminimal works.

An Angel presented Chatham with an unusual logistical problem: performing a piece for one hundred electric guitars is nearly always bound to necessitate dependence on some musicians who do not read music. Chatham conceived the piece for two tiers of guitarists – an "inside," necessarily literate group, and a surrounding group whose reading skills need not be at a high level – and structured the piece around this limitation. In *An Angel's* fifth movement, Chatham – figuring guitarists who could not read at least could count – gave each section only one or two notes to repeat at a different number of beats. Thus section 1 plays B and F every seven beats (marked off by the drummer), section 2 plays

¹ Henry Cowell, *New Musical Resources*, (New York: Alfred A. Knopf, 1930), pp. xvi-xvii.

G# and E every eight beats, section 3 an octave A every nine beats, and so on. The opening section of this movement appears below:

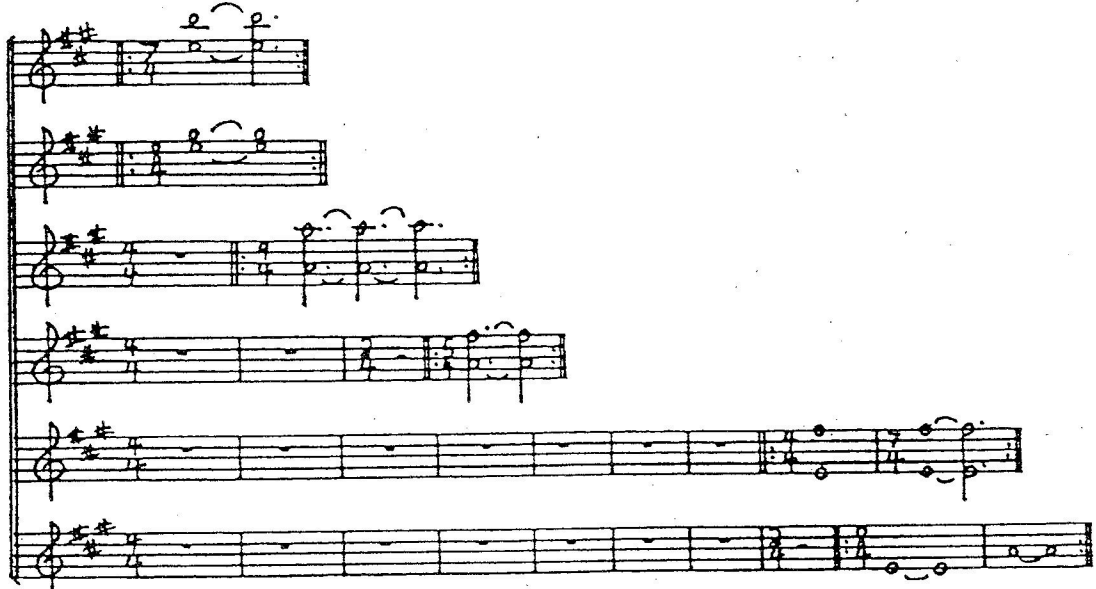


Figure 1 Excerpt from Rhys Chatham's *An Angel Moves Too Fast to See*

The perceived result is a quasi-endless melody (actually, one that would repeat itself after 55,440 beats):



Figure 2

The melody continues for forty-eight $\frac{4}{4}$ measures, at which point a cue is given for the players to switch to a different set of notes repeating at the same set of durations: 5, 7, 8, 9, 11. The melody changes several times, but its internal rhythmic structure, a kind of vocabulary of possibilities, continues to be determined by those numbers.

As an example of a surface form resulting from repetitive cycles of different lengths, this is fairly one-dimensional (depending on the listener's spatial position with respect to the guitar orchestra, for the melody notes do bounce from one section to another, and there is a one-to-one correlation between pitch and spatial position). *An Angel*, though, provides in skeletal form a technique that has been elaborated in other postminimal works (including several of my own). For example, Glenn Branca (born in 1949) structured a movement of his Sixth Symphony by having different guitar sections change chord every four, five, six, and eight beats respectively. The technique is part of the postminimalist vocabulary.

Mikel Rouse

Joseph Schillinger (1895–1943) coined an impressive-sounding term for the rhythmic technique Chatham used: "interference of monomial periodicities." A periodicity, in Schillinger's terminology, is any regularly repeating rhythmic unit; monomial denotes a rhythmic unit of only one note (though some of Chatham's periodicities are *binomial*, comprising two successive notes); and their interference is the rhythm that results from the juxtaposition of two unequal periodicities. Schillinger, who provided cut-and-dried techniques for a generation of Tin-Pan-Alley songwriters and other composers (including Gershwin), was convinced that the interference of two periodicities created a natural basis for pleasing rhythmic form. However valid or dubious his math-based aesthetics, his independent derivation of rhythmic techniques also developed by Cowell and Nancarrow is worthy of note. In fact, Nancarrow's *Player Piano Studies* Nos. 13 through 19 (written in the 1950s with no knowledge of Schillinger) are entirely based on interferences of tetranomial periodicities.

More than any other avant-gardist since Earle Brown, Mikel Rouse has taken his composing methods from *The Schillinger System of Musical Composition* (first published in 1941 with a foreword, significantly, by Cowell). Rouse performs most of his music with his rock quartet Broken Consort, consisting of electric keyboard, electric bass, saxophone or MIDI wind instrument, and trap set; he also performs with the rock group Tirez Tirez. His *Quick Thrust* of 1984 (which I hailed in *The Village Voice* as "the first isorhythmic 12-tone rock piece") is drawn from the interaction of a 12-tone row with an interference pattern of monomial periodicities with duration values of 2, 3, 5, and 8. (The reader can weave whatever significance he or she likes around the fact that these numbers are from the Fibonacci series.) These periodicities work both as durations and as divisions.

As divisions, they segment a repeating cycle of 30 eighth-notes into 2, 3, and 5 parts, with durations of 15, 10, and 6 eighth-notes respectively. Superimposed, the three patterns result in the rhythm of the opening bass line (as in George Crumb's notation, a dot on either side of a note indicates that it is lengthened by one fourth of its duration):

Figure 3

The reader will notice that this 2-3-5 interference creates its own eight-note periodicity, 30 eighth-notes in duration; that the periodicity is palindromic (with respect to attack points, though Rouse simplifies the notation); and that since there are twelve notes in Rouse's *color*, and eight notes in his *talea*, three occurrences of the rhythm occupy two of the row before the pattern repeats verbatim. As in some sections of Stravinsky's *Threni*, Rouse never transposes the row in *Quick Thrust*, nor does he use retrograde or inversion.

As durations counted in eighth-notes, a periodicity of 2 is represented by a repeating pattern of quarter-notes, 3 by a pattern of dotted quarters, 5 by a half-note-tied-to-an-eighth pattern, and 8 by a series of whole notes. Interferences need not use all of these values at once. For example, *Quick Thrust's* opening saxophone melody combines the 3, 5, and 8 periodicities, omitting the 2:

Figure 4

This interference pattern repeats after 120 eighth-notes ($3 \times 5 \times 8 = 120$). Also palindromic (as any interference of *monomial* periodicities will be), it contains sixty-four attack points, and, in three repetitions, will state the row sixteen times. The arithmetical proportioning of such isorhythmic processes tends to determine section lengths in Rouse's music.

A faster rhythmic pattern (found in the keyboard part of Figure 6) results from durations of 2, 3, and 5 eighth-notes superimposed. A slower one results from divisions of a cycle of 120 eighth-notes into 5 and 8 equal durations. Figure 5 contains virtually all the rhythmic patterns used in *Quick Thrust*, shown between the durations and divisions which are superimposed to create them. Figure 6, from a constructed score (the notation exists only as a set of parts), demonstrates how the interference patterns work together as counterpoint. The fact that the same numbers run through each line's rhythm creates an intriguing synchronicity among the lines. For example, each attack in the bass line coincides with an attack in the saxophone, and each attack in the saxophone coincides with an attack in the keyboard. The bass line is a skeleton, fleshed out partly by the saxophone and more completely by the keyboard, all heterophonically playing the same *color* in dissonant counterpoint with itself. The piece is as economical as any minimalist work from the 70s, but, unlike minimalist works, its processes are neither gradual nor obvious in audition.

The diagram consists of several rows of rhythmic notation. The top row is a sequence of eighth notes. Below it are rows of notes with stems pointing up and down, representing different rhythmic patterns. At the bottom, there are rows of notes with stems pointing up and down, and some notes with stems pointing up and down, representing different rhythmic patterns. The diagram is a complex rhythmic structure with many notes and rests.

Figure 5 Resultant rhythms from Mikel Rouse's *Quick Thrust*

The musical score excerpt shows four staves. The top staff is labeled 'Soprano Saxophone' and contains a melodic line with eighth and sixteenth notes. The second staff is labeled 'Electric Keyboard' and contains a more complex rhythmic pattern with many notes. The third staff is labeled 'Electric Bass' and contains a simple, steady bass line. The bottom staff is labeled 'High Hat Snare Bass Drum' and contains a rhythmic pattern with many notes and rests. The score is written in a standard musical notation style.

Figure 6 Excerpt from Mikel Rouse's *Quick Thrust*

Rouse's *High Frontier* takes a simpler 4-against-5 interference pattern and runs it through classical Schillinger transformations. One of these involves the rotation of rhythmic units so that, from each pattern, five quarter-note beats are subtracted from the beginning and added to the end to make the next pattern:

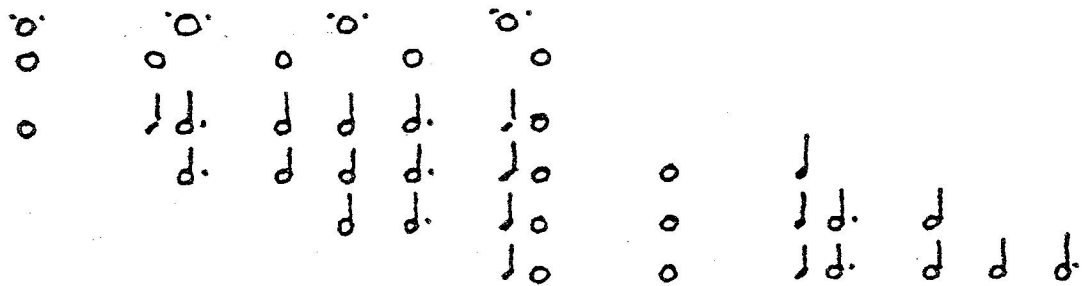


Figure 7

The rhythm is also used in double and quadruple diminution; except for a steady eighth-note pattern in the keyboard and drums, all rhythms in *High Frontier* come from the following table:

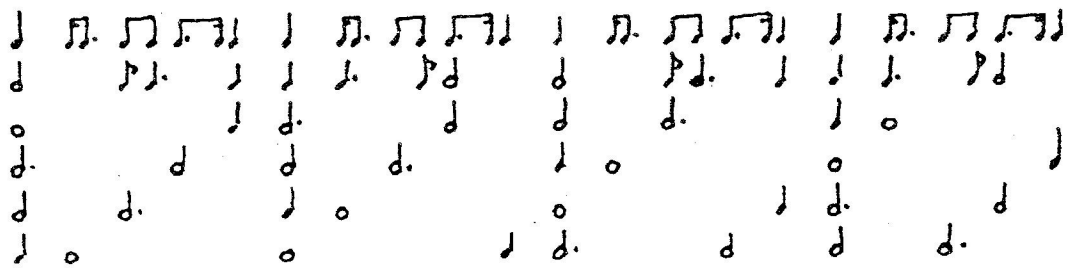


Figure 8

Meanwhile, the saxophone melody puts six pitches through a permutation process in which the second note of each eight-note (five-beat) pattern is moved to the end and the succeeding note-pairs are switched:



Figure 9

What is the point, from the audience's standpoint, in this bag of arithmetical tricks? Embedded in the structure of Rouse's works is a series of competing rhythms that creates an equilibrium with an attractive metric ambiguity. *High Frontier* sometimes sounds like it is in $\frac{5}{4}$ meter, at other times like $\frac{4}{4}$ with quintuplets; at other times the listener can perceptually move back and forth at will between these meters, as in an optical illusion. The various rhythms are predetermined numerically to support each other; a slower rhythm bass line, for example, may coincide with a quicker saxophone melody on every fifth beat, outlining a subtle secondary accent. The surface of Rouse's music is lively and varied, while the background exerts a consistent, unifying structural influence. The listener can rarely identify by ear what process is going on, but gets a strong sense of an unfolding, internal logic.

Quick Thrust and *High Frontier* date from the mid-80s; Rouse's recent music (for which I have no scores) is smoother, better integrated, and more varied, but relies on similar methods.

Michael Gordon

Rhythmic patterns abstracted from the musics of Rouse and Michael Gordon reveal a network of similar ideas. However, while Rouse blends beats from different rhythmic levels into a smoothly unified surface, Michael Gordon creates his music's structural tension by pitting instrumental groups at different tempos against each other in unresolved conflict. Even the titles of his pieces, like *Thou Shalt!/Thou Shalt Not!* and *Four Kings Fight Five*, hint at the ubiquity of opposition. Gordon formed the mixed acoustic-electric Michael Gordon Philharmonic to execute his rhythmically harrowing music, and he is one of the cofounders and directors of New York's annual and enormously successful Bang on a Can festival.

Thou Shalt!/Thou Shalt Not! is a struggle between two forces. One is a metric pattern alternating $\frac{9}{8}$ and $\frac{6}{8}$ meters, and involving violin, viola, electric guitar, and electric organ. The other is a quarter-note beat struck harshly by marimba and tuned drums (one player). In the piece's first section (eighty-two measures), that interruptive, question-and-answer pattern occurs twenty-four times. Twelve of those patterns are identical to the first three measures of the following example. The remaining patterns are altered, sometimes by the electric organ joining the strings, more often by the percussion's meter switching to $\frac{5}{4}$, or else by the latter's rhythm speeding up into dotted eighths as in the last four measures of Figure 10 (the notation is slightly simplified, with doublings omitted):

m. 16 $J. = 180$

The image shows two systems of handwritten musical notation. The first system is labeled 'm. 16' and 'J. = 180'. It consists of four staves. The top staff is a bass clef with a 9/8 time signature. The second staff is a treble clef. The third and fourth staves are also treble clefs. The notation includes eighth notes, quarter notes, and rests, with some notes beamed together. There are dynamic markings like '(f)' and various time signatures such as 9/8, 6/8, and 4/4. The second system also consists of four staves with similar rhythmic notations.

Figure 10 Excerpt from Michael Gordon's *Thou Shalt!/Thou Shalt Not!*

As the ensemble's passages become more and more elaborate, the percussion continues its obstinate repetitions with few changes. The piece builds to a percussion cadenza which articulates contrasting tempos via quarter note, dotted quarter-note, and triplet quarter-note beats. At last the ensemble surrenders, leaving the percussion to rant its final patterns alone over a solitary drone in the bass clarinet and keyboard (on E, while the marimba continues to play F and A). The meters fight, but no musical resolution or synthesis occurs.

The opening of Gordon's *Acid Rain* (1986, reproduced as Figure 11) is particularly striking: the synthesizer plays in triplets, while the string quartet shifts nervously between eighth-notes and dotted sixteenths. (If one were to draw an analogy between a tonality of pitch and a tonality of rhythm, one could call the standard eighth or quarter-note the "tonic pulse," triplets the dominant - $3/2$ as fast, and dotted notes the subdominant - $4/3$ as fast.) *Acid Rain's* largely homophonic rhythms move fluidly between eighths and quarters, dotted eighths and sixteenths, and triplet quarters and eighths.

Score in C (piccolo sounds 8th, bass sounds 8th)

ACID RAIN

Michael Gordon

flute

bass clarinet

electric organ or synthesizer

violin I[#]

II[#]

viola[#]

cello[#]

bass

f

p

quarter = 126

-1-

[#]Scordatura

violins

viola

cello

Figure 11 Excerpt from Michael Gordon's Acid Rain

Four Kings Fight Five, scored for oboe, clarinet, bass clarinet, electric keyboard, percussion, string trio, and electric guitar, is one of Gordon's most ambitious and rhythmically complex scores. The piece's opening theme defines three of the work's tendencies: an opposition between quarter-note and dotted-quarter pulses, a drone pitch firmly anchoring otherwise freely atonal melodies, and the tendency for phrases to end in alternating notes an octave apart, which then merge into less linear textures:

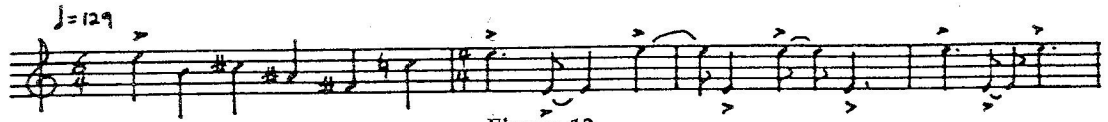


Figure 12

The opening section is striking for its dissonant clashes and rising, chromatic bass lines over a relentless drone on E.

At measure 102, following a dramatic rest, a new section begins. The tonal spectrum strips down to a few adjacent pitch classes, and different pulsations begin to compete. Gordon creates a texture of continuous tempo modulation, using eleven different note values implying five different tempos (counting durations related by two – say, dotted quarter notes and dotted eighth-notes – as different “octaves” of the same tempo). Since Western notation handles two-against-three more conveniently than other rhythmic ratios, the four main tempos express a series of nested 2:3 relationships:

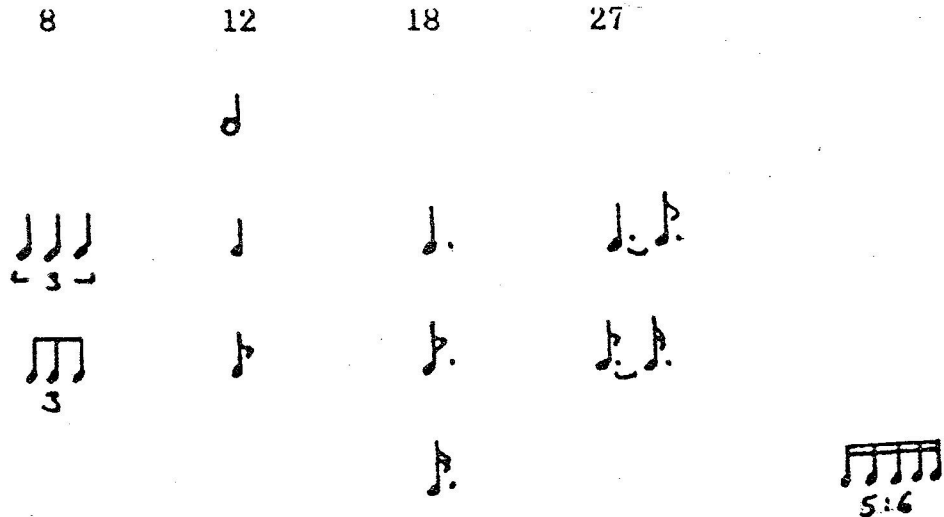


Figure 13

(In an analogy to pitch ratios, this tempo framework could be considered “Pythagorean,” limited to powers and multiples of 2:3, the rhythmic diapente.) The eleventh pulse used is a quintuplet spread across a dotted quarter-note.

In terms of durations, the eleven tempos implied by the reiterated notes are related according to the following ratios:

- 7.2 8 9 12 16 18 24 27 36 48 54

16 is an octave of 8, 18 and 36 are octaves of 9, 24 and 48 are octaves of 12, and 54 is an octave of 27. In terms of implied tempos, the ratios are reciprocal:

60 54 48 36 27 24 18 16 12 9 8

(One should keep in mind here and below that these represent *ratios* between tempos, not absolute tempos as measured by beats per minute.) Figure 14 shows

Tempo Structure in Section 2 of Michael Gordon's Four Kings Fight Five

Tempo ¹	60	54	48	36	27	24	18	16	12	9	8
Duration	7.2	8	9	12	16	18	24	27 ²	36	48	54
Notation											
	5:6	3			3						

Measure

102							+		*		
112							+		*	+	
114							+		*	+	^
125										+	^
132					-				*	+	^
135							+		*	+	^
141							*	+		+	^
152							*	+	*	+	^
154							*	+	^	*	+
157					-	*	+	^	*	+	^
161					-	*	+		*		^
169		-	*			*			*		
182		-	*		-	*	+				
194			*	+	-	*			*	+	
202					-	*	+				
208		-	*			*	+		*		
210		-	*	+			+		*		
212	/	-	*				+		*		
214	/	-	*						*		
216	/	-	*						*		
218	/	-	*	+					*		
220	/	-	*						*		
222	/	-	*	+					*		
226	/	-	*						*		
228	/	-	*	+					*		
230	/	-	*						*		
233	/	-	*	+					*		
235	/	-	*						*		

Columns that share the same type of sign (plus, minus, asterisk, virgule, or caret) are related by "octave" ratios, either 2:1 or 4:1. Minus to asterisk, then, denotes an 8:9 ratio, asterisk to plus a 3:4, plus to caret an 8:9, and so on.

¹That is, relative tempo ratio, not absolute tempo in beats per minute

²Notated in Gordon's score as

Figure 14

the additive/subtractive movement of the second section of *Four Kings*, growing generally from slower notes to faster ones. At m. 125, just before a new infusion of melody, the texture is reduced to the woodwinds and keyboard (both hands, which often operate separately) playing octave Fs against the strings' octave F#s in an eight-against-nine rhythm – a graphic illustration of four kings fighting five. Within this already metrically elaborate structure, further surface complexities are sometimes created by repeated patterns of subdivisions, such as grouping dotted eighth-notes in implied meters of five or seven.

The most complex moment, reproduced as Figure 15, appears at m. 157, where seven different beats are going at once, using only the pitch classes F, F#, G, and G#, at ratios of

Duration	16	18	24	27	36	48	54
Tempo	27	24	18	16	12	9	8

Notice that the violin and viola are still playing eight-against-nine, and that the clarinet and bass clarinet fight out their own eight-against-nine pattern three times as fast. The section moves through a climax of greatest complexity to a final climax of greatest speed.

The musical score for Figure 15 is a complex multi-measure rest piece. It features nine staves for different instruments: Oboe, Clarinet, Bass Clarinet, Electric Keyboard, Tom-toms, Violin, Viola, Cello, and Electric Guitar. The score is marked with a multi-measure rest of 157 measures. Above the Oboe staff, there are rhythmic annotations: 'r 2 7', 'r 2 7 r 2 7', 'r 2 7 r 2 7', and 'r 2 7 r 2 7'. The Clarinet and Bass Clarinet staves have a multi-measure rest of 8 measures. The Electric Keyboard staff has a multi-measure rest of 12 measures. The Violin and Viola staves have a multi-measure rest of 8 measures. The Electric Guitar staff has a multi-measure rest of 8 measures. The Tom-toms staff has a multi-measure rest of 8 measures. The Cello staff has a multi-measure rest of 8 measures.

Figure 15 Excerpt from Michael Gordon's *Four Kings Fight Five*

After this grand conflict of pitches and pulses, the third section (mm. 237–315) thins its texture and narrows its focus to an ongoing counterpoint of dotted eighth-notes against quarter-notes, an underlying three-against-four around which other tempi are added. The opening theme returns in dotted eighths, then triplet eighths, and finally dotted sixteenths, its perceptual speed ingeniously affected by the context of background pulsations. The final section is pure, shimmering texture, its patterns based on tempo contrasts of 8:9:12. As the harmony approaches a G major triad spiced with occasional A \flat s and A \sharp s, the viola enters with a final, free-rhythmed reminiscence of the theme. Unlike *Thou Shalt!*, *Four Kings* resolves its crisis of tempo disagreement into an ethereal, rhythmically blurred continuum.

Larry Polansky, Ben Neill

Gordon's music opens the possibility of treating tempo the way traditional music treats tonality: treating one pulse-speed as a "tonic"; contrasting dominant and subdominant directions from the home key; and basing a piece around the conflict between two tempos, analogous to the more traditional conflict between two key centers. *New Musical Resources* explicitly attempted to derive an analogous rhythmic language from conventional pitch language. Cowell applied every pitch-structuring technique to rhythm and vice versa, arriving at the theoretical underpinnings for a "unified field theory" of music decades before Boulez and Babbitt began applying serial pitch-technique to duration. Since Cowell, American experimental music has often leaned toward fusing rhythm and pitch into a single method, perhaps the most elaborate example being Ben Johnston's *Fourth String Quartet*. The challenge still inspires younger composers, and some have devised tempo combinations from explicit pitch analogues.

Larry Polansky (a recently displaced West Coaster now teaching at Dartmouth and running the publishing company Frog Peak Music) has worked extensively with just tuning, and has applied the same concepts to rhythm. (Polansky's compositional concerns, though, are so wide-ranging that it would be inaccurate to accuse him of being generally a postminimalist.) It will be sufficient to quote his *Four Voice Canon #5*, one of a series of strict, Nancarrowian tempo canons, this one written for percussionist William Winant. The percussion instruments are not specified, and the piece can be played either live by four percussionists, or by one with the three remaining parts on tape. The second voice enters $1/3$ of the way through, $3/2$ as fast; the third voice $3/5$ of the way through, $5/2$ as fast as the first; and the final voice enters $3/4$ of the way through, 4 times as fast, so that they all end together. Figure 16 shows the entrance of the fourth voice:

Figure 16 Excerpt from Larry Polansky's Four Voice Canon #5

The tempo ratios, beginning from the bottom, are the ratios of a widely spaced major triad – 2:3:5:8 (and in this case the Fibonacci series is deliberate).

Ben Neill, trumpet virtuoso, inventor of the MIDI-capable Mutantrumpet, and Music Director of the Kitchen, has expanded on Chatham's nonsynchronous, cyclic structures. For instance, some sections of his *Downwind* are structured according to recurring phrases of different lengths, such as a melody repeating every eleven eighth-notes in a $\frac{4}{4}$ meter. Like Polansky, Neill has experimented in tempo canons with correspondences between pitch and rhythm. In the manner of the Rhythmicon instrument Cowell helped invent, Neill has sometimes based works on proportional pitch/duration relationships.

Neill's *Antiphony* is scored for four trumpets transposing in different keys, in Bb, C, D, and F. The just-tuning ratios of those pitches are 8:9:10:12, and Neill set them in a tempo canon at those ratios. Each is playing what is notated as a second-inversion C-major triad, G-C-E, with the pitch ratios 3:4:5. Within each part, he assigned G a proportional duration of twenty, C of fifteen, and E of twelve, inversely proportional to their frequencies. He then put that repeated phrase through the 8:9:10:12 tempo canon over a steady drum beat (here notated in a C score without the drum):

Figure 17 Excerpt from Ben Neill's Antiphony

Just intonation is not explicit in the notation, but it is implicit in the fact that each trumpeter is playing pitches from the natural overtone series of his or her instrument. The correspondence between pitches and proportional durations, taking the lowest pitch as a reference point, is as follows:

F	G	A	Bb	C	D	E	F	F#	A
1	8	4	3	2	3	8	1	12	2
1	9	5	4	3	5	15	2	25	5

From this one can deduce the scale's assumed tuning from the inverse of the durational proportions:

F	G	A	Bb	C	D	E	F	F#	A
1	9	5	4	3	5	15	2	25	5
1	8	4	3	2	3	8	1	12	2

Actually, Neill cheated slightly in the highest trumpet, simplifying the notation by adding an extra triplet sixteenth-note to the duration of the higher A. Theoretically, though, each note in the canon contains about the same number of vibrations. The correspondence at this point may have more theoretical than perceptual interest, but Neill, who often performs solo with a computer modifying the output of his Mutantrumpet, is working with software to experiment with tempo canons in real time.

These examples show the tremendous variety of postminimal music, and suggest that a new rhythmic language is coalescing, that many composers are thinking about rhythm in the same terms. Certainly complexity is considered a valid goal, but it is primarily the static complexity of a sustained musical image, not the evanescent, too-quick-to-process complexity of serialism's atomized textures. That this new rhythmic complexity is so dependent on number ratios for its conceptualization puts it squarely in the American experimental tradition of Cowell's *New Musical Resources*.

There is also, among the 50s generation, a corresponding and increasingly widespread movement to structure pitches in just tuning according to the same whole-number ratios: among its members are Dean Drummond, Erling Wold, Johnny Reinhard, Elodie Lauten, David First, Michael Harrison, and many others. Number and pitch have had a long, complex history together, though, and that is another article. For now, the avid interest in rhythmic number systems and simultaneous tempo contrasts is sufficient evidence of the resurgence of the American experimental tradition in Downtown Manhattan.

Selected Discography

Rhys Chatham:

Die Donnergotter, Dossier ST 7538

(*Die Donnergotter*, Waterloo No. 2, Guitar Trio)

Factor X, Moers Music LP 02008

(*For Brass*, *Guitar Ring*, *The Out of Tune Guitar #2*, *Cadenza*)

*Mikel Rouse:**Soul Menu*, New Tone NT 6716*Lincoln Portrait*, Cuneiform Rune 13 (*Full Flow*, #2, *High Frontier*, #1, *Quick Thrust*, #3)*A Walk in the Woods*, Crammed / Made to Measure 6 (*Friendship '84*, *Big Pine II*, *Airland 2000*, *Hardfall*,
Winter in Wyoming, *The Eloquent Dissenter*, *A Walk in the Woods*)*Quorum*, Club Soda Music 001*Jade Tiger*, Crepescule TWI 220*Colorado Suite*, Crammed / Made to Measure 3

Rouse with Tirez Tirez:

Against All Flags, MCA IRS 42209*Social Responsibility*, MCA IRS 42016*Set the Timer*, Warner Bros. 20445*Under the Door*, Crepescule 8408*Michael Gordon:**Big Noise from Nicaragua*, CRI CD 636*(Thou Shalt!/Thou Shalt Not!, The Low Quartet, Four Kings Fight Five, Acid Rain)**Larry Polansky:**The Theory of Impossible Melody*, Artifact ART 1004*(B'rey'sheet, Four Voice Canons ##3-6, Simple Actions/Rules of Compossibility)*

Polansky's music is published by Frog Peak Music, Box A36, Hanover, NH 03755.

*Ben, Neill:**Mainspring*, Ear-Rational ECD 1002*(Mainspring, Two Dances, Dis-Solution 2, No More People)**ITSOFOMO*, (with David Wojnarowicz), New Tone CO 6710

Neill on compilations:

Virtuosity with Purpose, Ear-Rational CO 1034*(Money Talk)**Site-Less Sounds*, Tellus CO #25*(ITSOFOMO excerpt)**Permissions**An Angel Moves Too Fast to See* by Rhys Chatham. Used by permission of the composer.*Quick Thrust* and *High Frontier* by Mikel Rouse. Used by permission of the composer.*Thou Shalt!/Thou Shalt Not!*, *Acid Rain*, and *Four Knights Fight Five* by Michael Gordon. Used by permission of the composer.*Four Voice Canon #5* by Larry Polansky. Used by permission of Larry Polansky, Frog Peak Music (A Composers' Collective).*Antiphony* by Ben Neill. Used by permission of the composer.