

**NEW INSTRUMENTATION and ORCHESTRATION**  
**An Outline for Study**

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## NEW INSTRUMENTATION AND ORCHESTRATION An Outline for Study

### Introduction

The following general outline began as a syllabus for a course of study on orchestration and instrumentation at Mills College, Oakland, California. Completing such a course was a task requiring more than the one or two semesters usually allowed, even for the most diligent of students, and necessarily certain compromises had to be made. Percussion, organ, and some other instruments are not covered in great depth -- I believe that though they should be dealt with, these topics fare better in an even more specialized curriculum. The voice and the use of electronics are not covered in the outline at all, although I occasionally included them in the class when time allowed. Some subjects, like the fretted strings, are covered in this outline in a detail that would at first seem out of balance to the commonness of their usage -- but I have done this to give some idea as to the detail that any one of the instruments, especially the non-western and non-orchestral ones, might receive in further study. In the case of the fretted strings, I must also admit to a special personal interest, and have allowed myself to indulge that interest for exemplary purposes.

With certain exceptions, I have retained the form of the original course syllabus in this present outline. I still feel that topics like the percussion instruments, the voice, the organ, and the use of electronics merit more specialized texts, and that "orchestration" per se is a topic which can be studied after "instrumentation". Since I am quite interested in the experimental nature and possibilities of the subject matter, focussing on historical instrumental combination conventions did not seem to me to be appropriate. Rather, I try in the class, and in this outline, to present an overview of the technical, acoustical, and cross-cultural potentials of each instrument.

There are several approaches which I believe distinguish this outline from most other books of its kind. First, as stated above, it rarely deals with "orchestration" per se -- rather it attempts to give a bare-bones, straightforward, and stylistically unbiased accounting of the physical and musical possibilities of the instruments. Thus, I am as likely to include an explanation of Tommy Jarrell or Hardinger-style

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fiddling and guzla playing as I am Beethoven symphonic string writing.

Another unusual viewpoint of the outline is on the importance of contemporary and world musics. As a composer myself, I feel most comfortable using examples from the twentieth century, although of course not exclusively. I also believe that we are at a point where we can no longer afford to exclude other musical cultures in our conceptions of music, especially orchestration. Our own historical traditions are of course sadly under-developed in certain areas (like rhythm, percussion, and intonation), and we must look to other more established traditions to "catch up". Even where our music (and by this I mean the European art music tradition) is well-evolved, in matters of harmony and form for example, other musics present essential and challenging parallel approaches. We live in an era of one world music, and no modern curriculum may ignore that.

Because this course was aimed primarily at composers, and was designed at a school (Mills College) which has always been in the vanguard of contemporary composition, these unusual approaches have been quite successful. In general, I expect that students and interested readers of this outline will have available more conventional orchestrational texts and materials; though I include most standard instrumentational information in this curriculum (like ranges, transpositions, and many of the classic examples), I do not mean this text to supplant the ample existing material. Rather I intend it as a supplemental guide to those wishing to expand their thinking, teaching, and learning. In this way, I think that this outline will be of some use even to those who are not teaching or taking a course, but who simply wish a resource for extended instrumentational ideas, and for those who might use it as an organizational tool for their own investigations and pedagogy.

Two scores are used quite often: Schoenberg's **Pierrot Lunaire** and Stravinsky's **Le Sacre du Printemps**, and these two masterpieces of contemporary orchestration serve as threads through most of the discussions on standard instrumentation. In addition, I frequently use my own scores and those of colleagues. This, I believe, personalizes the material to a great extent, and allows me to speak not only from an academic and critical point of view, but from an intensely personal and artistic one as well. In the context of the class, this approach offered the students examples and experiments, not always entirely successful, of a composer "in the flesh" struggling with the same problems that they dealt with in their assignments. I would hope that any composer using this outline to help teach a course would substitute her own work where appropriate, and also draw on the work of local colleagues.

Because I am interested in brevity, the references and citations are meant to serve mainly as examples, and as resources for further investigation. For example, I have included a few texts like Sankaran's mrdngam treatise, Sutton's gambang thesis, and periodicals like the highly specialized Mandolin World News primarily to emphasize the notion that extremely detailed analyses now exist of practically every subject the would-be orchestrator might find herself interested in. She has only to find them.

My intention in making this text available, in its present outline form, is to

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offer guide and a reference for anyone wishing to undertake the task of studying or teaching instrumentation, at either the advanced or beginning level. I hope that this document will serve as an expansive supplement to the existing literature on the subject. Each entry in the outline is a topic that might be discussed in a classroom environment, or used by students to enrich their own knowledge. My goal is not so much to provide answers, but instead, a rather voluminous and somewhat unusual list of questions.

My thanks go to several people in the design of this course and document: to the students of Mills College and its Center for Contemporary Music who have taken the course and learned with me; to my colleagues at Mills who have frequently answered questions, performed student compositions, and supported the class in many ways; to Jody Diamond, who read the manuscript many times and made invaluable and perceptive suggestions, and who has greatly contributed to my knowledge of world musics; and to the many musicians I have known throughout the years who have been willing to share their expertise with composers like me.

Larry Polansky  
Oakland, CA  
Spring, 1986

I. Fundamentals

A. Manuscript preparation

1. Score order

a. basic principles

1. high and low, family groupings  
as general guidelines for score layout

a. chamber ensembles follow  
general orchestral principles

2. specials

a. percussion, keyboards,  
voice, solos, harp, and others

b. Ives: **Fourth Symphony**  
as example for piano parts  
("orchestral" and "solo")  
and other specials

3. adjoining and combining parts

4. French Horns

2. Copying techniques

a. pens and pencils

a. stencils and guides

b. papers

a. color (green, manila, white)

b. texture (how well it holds ink)

c. size of staff, spacings,  
number of staves

c. corrections

a. razor blades, electric erasers,  
fluids, tapes

d. reproductions

1. onion skin vs. xerox

2. high resolution copiers, reductions,  
enlargements

e. Alpheus, Aztec, and Judy Green as sources  
for materials

f. copying styles

1. examples, scores by: Mark Boehm, Andrew  
Newell, David Rosenboom, ("rapidograph");  
Lentz, Harrison, Polansky, Tenney  
("calligraphic"); jazz parts; other, more  
abstract styles (Phil Corner and  
Malcolm Goldstein)

2. Cage/Knowles: **Notations** as resource  
for experimental notational styles

g. computer aided music copying

a. Leland Smith's "Faultless Press"

b. Macintosh and SynClavier innovations

## Fundamentals

1. part extraction, transposition, graphic displays
2. limitations and future possibilities
  - a. print resolution
  - b. user interfaces
  - c. automatic transcription
3. Notational conventions and linguistic problems
  - a. rehearsal #s
    1. simple method: always use measure numbers!
  - b. alignments
    1. grupetti -- how to count and measure them
      - a. greatest power of 2 in denominator assumed as default
  - c. title paging
  - d. cues (performance, rehearsal, entry, and others)
    1. differences
    2. uses of each and conventions
  - e. language: English or "universal"? (or both?)
    1. Christine Ammer book as resource for languages
    2. Rastall book as historical resource
    3. what language(s) to use
      - a. the argument for "native" language usage
  - f. philosophical problems, questions
    1. Virginia Gaburo book (raises crucial philosophical questions)
    2. Cage, Corner, and the concepts of visual concordances and non-concordances
      - a. graphic notations
      - b. improvisational notations
      - c. computer aided interactive and dynamic notations (computer notations responding to performer stimuli)
    3. Christian Wolff: **Burdocks**
    4. Cardew: **Scratch Music**
4. Parts, study scores, page turns, etc.
  - a. study scores
  - b. parts vs. scores - information
    1. conventions in part writing; mutes, rests, clefs, keys
    2. pageturns !!!!! (!)
    3. everything in score must be in part (tempi, performance directions, etc.)
5. some possible exercises: typical pages (without instrumentation) from Wagner: **Siegfried**

## Fundamentals

**Idyll**, Berlioz: **Fantastique** and Stravinsky: **Sacre**, to identify instrumentation and transpositions

### **B. Transpositions and Clefs**

1. Score in C?
  - a. actual/concert/written/sounding pitch
    1. attempts at clarification of language and existent practical confusion
    2. arguments for and against score in C
  - b. exceptions to score in C: piccolo, guitar, contrabass, and others (octave transposers)
2. when and why to transpose
  - a. abilities of some performers to transpose at sight (Bb instruments, octaves)
3. why all western instruments sound down/transpose up
  - a. brightness, and rising absolute pitch
4. moveable and non-moveable clefs
  - a. arguments for and against simplifying clef usage

### **C. Textbook, score and recording resources**

1. Berlioz, Rimsky-Korsakov, Piston, Sebesky, Russo, Stiller, Read, Blatter, periodicals, UC Press series, various acoustics texts

### **D. Some introductory exercises**

1. Blatter text: page 11, #2; page 9, #2
2. blank pages from two scores to identify instruments
3. excerpts from **Preparatory Exercises in Score Reading** as piano score-reading exercises

## II. Acoustics, Psychoacoustics, Perception, Modeling, and Cognition

### A. Harmonic series

1. Vibrational nodes in strings and winds
  - a. velocity, tension, length, mass
    - a. relationship to frequency and pitch
  - b. open and closed pipes
    - a. relationship to spectra and timbre
  - c. open and stopped strings
  - d. inertia and excitation
    - a. transients, steady-states
2. Fourier theorem
  - a. additive and subtractive synthesis
  - b. dynamic spectral evolution (envelopes)
  - c. other synthesis methods: Walsh functions, FM, waveshaping, vocal tract synthesis, linear-predictive coding, Karplus-Strong algorithm, and others
3. Formants
  - a. human hearing as formant filter
  - b. instrumental formant resonators
  - c. generalized, non-voice related definition of formants
4. conical, cylindrical and plate vibrators

### B. Inharmonic vibrators

1. bells and gongs
2. noise generators
  - a. natural and electronic
3. simple synthesis methods
  - a. irrational partial ratios via additive synthesis, linear FM, waveshaping, and other techniques
4. dynamic "pitch" envelopes: simplification of spectra

### C. Intonation and pitch

1. just/harmonic series
  - a. definition of just intonation
    1. the "language of ratios"
    2. Pythagorean and higher prime tunings (Partch's "limits", Johnston and Tenney's definitions of multi-dimensional intonation spaces)
      - a. commas (syntonic, diatonic, Didymus) and schismas
    3. equal-divisions and intervallic approximation
      - a. some favorites:  
31-tone (Dutch and contemporary composers), 5-tone (Asian musics), 7-tone (heptatonic) African and



## Acoustics

Asian (Khmer), 17, 24, 53, and 72, 171

b. future possibilities: high equal-temperaments (like 72 and 171) to approximate high prime-limit just tuning "spaces" (composers like Jim Horton, Ezra Sims, James Tenney, and others)

4. some common intonations: just, Pythagorean, harmonic series; and their cents deviations from 12-tone equal temperament (see figure on following page)

b. questions:

1. relation of intonations to harmonic series?
2. acoustically "superior"?
3. octave?

a. Javanese stretched tunings  
1. implications for "paratactical" internal interval structure for scales (intervals relating to more than one "octave")

b. spiral tunings

c. psychoacoustical experiments doubting primacy of octave perception (octaves preferred about 10 cents wide)

2. meantone, well-temperaments, equal temperaments

a. brief history

b. current practice, both in contemporary music and in performance of historic music

c. common mean-tone tunings:  $1/4$  and  $1/6$  comma

d. common well-temperaments: Kirnberger(s) and Werkmeister(s)

e. future possibilities of mean and well-temperament

3. pitch and the basilar membrane

a. structure and function

b. organization of pitch information (localization)

c. beats, difference tones, roughness and fusing

1. just noticeable difference

2. resolution and discrimination

d. range of perception and extremes

### D. Loudness

1. power, intensity, loudness

2. some measures: watts per meter squared,

## Acoustics

## Acoustics

- DB (A and C), phons, sones
- 3. critical bandwidth and doubling of loudness (Seashore book as reference, page 73)
- 4. relation of spectra to perceived loudness
- 5. instrumental loudness curves
- 6. digital recording: relationship of bits of information to DB and logarithmic perception

### **E. A language for timbre**

- 1. Transients
- 2. Steady-state and steady-state modulation
  - a. amplitude, frequency, spectra
- 3. Multi-dimensional timbre space, and the concept of "distance"
  - a. references: John Grey, James Tenney  
David Wessel, Diana Deutsch and others
  - b. possibilities of computer synthesis and timbral mapping
    - 1. synthesis techniques
    - 2. "concept" space and related constructs
    - 3. Brightness curves as timbre and distance functions
    - 4. "jitter", or common destiny
      - a. parallel spectral evolution
      - b. modulations
      - b. higher level forms

### **F. Acoustic vs. psychoacoustic, and the exponential nature of auditory perception**

- 1. Examples: the "choral" effect, pitch and amplitude perception, the octave
- 2. the Fletcher-Munson curve and other scales
  - a. isophons
  - b. acute hearing
- 3. perceptual cueing, e.g. attacks vs. steady-state in recognition processes

### III. Strings

#### A. Fundamentals

1. Parts of the instruments
  - a. instrument: scroll, pegs (friction vs. gears), neck, holes, posts, body, bridge, tuners, tailpiece, chin-rest, etc.
  - b. bow: tip, heel, hair
  - c. acoustic properties
    1. relationship of soundpost and bridge placement
    2. body shape
    3. materials (varnish, wood, etc.)
2. Bowing
  - a. general classifications
    1. on or off string
    2. legato or staccato
    3. notations for each of the above
  - b. detache, legato, loure, on string staccato spiccato, saltando, jete, and others
    1. example of spiccato: Tommy Jarrell: **"Cumberland Gap"**
  - c. different parts of the bow (frog, heel)
  - d. tasto, ponticello
    1. example, Stravinsky: **Three Pieces for St. Quartet, III (tasto)**
  - e. up-bow, down-bow
    1. notations
    2. how much to notate, conventions
    3. up-bow= crescendo; down-bow= decresc.
      - a. notation
      - b. up=non-accent; down=accent
    4. physical positions
  - f. length and speed of bow
    1. relation to dynamics: amount of energy in vibrating system
    2. idiomatic writing concerning length and speed of bow
  - g. bow pressure
    1. relation to spectra
    2. harmonics
    3. "over-bowing" and crushing strings
    4. attack and decay
3. String and fingering notations
  - a. Roman and Arabic numerals
    1. notation of finger positions (Arabic)
    2. Roman for strings

## Strings

- b. ordering of strings
  - 1. various linguistic terms: Sul A, on A, I
  - 2. IV lowest, I highest
- 4. Left-hand
  - a. fingering techniques, problems
    - 1. typical scale patterns, importance of symmetry
    - 2. position playing and shifts
    - 3. "high on low string or low on high string"?
  - b. double-stops
    - 1. triple and quadruple stops
    - 2. flat bridge and "round" bow technique
    - 3. possible, semi-possible, and impossible multiple stops
    - 4. idiomatic double-stops (3rds and 6ths)
  - c. bariolage and use of open fingerings
    - 1. cross fingerings a la Bluegrass guitar styles -- placement of higher notes on lower strings
    - 2. some possibilities of bariolage: scordatura, multiple instruments
    - 3. some examples from Bach
  - d. arpeggiations, positions, glissandi
    - 1. notational procedures
    - 2. Xenakis' "contrary glissandi" in **Mikka, Theraps**, and other works
    - 3. "false" glissandi
      - a. various types: two strings, alternating fingers, and others
    - 4. portamento and glissando
- 5. Pizzicati
  - a. general principles, limitations
    - 1. thumb and/or fingers
    - 2. speed, accuracy
    - 3. what to do with the bow
  - b. Bartok pizz, left-hand pizz, etc.
  - c. examples: Bartok: **3rd Quartet** 1st mvmt, 11; Vasser Clements "plectrum violin"; **"Orange Blossom Special"** (left hand pizzicato lick)
  - d. arco/pizz.; example: Webern **Bagatelles**, #V ('cello)
- 6. Vibrato
  - a. width, speed, shape (vibrato as steady-state modulation)
    - 1. how to notate, what to notate

## Strings

- b. electronic simulation results
  - 1. introduction of random fluctuations in rate and index
- 7. Harmonics
  - a. natural vs. stopped (artificial)
    - 1. terminological: artificial vs. stopped
  - b. "expanded" natural harmonics
    - 1. nodal theory -- natural and artificial harmonics
      - a. e.g. the "seagull" effect (Crumb: **Voice of the Whale**) (artificial harmonics equally spaced in glissando)
      - b. following chart of natural harmonic nodes
    - 2. Zukofsky article
  - c. use of scordatura to achieve altered intonations
    - 1. Polansky article in 1/1 on use of retuned natural harmonics
    - 2. Tenney: **Quintext**
  - d. harmonic glissandi, both on natural and stopped harmonics (examples, Stravinsky: **Firebird** (beginning), Polansky: **Will You Miss Me** (bass part))
  - e. notation of harmonics
    - 1. sounding pitch, what to assume and what not to assume
    - 2. how to notate scordaturas, and composer vs. performer preferences
    - 3. nodal notation (tablature)
  - f. special effects
    - 1. pulled harmonics
    - 2. vibrati and trilled harmonics
- 8. Mutes
  - a. how long to allow for placement
  - b. many types and materials
  - c. practice and concert mutes
- 9. Special effects
  - a. scordatura
    - 1. range, problems
    - 2. notational questions
    - 3. American traditional music tunings
      - a. modal and "banjo" tunings
  - b. "extended" bowings (behind bridge: "sub ponticello", battuto, and others)
    - 1. Penderecki: **Threnody for the Victims of Hiroshima**
  - c. microtones (e.g. Johnston: **4th Quartet**)
    - a. notations

## Strings

## Strings

- b. technical demands
  - c. some myths and claims about string players, and some intonational ideas
    - 1. "tend to read flats down" and other parables
    - 2. confusions about "in-tune" thirds
  - d. amplification techniques
  - e. Pat Strange's thesis on extended violin techniques
- B. Violin**
- 1. typical orchestral, soloistic and ensemble approaches
  - 2. sonorities, string characteristics
    - a. choral effect
    - b. classical/romantic symphonic procedures
      - 1. "rocket" openings (Mozart: **Jupiter**, early Beethoven: **2nd Symphony**); **Eroica**
      - 2. Brahms: **1st Symphony** (last movement, allegro), low register melodic effects
    - c. Bach
      - a. bariolage
      - b. position exploitation (symmetry, motivic orchestration): **E Major Partita**
      - c. contrapuntal divisions of registers
      - d. "cross-string" techniques
    - d. double and triple stops
      - a. theory and possibilities
        - 1. fifths, thirds, sixths, octaves
        - 2. Schoenberg: **Phantasy** ms. 29-32, 56-60, 82-93
        - 3. Stravinsky: **Histoire ...**, violin part throughout
      - b. realization of impossible multiple stops
        - 1. quick arpeggiation
        - 2. slightly crushed bow
  - 3. Some contemporary experiments
    - a. Cage: **Nocturne, Freeman Etudes**
      - 1. **Nocturne**: confusion of violin and piano; subtle use of ponticello and tasto, relaxed pitch, vib/no vib (measure 27), use of lower strings for higher pitches (mm. 25-27, last three measures), use of mute
      - 2. **Freeman Etudes**: notational developments, extreme registers for



## Strings

artificial harmonics, "overlapping"  
double stops; e.g high note on II  
with open I (Etude #1, second page),  
"beating".

b. Polansky: **Studies, Movement in E Major for John Cage; Movement for Andrea Smith (My Funny Valentine for Just String Quartet); Little Maggie**

c. Riegger: **Study in Sonority**  
(analyse for use of string timbre as organizational principle)

d. Tenney: **Koan** (tremolo and glissando)

### 4. Non-western and non-"classical" violin

a. American traditional playing and jazz

1. Tommy Jarrell; examples:

**"Jack of Diamonds", "Soldier's Joy",**  
(open A tuning) **"Spiritual",**

**"When Sorrows Encompass Me round"**

(imitation of the voice, muted  
violin, intonational adjustment)

---use of contrapuntal techniques,  
flat-bridge, just tunings, non-stand-  
ard rhythms

2. Joe Venuti, Darrell Anger, Cliff Bruner,  
Europe's Society Orchestra (violin as lead  
in old-time jazz/rag ensemble), Joe  
Holley/Paul Anastasio (comparison of  
two styles)

3. strings in pop; e.g. arrangement  
of M. Gaye: **"Heard it through the  
Grapevine"** (funk, rhythmic)

b. non-western

1. South Indian (Subramanian)

2. Hardinger fiddling and new developments  
in sympathetic strings: Susan  
Norris and the Suzolin

3. Eastern-European folk styles

4. Indonesian rebab

5. Slavic guzla

6. Chinese erhu (extended techniques  
tradition: slides, harmonics,  
rapid passages, bowing techniques;

e.g. Tsui Wah-Num: **"Happiness  
Upon the Grassy Plain"**)

7. Turkish kemence (example: **"Horon Dance  
from Macka"**)

## C. Viola

1. the alto clef and you

2. why all contemporary composers should write

## Strings

for the viola

- a. lack of repertoire
  - b. versatility
  - c. overuse of violin virtuoso styles
  - d. new timbral possibilities
  - e. fingering differences between violin and viola
3. the "inner voice"
    - a. e.g. opening Mozart: **G Major Quartet**
  4. registral/timbral string distinctions
    - a. the A string
      1. comparison to D string
      2. extreme "violinistic" register
    - b. use of the viola as a "bass" instrument
      1. extended C string possibilities
  5. examples
    - a. Stravinsky: **3 Pieces for String Quartet**, 1st movement (arco/pizz at opening); 2nd movement, allegro (pizzicatti, harmonics, extended artificial harmonics, glissandi)
    - b. Polansky: **Shm'a: Fuging Tune in G**, opening, high harmonics
    - c. Berlioz: **Harold in Italy**, opening solo after orchestral intro.; "Canto Religioso" section: arpeggios, sul ponticello, quadruple stops
    - d. Brahms quintets: clarinet/viola equivalence
    - e. Schoenberg: **Serenade**
      1. "Marsch" opening, use of different bowings, articulations
      2. "Trio" from "Menuett"
      3. "Sonnett", use of string trio orchestration

### D. Cello

1. The tenor clef and you
2. Thumb positions
  - a. speed and stretch limitations
3. string quartet role
  - a. as alternate melodic color
  - b. bass lines and primary counterpoint
4. soloistic possibilities
  - a. e.g. Debussy **Sonata for Cello and Piano** (variety of bowing and pizzicato techniques)
  - b. Bach: **Suites** as idiomatic writing guide
  - c. **Eroica** opening
  - d. solo from Johnston: **4th Quartet**, ("Amazing Grace") use of high natural harmonics to achieve just intonation
  - e. solo from Polansky: **Sh'ma...**

## Strings

(octave displacement of melody via natural harmonics)

f. Webern: **Bagatelles**, artificial and natural harmonics, inverted voicings (V, ms. 1)

g. different pizzicato possibilities than viola or violin

5. examples: "Nacht" and "Madonna", "Heimfahrt", from Schoenberg: **Pierrot** (full range of instrument, pizzicati, harmonics, sul ponticello, use of different clefs)

a. "Madonna" ms. 20 (glissando on IV string), mm. 15-16 (clefs and harmonics), ms. 18 (pizz. glissandi)

b. "Nacht", ms. 11, 19 (harmonics), 12-16 (sul pont and tremolo)

c. "Heimfahrt" mm. 1-5 (pizzicati arpeggios), 7-8 (agility), 16-17 (spiccato bowing)

6. Stravinsky: **Petruschka**, opening (high register)

### E. The String Quartet

1. Typical scoring procedures

a. Mozart: **G Major**; Beethoven (early and late quartets, **C# Minor**, etc.); Haydn and Shostakovich quartets

b. imitation (violins, all four instruments)

c. homophony and polyphony

d. division and overlapping of registral assignments

e. articulations, vibrati, dynamics and tempi: assumptions and conventions

2. Newer developments (Bartok, Cage, Ives, Crumb, Carter, Schoenberg, et al)

a. examples: Stravinsky: **3 Pieces...**; Webern: **Bagatelles**; Ben Johnston quartets; Tenney: **Quintexts**

b. Bartok innovations: pizzicati, rhythmic polyphony, textural independence

c. amplification

d. mixed-media and cross-stylistic experiments

### F. Bass

1. Transposition

a. harmonics and transposition (sometimes harmonics not transposed!!!), otherwise bass always sounds octave down

b. use of different clefs (tenor, treble)

2. 4th vs. 5th tuning

a. five string basses

b. orchestral extension

c. harmonic vs. melodic considerations in various

## Strings

tunings

1. scales and melody: fifth tuning advantages: scales, retention of finger positions
2. harmonic and accompanimental: fourth tuning advantages: root and fifth on adjacent strings

### 3. Jazz techniques

- a. right hand patterns and techniques
- b. left hand extended harmonic usage
- c. harmonic implication
  1. Slam Stewart with Don Byas, **"I Got Rhythm"**
- d. some examples: Red Mitchell (fifth tuning), Jimmy Blanton (**"Pitter Patter Panther"**), (evolution of the modern jazz bass); Charles Mingus (**"Better Git it in Your Soul"**, changing role of bass player, relationship to Blanton); Scott LeFaro and Bill Evans, Paul Chambers (**"Freight Trane"**, playing ahead of the beat, bass player leading time)

### 4. Extended harmonics

- a. Polansky **Movement for Lou Harrison**, use of scordatura
- b. higher harmonics possible (up to about the 17th), by marking the strings
- c. artificial harmonics

### 5. Electric bass

- a. standard styles (Fender)
  - a. Brothers Johnson and thumb and percussive finger techniques
- b. six string electric basses
  1. examples: Wes Montgomery (octave guitar), Jack Bruce, Phil Lesh
- c. fretless electric
  1. J. Pastorius, Jamaladeen Tacuuma, and others
- d. amplification techniques for acoustic bass
- e. use of picks

### 6. Transcriptions, lack of literature, nascency of virtuosos (Gary Karr, Turetzky, Neidlinger, and others)

### 7. orchestral uses

- a. low frequency problems
- b. doubling as a way of life
  1. cello doublings in orchestral music
- c. Beethoven: **9th Symphony**, 4th movement; **3rd Symphony**; **5th Symphony**

### 8. extended bass techniques

## Strings

- a. examples: Druckman: **Valentine**;  
Xenakis: **Theraps**; Tenney: **Beast**
- 9. standard references: Krolick, Turetzky (see bib.)

#### IV. Woodwinds

##### A. The woodwind family

###### 1. Typical writing and scoring principles and conventions

- a. harmonic conventions
- b. orchestrational: along family lines and across family lines (flutes, clarinets, double reeds, horns)
- c. flexibility of range and timbre of the woodwinds, and ramifications for the orchestrator

1. bassoon, clarinet, and bass clarinet, can each be considered, for practical purposes, to consist of several "instruments"

###### d. examples: Mozart flute concerti, opening of Beethoven: **2nd Symphony**

1. flutes in 3rds, oboes in 6ths
2. woodwind concerti excellent source of study for woodwind instruments in supporting roles

###### 2. The "wind ensemble"

###### a. some historical perspectives (early usages, development, definition of roles)

###### 1. Haydn "experiments" with independent wind quintet writing in symphonies

###### 2. technical evolution of the instruments

- a. different fingering systems
- b. transpositions
- c. co-evolution of instruments and their orchestrational uses
  1. intonation
  2. key mechanics
  3. mouthpiece and basic materials of construction

###### b. the woodwind quintet

###### 1. independence: Schoenberg: **Woodwind Quintet Op. 26**

- a. five solo instruments
- b. redefinition of registral roles

###### 2. conventional roles in the quintet

- a. overlapping of clarinet, flute, and oboe
- b. horn as "tenor", bassoon as bass

###### 3. examples from the classic literature

###### c. classification of tone production:

aperture, reed against mouthpiece, double-reed

1. non-western example: Cambodian Forest vibrating leaf playing, Hmong

## Woodwinds

- jaw's harp
- 2. whistling (breathing in and out)
- 3. opening from Debussy **Nuages** as possible transposition exercise

### B. General principals

- 1. Articulations
  - a. tonguing
  - b. legato vs. staccato
  - c. breath and phrase indications
    - 1. notational confusions (what is assumed by the player)
  - d. fluttertongue (speeds, techniques, notations)
  - e. trills: key and lip
    - 1. different sounds and problems
    - 2. timbral trills
  - f. teeth
- 2. Transpositions
- 3. Family structure of each instrument
- 4. Breathing techniques
  - a. necessity of breath spaces
  - b. relationships of breathing to dynamics and timbre
- 5. Extended techniques
  - a. multiphonics
    - 1. theory of double-venting pipes
    - 2. spectral emphasis
  - b. circular breathing
  - c. percussive ideas
    - 1. fingers, breath, and keys
  - d. non-tempered fingerings
    - 1. determinate and indeterminate
    - 2. use of altered fingerings, vents, and slight reconstruction to produce just and other intonations
  - e. harmonics
    - 1. notations
    - 2. differences in timbre and intonation
  - f. amplification: air and contact microphones
    - 1. some typical signal processing techniques
      - a. filtering, pitch following, envelope following
      - b. pitch following techniques: software, hardware, debouncing, averaging
- 6. some typical and atypical voicings
  - a. **Eroica** (2nd and 3rd mvmts.)
  - b. Stravinsky: (**Symphonies of Winds, Octet**)
  - c. Varese: **Octandre, Integrales**

## Woodwinds

a. registral overlapping of clarinet and piccolo in first few measures of **Integrales**

d. Tenney: **Seeds**

e. Carter: **8 Etudes and a Fantasy**

f. Bartoluzzi book as general resource

### C. Flute

#### 1. The flute family

##### a. transpositions and ranges

1. C flute

2. piccolo

a. orchestral conventions (2nd flutist)

b. no low C in range

3. alto in G

a. registral peculiarities

4. Eb flute (above)

5. bass flute

6. shakuhachi, flutes, ocarinas,

Lou Harrison: **Canticle #3**

7. recorder family, Richard Felciano:

piece for Franz Brueggen: **Allelulia to the Heart of Stone** (for recorders and electronics)

8. Indonesian suling, Chinese ti, and hsiao  
e.g. ti solo: Wong Kuen, **"Pigeons Flying"**  
(fl. tongue, sliding, harmonics)

##### b. idiomatic usages

1. typical doublings (1st vln., oboes)

2. registral applications to orchestra

3. the flute "choir"

##### c. orchestral and practical considerations

1. typical scorings (3rds and 6ths)

2. weak low register

3. use as a "spectral" re-enforcement for melody lines

##### d. dynamic curve

1. amplitude correlated to pitch

#### 2. Characteristics of the C flute

##### a. range and registral sonorities

1. "fingered" and "harmonic" pitches

2. many alternate voicings for pitches above high C

##### b. fingering possibilities and limitations

##### c. trills, intonation

1. impossible trills

a. new key/trill

possibilities (C# key)

##### d. the B joint



## Woodwinds

- e. extended techniques
  - 1. multiphonics (various types)
  - 2. glissandi, microtonal possibilities
    - a. open-holed vs. keyed
    - b. alternate fingerings
    - c. fake glissandi
    - d. liping
    - d. alterations to the flute
  - 3. percussive and non-pitched ideas
  - 4. timbral trills
  - 5. harmonics
    - a. fingerings systems
      - 1. different ways to play harmonic pitches
      - 2. intonational adjustments
        - a. Charles DeLusse: **Air a La Grecque**, use of quarter tones in 1760
        - b. John Fonville's just intonation panpipes
      - b. whistle and whisper tones
      - c. "low register" harmonics
      - d. timbral changes for different pitches
      - e. Polansky: **Will You Miss me, V'Leem'shol**
  - 6. resources for study (the work of Fonville, Dick, Heiss, LaBerge)
  - 7. singing and playing
  - 8. other flutes (Murray, electronic, etc.)
- f. examples: Varese: **Density** (use of registers to structure a work, breathy tones, key clicks); **Octandre** (2nd mvmnt., piccolo solo, and piccolo under Eb clarinet sonority); "magician's solo" (1st Tableau) from **Petruschka**, opening solo from **Petruschka** (high register); Boulez: **Sonatina** (registral, chromatic, and rhythmic agility; wide range of articulations); Berio: **Sequenza** (flutter tonguing, proportional notation); "Der Kranke Monde" (range and timbral/accompanimental possibilities) and "Moondestrunken (articulations, range, fluttersong) from **Pierrot**; M. Bresnick: **Conspiracies** (whistle tones, multiphonics, and other effects); Tenney: **Three Indigenous Songs** (flute choir effects, flutes as pure tones); Brian Ferneyhough: **Cassandra's Dream Song** and **Unity Capsule**.

D. Clarinet

1. The family

- a. basic transposition principles
- b. fingerings
- c. overblowing at the "3rd harmonic" and other acoustical ideas
  - a. sawtooth and triangle waves
  - b. Helmholtz/Varese/Tenney harmonic consonance theories: clarinet excellent source of study as to acoustic basis for consonance (lack of even harmonics, use in **Octandre** and other works by Varese)
- d. dynamic curve
  - 1. wide dynamic range in all registers, unusual for winds
- e. study resources
  - 1. Stravinsky: (**Sacre...**, **Histoire...**)
  - 2. Gary Dranch thesis (U. of IL) on extended clarinet techniques
  - 3. Dan Goode's writings and pieces (**Interval** magazine)
  - 4. Brahms use of clarinet, e.g. **Op 115** (agility and dynamic range, imitation of string lyricism)
  - 5. Nielsen: **Clarinet Concerto**
  - 6. Mozart, Weber, Brahms -- writing virtuosic and highly idiomatic works for specific performers
- f. D and Eb clarinets (uses)
  - 1. **Sacre...**

2. Bb and A clarinets

- a. distinction between them (timbral)
  - 1. Clarinet in A in Polansky: **Quartet in F ...**
  - 2. **Petruschka** reh. #49
- b. characteristic ranges
  - 1. throat tones
  - 2. chalumeau
    - a. e.g. "Three Dances" from **Histoire...**, reh. #4
  - 3. clarino (**Petruschka**, reh. #100)
  - 4. compositional uses of these ranges
  - 5. the "break" (problems and uses)
    - a. what it is
    - b. ways to avoid and exploit it
- c. extended techniques (alteration of

## Woodwinds

instrument, circular breathing, multiphonics)

1. Dan Goode: **Clarinet Songs**

d. jazz styles

1. extended lipping and glissandi
2. high register "bite" (embouchure)
3. use in Dixieland
4. Klezmer clarinet (e.g. Andy Statman;

Klezmer record produced by Martin Schwartz)  
e. other examples, Varese: **Octandre** opening  
(flz., pianissimo)

3. Bass clarinet

a. range and agility

1. different keys available (major third down)
2. extended "knee-jerk" range
3. notation

a. usually reads down a ninth, but sometimes in bass clef (down a second)

b. various idiomatic usages

c. Schoenberg and Stravinsky (especially **Serenade** and **Pierrot**)

1. Duet from **Sacre...** prior to reh. #141

a. note older German notation up a second

2. **Pierrot**: "Madonna" (range, registral crossings), "Nacht" (flutter-tonguing, fluidity)

d. Eric Dolphy, and use of the b. cl. in jazz

e. contrabass clarinet

1. sub-audio orchestral possibilities

a. range octave below bass clarinet

2. S. Gresham-Lancaster: **Allegory: The Beached Whale**

a. extended low range and electronic modification possibilities

3. use of the instrument as a low frequency oscillator

## E. Saxophone

1. The family and transpositions

- a. soprano in Bb
- b. alto in Eb
- c. tenor in Bb
- d. baritone in Eb

1. Basie/Heftie "**L'il Darlin'**"

e. others (C melody, soprano in C, bass, contrabass)

1. e.g. Frankie Trumbauer: "**For No Reason at All in C**" (melody sax)

2. Jazz vs. classical technique

## Woodwinds

- a. classical "French" style and repertoire
  - 1. e.g. Fred Hemke, Debussy
- b. embouchure and tone differences
  - 1. control of vibrato
  - 2. softening of attack
- c. crossover in modern era
  - a. examples: Coltrane, Dolphy, and others studying at Julliard.
- 3. Jazz technique and usage
  - a. tenor vs. alto soloistic styles
    - 1. more variety of styles and sounds on tenor
    - 2. alto more responsive in upper registers
    - 3. exceptions to these rules (many!!)
  - b. flat keys -- why they are so common for saxes
  - c. quartet and ensemble writing
    - 1. e.g. Ellington, Gil Evans, Fletcher Henderson, Konitz/Tristano, Bill Holman, Claude Thornhill, Polansky: arr. Ray Charles **"I Got a Woman"**
      - a. close voicings, parallel motion, importance of similar articulation
  - d. ability to double
    - 1. extended "doublings", a la Broadway
    - 2. what to reasonably expect
  - e. some saxophone idioms
    - 1. shake (e.g. Boots Randolph)
    - 2. rip and fall
      - a. standard notations
    - 3. "passagework"
      - a. rhythmic and comping styles
    - 4. expressive qualities
      - example: Coltrane: **"Why Was I Born"** (sotto voce, varying vibrati, intonation, low register tenor expressivity)
  - f. extended techniques
    - 1. David Pate, Steve Lacy
    - 2. Anthony Braxton
      - a. extreme ranges, screams, and use of mouthpiece and reed tones
      - b. exploitation of one instrument (alto) for wide variety of timbres
      - c. use of the 'family' (bass sax, contrabass sax, soprano sax, etc.)
      - d. development of extended techniques into controlled,

## Woodwinds

- idiomatic language
- use of the lyrico and other electronic simulators

### F. Double Reeds

#### 1. Oboe

- range and dynamic curve
  - particular dynamic limitations
  - low Bb unique to oboe
  - range of English Horn and oboe d'amore approximately minor third shorter
- orchestral uses
  - soloistic
    - Beethoven 3rd, III, mm. 350-380
  - as a doubling force
    - spectra and attack and decay transients ideal for doubling with all instrumental families
  - programmatic
    - Beethoven: 3rd (2nd mvmt.) (lament)
    - Berlioz (lietmotif)
  - the Baroque oboe
- extended techniques
  - Joseph Celli performance of Malcolm Goldstein: **A Summoning of Focus** (circular breathing, resistance)
  - David Rosenboom: **And Come Up Dripping**, electronics, multiphonics
  - altered fingerings for extreme high registers
  - Berio: **Sequenza VII** (low B pedal point, multiphonics, harmonics)
- English horn (F) and oboe d'amore (A)
  - transposition
  - sonority and range (smaller than oboe and bassoon)
  - Berlioz: **Fantastique III**, "In the Country", duet for english horn and oboe
  - Tristan** english horn solo
  - other examples: opening **Octandre**
- Bassoon and contrabassoon
  - range and transpositions
    - low Bb to high E-G
  - special importance of the bocal

Woodwinds

## Woodwinds

- b. clef usage
  - a. bass and tenor preferred
  - b. bassoon often substituted for cello or trombone (same approximate range)
- c. bassoon agility (like bass clarinet)
- d. typical scorings
  - a. doubling celli and reenforcing strings
  - b. low voice in woodwind choir
  - c. octaves with flutes
- e. extended voicings, three and four part bassoon choir in **Sacre...**, "Glorification of the Chosen Maiden"
- f. soloistic usage (Stravinsky)
- g. extended modern range
  - 1. **Sacre...**
  - 2. lower extended range: extensions, hand, tube; low Bb not available if extended
- h. examples:
  - 1. **Sacre...** opening ("impossible" high C)
  - 2. **Histoire...**: "Ragtime", (leaps) "Devil's Dance"
  - 3. Mozart: **Bassoon Concerto**
  - 4. Stravinsky: **Octet** (opening - harmonic usage)
  - 5. Brahms: **4th Symphony**, 3rd mvmt., **1st Symphony**, use of contrabassoon to continuously double bassoon
  - 6. **Petruschka**, reh. #49

## G. French horn

- 1. transpositions
  - a. bass vs. treble clef
    - 1. historical notation
    - 2. up a fourth (bass) or down a fifth (treble)
  - b. double horn (F/Bb)
    - 1. fingering differences
    - 2. harmonic series and intonation
    - 3. new flexibilities
- 2. range and dynamic curve
  - a. low B to high F or G
- 3. stopped horn
  - a. cuivre
  - b. range where impossible (below sounding Eb)
- 4. typical four part horn usage (I,III/II,IV)
  - a. range specialization and interlocking parts

## Woodwinds

5. the horn and the harmonic series, holdover from "waldhorn"
  - b. "horn fifths"
6. typical horn effects
  - a. "hunt" calls
  - b. e.g. Polansky: **Around the Horn**
  - c. new uses and possibilities of natural horn
7. trills, fingerings, tonguing
  - a. glissando "rip"
  - b. bells in air
  - c. non-directional quality of sound -- uses and problems
7. trills, fingerings, tonguing
  - a. why horn players get ulcers
    1. response time
    2. difficult intonation
  - b. lip and key trills
    1. 7th and 8th harmonics above treble clef Bb
  - c. fourth valve possibilities
8. examples:
  - a. "piu mosso" from **Fantastique** (page 4)
  - b. **Eroica** "snafu" solo
  - c. **Sacre...** glissando (before reh. #105)
  - d. Beethoven: **7th**, mm. 88-96
  - e. **Birth of the Cool** (jazz usage)
    - a. rhythmic peculiarities due to response of instrument
  - f. Gordon Mumma: **Hornpipe** (mouthpiece alteration, directionality)



V. Brasses

A. General characteristics

1. Acoustics of brasses

- a. the harmonic series, the bell, the mouthpiece, and the "adjustments" made to correct for and reinstate the harmonic series
- b. relationships of natural harmonic nodes to fingering decisions -- exponential increase of choices as function of register
- c. directionality of sound (the bell)

2. Valves and slides

a. uniformity of fingerings

1. as a "schema", fingering chart for C trumpet, showing valve mechanisms

- a. 1st valve, lowers by major second
- b. 2nd valve, lowers by half step
- c. 3rd valve, lowers by step and a half

1. holes in range between first and second harmonic -- lowest octave after pedal tones

2. "tritone system", between one node and next up a perfect fifth (3rd harmonic as most common fingering division)

3. higher harmonic fingerings

- a. tremendous flexibility in high registers, with tuning problems
- b. importance of lip in high and low registers (clarino and basso)
- c. importance of mouthpiece and lip "dynamic series impedance" to instrument tone
- d. evenness of the inner surface of the tube and relationship to Q of spectral response
- e. change of shape of the "ante-vibratory resonance cavity" (mouth) with respect to register

4. reference: chart in Kennan, page 142 (see references)

5. Niles Steiner's Electronic Valve Instrument as a contrary example to harmonic fingering systems (symmetric fingering around a given interval for complete range)

c. pedal tones (what they are, how they are played)

## Brasses

3. transpositions (common keys of the instruments)
4. mouthpiece and bell
  - a. cylindrical bore (acoustical properties)
  - b. width of bore (relation to sound, distinction between otherwise similar instruments)
5. mutes: straight, cup, harmon, plunger, solotone, into stand, cloth, whispa
  - a. conventions
  - b. practicalities
    1. time needed for insertion
    2. theatrical considerations
    3. hand needed to hold mute
  - d. different sounds and uses of each
  - e. ranked in order of most common
  - f. e.g. Ruggles: **Angels** (with straight and cup mutes); M. Davis: **Steamin'** (or other works from this period of his quintet)
6. articulations
  - a. tonguing
  - b. vibrati
    1. jaw, diaphragm, mechanical, shake, lip
    2. conventional non-vibrati in classical context for most brass
  - c. lip and valve slurs
7. special effects
  - a. singing effects
    1. multiphonics, whistling
      - a. no way to "double-vent" a brass instrument
  - b. percussive effects (mouthpiece pops and others)
  - c. half-valves (Jon Hassell, Ed Harkins)
  - d. microtones
  - e. glissandi (lip, valve, and slide)
  - f. timbral trills (fingering changes)
8. the brass quintet
  - a. typical scorings
  - b. wide, overlapping range of all instruments
9. orchestral brasses
10. marching and concert band conventions
12. jazz scorings and techniques
  - a. big band trombone/trumpet choir
  - b. solo trombone and trumpet
  - c. other instruments (fr. horn, flugelhorn, tuba, valve trombone)

### B. Trumpet

1. Bb, C, and A trumpet
  - a. other trumpets (D, piccolo, bass, Eb,

## Brasses

and others)

1. examples of piccolo trumpet,  
Polansky: **"CPR Logo"** and Lou Harrison:  
**Bubaran Robert**
  2. range and dynamic curve
  3. fingering
    - a. special availability of certain pitches  
on piccolo and bass
    - b. fourth valve
      1. alternate fingerings
      2. intonation
    - c. use of slide to low F natural on C trumpet
  4. cornet and flugelhorn
    - a. e.g. Ruby Braff, old-time jazz
    - b. Bix Biederbecke: **"Singing the Blues"**,  
**"Mississippi Mud"**
    - c. Louis Armstrong: **"West End Blues"**
    - d. **Petruschka** reh. #69, reference to military  
trumpet/cornet style
  5. voicings
    - a. close, octave, "horn" voicings
    - b. e.g. **Sacre...** reh. #132
  6. soloistic styles
    - a. Dizzy Gillespie, **Histoire...**, M. Davis,  
Bach, Copeland, Fats Navarro
    - b. historical styles and developments  
(e.g. clarino style)
      1. non-harmonic pitches
  7. extended and experimental usages
    - a. Jon Hassell (microtonal and timbral alterations)
  8. **Histoire...** particular problems
    - a. exposure, range, speed, balance
    - b. opening of "The Soldier's March" (articulation),  
"Royal March" (use of A trumpet)
  9. baroque usage
- ### C. Trombone
1. range
    - a. extended low and high ranges
  2. clef usage (bass, tenor, treble)
  3. "Bb" instrument in C (like tuba)
  4. mutes
  5. tenor, bass and F trigger trombone
    - a. bass = F trigger tenor
      1. larger bore
      2. better low register and pedal tones
    - b. other trigger innovations (the "orchestral"  
trombone)
  6. basic theory of the slide
    - a. harmonic series and the slide position

## Brasses

- b. greater agility in higher positions  
(more harmonics available)
  - c. awkward passages (B natural - A# in lower positions nearly impossible at fast tempi as good example)
    - 1. Kennan's **Orchestration**, page 149
  - d. demonstration of various possibilities for several selected pitches; composers need to be aware of this
    - 1. intonation (harmonic series) related problems and adjustments
  - e. F trigger
    - 1. lowers pitch by fourth
    - 2. new fingering possibilities
    - 3. trigger trills
    - 4. bass trombone with additional E and F triggers
  - f. "holes" in range
  - g. fingering charts in appendix of Blatter as important resource for composers
7. Trombone writing
- a. the trombone choir
    - 1. Ruggles: **Angels** (high and low writing)
    - 2. Ellington
      - a. trombone choir: harmonic, melodic, and rhythmic usage
      - b. the trombonist as arranger
      - c. historic extensions of the instrument's role
    - 3. Berlioz: **Fantastique**, "Dies Irae", after reh. #60
  - b. Varese: **Hyperprism** reh. #1 (glissandi), pedal tones at reh. #2
  - c. Stravinsky: **Octet** (before finale)
  - d. Libby Larsen: **Bronze Veils**
    - 1. use of syllabic effects
    - 2. range exploitation
    - 3. articulations, mutes, and slide positions
    - 4. multiphonics (notation and effects)
  - e. programmatic uses (death and destruction)
    - 1. Harrison: **Pacifica Rondo**;  
Berlioz and others, "dies irae" (see above)
  - f. jazz styles
    - 1. Kid Ory ("tailgate") e.g. L. Armstrong's Hot Five: **"Ory's Creole Trombone"**
    - 2. Lawrence Brown, Juan Tizol
      - a. melodic styles (use of

## Brasses

- valve trombone)
- b. muting effects (Tricky Sam Nanton)
- c. lyrical nature

- 1. **"Don't Get Around  
Much Anymore"; "Mood  
Indigo"**

### 3. Marching band

- a. Arthur Pryor: **"Trombone Sneeze"**

### g. experimental and new music

- a. George Lewis
- b. Phil Niblock's music (intonation)
- c. James Staley (circular breathing, sotto voce and mouthpiece effects)
- d. Stuart Dempster, and modern exploration into other styles (didjeridu, plastic hose); Robert Erickson: **General Speech**
- e. example, **Miles Anderson Plays His Slide Trombone**, pieces by Budd, Childs
- f. Rosenboom: **In the Beginning**, exploitation of tuning possibilities

## D. Tuba

### 1. Tuba family

- a. Double C, double Bb, and F tuba
- b. Euphonium, tenor tuba, baritone
- c. Wagner tubas (see fr. horn)
- d. sousaphone

### 2. transposing and non-transposing

### 3. range of instruments

- a. extended range

### 4. brief historical description

### 5. fingerings

- a. same (roughly) as trumpet
- b. fourth valve
  - 1. facilitates certain lower intervals
  - 2. improves intonation

### 6. writing for tuba

- a. new virtuosi (Roger Bobo, Harvey Phillips, Dan Perantoni, Howard Johnson)
- b. transcription from other repertoire
- c. special effects (multiphonics, percussive)
- d. use of tuba in jazz (old and modern, bass player doubling on tuba)

- 1. Dixieland

- 2. Don Butterfield, Howard Johnson, and others

- 3. tuba in Klezmer music

### 7. examples

- a. Richard Felciano: **and from the abyss** for Floyd Cooley
- b. William Kraft: **Encounters II** (Bobo)

## Brasses

glissandi, ranges, multiphonics, singing, extreme  
low register (low C approximately 15 hertz at "Largo")  
c. David Reck: **Five Studies for Tuba Alone**,  
special notations, extreme ranges, "dangerous"  
agility problems ("Make Like a Wallenda,  
Man", Movement IV)

## VI. Keyboards (pianos, electronics, harpsichord, and others)

### A. Piano

1. range (27 to 4k hz.)
  - a. extended ranges (Bosendorfer and other models)
  - b. historical ranges, and problems of interpretation of older music
2. basic mechanisms and acoustics
  - a. strings (how many per key)
    1. one string from low B down
    2. 2 strings from an octave higher down
    3. 3 strings from low C up
    4. 1 string from high F up
    5. not always exactly as the above
  - b. pedals
    1. damper
    2. sostenuto ("mystery" pedal)
    3. una corda
    4. half pedals, pre-preparation
    5. pedal "after-sustain" effects
    6. pedal notations
      - a. non-notated performer assumptions
      - b. "legato" pedaling
      - c. pedal vibrato
  - c. striking of strings
    1. attack possibilities
      - a. "touch" and "action"
    2. alteration of hammers
      - a. tack piano
      - b. steel and aluminum hammers
  - d. acoustics and tuning
    1. enharmonicity and "stretching"
    2. equal and well-temperaments, mean-tone, and just intonations...
3. idiomatic techniques, compositional principles
  - a. basic fingering patterns, trills
    1. thumb cross-overs
  - b. left-hand
    1. alberti bass
      - a. e.g. Mozart, Haydn, Clementi, et al
    2. arpeggiations
    3. "pedal tone" ideas
      - a. Schoenberg: **Op. 11**
    4. block chordal styles
      - a. Bach chorales
      - b. examples from jazz: Red Garland, Erroll Garner, Ahmad Jamal
    5. voicings and harmonies

## Keyboards

- a. four-part voicings
- b. implied extended harmonies  
(Monk, Ellington, Elmo Hope)
- c. right-hand
  - 1. scale fingerings
  - 2. reach, agility
  - 3. speed
- a. scales, arpeggios, chords
- d. "hand-to-hand" combat
  - 1. hand independence in contemporary usage
    - a. Borah Bergman, Lubovyr Melnick, David Rosenboom, J.B. Floyd, and others
  - 2. Schoenbergian "independent" dynamics
    - a. e.g opening to III of **Sechs Kleine Klavierstucke; Op. 11**
  - 3. two-hand voicings (independence, overlap)
  - 4. two-hand arpeggiations (independent, overlapping, continuous, alternating)
  - 5. polyrhythms
    - a. relationships of articulations to perceived rhythmic strata
  - 6. contemporary polyphonic experiments
    - a. Reich: **Piano Phase** and other gender wayang-like possibilities
  - 7. opening of **Concord**
  - 8. clef usage, triple-clef
- 4. orchestral and chamber uses
  - a. **Pierrot**
    - 1. "Mondestrunken" (tremolando, wide leaps, trills)
    - 2. "Colombine" (attacks, wide variety of sounds)
    - 3. "Der Dandy" (prepared resonant tones)
  - b. percussive use in **Ionisation** (pg. 21, ms. 13), Ives: **Concord**
  - c. **Petruschka** reh. #50-52
  - d. **Firebird** harp and piano effects (pg. 45)
  - e. orchestral support uses
    - 1. clarification
    - 2. doubling, e.g. Stravinsky **Petruschka**, "Dance Russe", mm. 1-9
  - f. accompanimental styles
    - 1. Ives: **Majority**
    - 2. guitar/piano; bass/piano in jazz
- 5. extended techniques
  - a. Cage "prepared piano": **Sonatas and Interludes**
    - 1. notational conventions: tablature
    - 2. diagram of preparations: materials,



## Keyboards

- string length, etc.
- b. Cowell: **Aeolian Harp**
- c. Crumb: **Voice of the Whale**
- d. Newell: **The Rolling of Worlds**
- e. Rosenboom/Floyd **Is Art Is**
- f. bowing (Stephen Scott and others)
- g. inside the piano
  - 1. plucking, harmonics, percussion, amplification, use of preparations, rubbing strings, etc.
- h. with electronics
  - 1. Davidovsky: **Synchronism #6**
- 6. transcription for piano
  - 1. **Sacre...** for two pianos (class exercise)
  - 2. example: piano transcription of **Pierrot**
- 7. player-piano
  - a. Nancarrow: **#3, #41**
  - b. Tenney: **Spectral CANON ...**
- B. Electric pianos**
  - 1. basic types (Rhodes, RMI style, Chroma, Casio-style, DX-7)
  - 2. examples: Herbie Hancock, Crumb: **Ancient Voices ...**, Joe Zawinul, Marvin Gaye: **"Heard It Through The Grapevine"**
  - 3. Kurtzweil and Emulator as keyboards
  - 4. Richard Teitelbaum and the "digital piano"
  - 5. altering of Rhodes and other instruments: Chris Brown: **Alternating Currents** (the gazamba); David Weinstein; Polansky: **Piano Study #5** for just Fender Rhodes
- C. "Digital synthesis", MIDI, and electronic keyboards**
  - 1. DX-7 and linear FM style sound production -- envelopes (of indices), spectra, intonation, intelligence possibilities
  - 2. other styles
    - a. samplers (e.g. Kurtzweil), technological basics and problems
      - 1. variable sampling rate
      - 2. registrally dependent envelopes
      - 3. parallel processing
      - 4. filter design
    - b. additive synthesis (e.g. Synclavier)
    - c. waveshaping (e.g. TOUCHE) and future enhancements (VOSIM and other methods)
  - 3. keyboard response: pressure and velocity sensitivity; "noteon/noteoff" concept; aftertouch; pedals
  - 4. software and hardware keyboard algorithms: stacks, FIFO's, LIFO's, splitting, polyphony, voicing, and input structures; keyboard zoning
    - a. the early experiments of Hugh LeCaine (input devices, expressivity)
  - 5. MIDI
    - a. definition of a standard

## Keyboards

1. rate, data format
  2. extensions: waveform (sample) format
  3. envelopes (?)
  4. definition of abstract keyboard
  5. system exclusive messages
- a. restrictions (speed)
    1. 5 milliseconds for "noteon/noteoff" transmit (approx. 200 notes per second) as absolute limit (slowed down by individual instrument response)
    2. faster: out-of-phase MIDI channels via multiple serial ports and interrupts
    3. response times of MIDI instruments
    4. processor overhead (parallel processing as one solution)
  - b. advances of MIDI (portability and general ease of use)
    1. ability to design system independent compositional and scheduling software
  - c. software ideas (record/playback, MIDI "throughput", sequencing, stimulus/response)
- D. Toy piano**
1. "Schroeder" style, Schoenhut style
  2. Cage, Crumb, et al
- E. Celeste**
1. range (4 octave, starting on C)
  2. metal bars
  3. Schoenberg: **Herzogwechse**
  4. possible substitutions (e.g. large glockenspiel)
- F. Harpsichord**
1. manuals
  2. tunings
  3. playing techniques
  4. modern uses (Carter, Cage, Mumma, and others)

## VII. The Harp

### A. The Pedal Harp

1. Range (Cb-G#, 5 1/2 octaves)
2. String timbres (wound vs. unwound)
3. Color coding
4. the pedals
  - a. how much to notate
    1. some typical notations
    2. DCB/EFGA
    3. when to notate a change
    4. speed and configuration limitations
  - b. theory and mechanisms
    1. string length
  - c. half pedaling
    1. special effects
  - d. enharmonics
    1. impossible chords (spellings)
    2. enharmonic tremolo
5. right and left hand
  - a. "natural" voicings and reaches
    1. tenth as guideline
    2. thumb/index finger natural formations for each hand
  - b. extended voicings
6. harmonics
  - a. standard
    1. left-hand vs. right-hand techniques
      - a. difference in hand angle
  - b. extended
    1. third, fifth, and seventh harmonics
    2. chords composed of harmonics and non-harmonics: difficulties, coloristic uses, notational problems
  - c. various production methods for harmonics
  - d. notation: notate sounding pitch or tablature?
    1. what harpists like
    2. what composers like
7. glissandi
  - a. harmonic
  - b. diatonic
  - c. dominant seventh problem (ninth?), key restrictions
  - d. diminished seventh chord (possible)
8. special effects
  - a. near soundboard (pres de la table)
  - b. damping (etouffez)
  - c. pedal portamento

## Harp

- d. prepared harp
- e. bisbigliando
- f. use of rods and picks
- g. transducers
- 9. resources and examples
  - a. Alyssa Hess and Kurt Stone: harp chapter in Kurt Stone book
  - b. Polansky: **Another You**
    - 1. intonational possibilities
    - 2. extended chord voicings
    - 3. wide dynamic range
    - 4. arpeggios, tremolos
  - c. Debussy **Trio Sonata**
    - 1. use of soloistic and accompanimental effects
    - 2. extended melodic writing
  - d. Carlos Salzedo
  - e. Susan Allen record, **New Music for Harp**
  - f. Lori Dobbins: **4 Songs for Chamber Orch.** (2nd Movement)
  - g. orchestral use: 1st mvmnt. Ives: **4th Symphony**
  - h. example from Sebesky book, #14
- B. Folk Harps**
  - 1. psalteries, cimbalom, "transfer" harps, Celtic harps, troubador harps, Paraguayan harps, Indonesian sifers and kachapis
    - a. e.g. **Pangkur Pamijen** siter "solo"
    - b. tuning techniques
      - 1. moveable bridges, tuning beads
      - 2. bridge and slide vibrati
  - 2. Robbie Robinson and the Folk Harp Journal
  - 3. examples: Lou Harrison: **Four Pieces for Psaltery**, Alexis Alrich: **Didymus Set for Harp** (tuning possibilities of troubador harp)
  - 4. Polansky: **Psaltery**: tuning, bowed harps, recording ideas

**VIII. Percussion (briefly)**

**A. Why it needs a separate course**

1. some selected references (Blades, **Percussive Notes**)
2. rise of percussion in this century: John Cage, Lou Harrison, Varese, and William Russell
  - a. extending the definition of "instrument"
3. orchestral percussion
  - a. specialization of the timpani
  - b. limited uses in conventional orchestral repertoire
4. unlimited instrumental possibilities in contemporary percussion

**B. Mallet instruments**

1. Vibraphone
  - a. motor
  - b. pedal
  - c. multiple mallet technique
  - d. special effects
    1. bowing
    2. glissandi (e.g. Gary Burton)
    3. unusual mallets
    4. harmonics
    5. Arthur Jarvinen: **Raison d'Etre**
2. Marimba, xylophone, glockenspiel
  - a. mallets
  - b. ranges
    1. extended range marimba (to low A)
    2. xyloimba and bass marimba
  - c. materials
    1. rosewood vs. plastic
    2. tuning problems
    3. resonators: types, problems, extended uses
  - d. African and Asian marimbas
    1. javanese gambang (e.g. **Pangkur Pamijen**)
    2. Thai and other Asian styles
      - a. Khmer Riniet: tied mallet technique for maintaining distance
    3. African balophones: pentatonic, hexatonic, and heptatonic resonator marimbas

**C. Drums**

1. rudimental and stick techniques
2. rolls
3. tenor drum, snare, tom-tom, and roto-toms

## Percussion

4. Trap drumming
    - a. notation
      1. "kicks"
      2. rhythmic sketching vs. exact notation
      3. trap-set playing conventions (e.g beat on hi-hat, off-beat on ride cymbal) and exceptions
    - b. some terminology
    - c. some extensions
      1. finger techniques
      2. multiple bass drums
      3. electronic drums and other recent mechanical innovations
    - d. R. Schwarz: **Brujo** for solo trap set
    - e. hand and feet interdependence
  5. tuned drums
    - a. skin and tension: variable tunings
    - b. fixed and dynamic tuning mechanisms
  6. tambourines
    - a. virtuosic playing styles
    - b. head materials and tuning
  7. friction drums
  8. talking drums
  9. two vs. one headed drums
    - a. two-headed drum damping and pitch-bending techniques
  10. skin vs. "vegetarian" heads (Dennis Murphy)
- D. General ideas about percussion notation**
1. Examples: Varese: **Ionisation**, and other works
    - a. early 20th century American percussion music: Harrison, Cage, Cowell, Roldan, Caturla, and William Russell
  2. durations and rests
  3. setup
    - a. pitch organization
    - b. timbral family organization
    - c. mallet organization
  4. symbolic notation and use of ascribed ledger lines
  5. player vs. instrument notation
  6. wood, skin, metal (glass, plastic, stone, ceramic)
    - a. Feldman: **King of Denmark** (material as structural determinant)
    - b. Stockhausen: **Zyklus**
    - c. Polansky: **Four Voice Canon #5**
    - d. Xenakis: **Psappha** ("matrix notation")
    - e. glass examples: The Glass Orchestra, Solonese glass gamelan, tuning problems and methods
    - f. lithophones (Korean jade instruments, African

## Percussion

- resonated stone instruments)
- g. South Indian ceramic drums
- h. "faunaphones" (Slonimsky's use of a cat)
- 7. mallet, hand, stick
  - a. problems in changing mallets
    - 1. mallet stands
    - 2. different timbres on different instruments
- 8. rhythmic notation in western music
  - a. relatively recent development of complex notions
    - 1. tyranny, in western music, of duple and triple meters
    - 2. modern tradition of western percussionists studying with non-western masters
  - b. Nancarrow's ideas and methods (tempi slide rules); Gardner Read charts from **Musical Notation**
  - c. general principles of gruppetto notation (coordination cues, simplifications, ossias)
  - d. cyclical rhythms and their notation

### E. Non-western examples

- 1. Gamelan (tuned and non-tuned)
  - a. gender and gender wayang techniques
  - b. gong time
    - 1. irama: tempo and temporal density
  - c. damping techniques
    - 1. on next beat
    - 2. on off beat
    - 3. mallet and/or hand
    - 4. gender technique
  - d. imbal (Java) and kotekan (Bali)
    - 1. use and influence in western music
    - 2. tendency among western performers to "dot the on-beats" (galloping)
    - 3. variants of these techniques in other parts of Indonesia (Sunda, Cerbon), and other parts of the world (e.g. Ituri forest singing)
- 2. gong acoustics
  - a. aural illusions
  - b. the boss and its function
    - 1. Lou Harrison's idea of the gong with boss as membranophone
  - c. gong vs. tam-tam
  - d. location dependent spectra (long wavelength)
  - e. many vibrational nodes
- 3. mrndngam and two headed multi-timbred drums
  - a. one drum: proliferation of sounds
  - b. evolution of complex rhythmic patterns
  - c. hand and stick (e.g. Balinese and Sundanese drumming)

## Percussion

- d. North Indian tabla, Indonesian kendang, and African and other styles
- 4. tap dancing as percussion
  - a. use of different timbres (heel, toe, different surfaces), and as electronic triggers
  - b. the work of Anita Feldman: (tap dance version of Steve Reich **Clapping Music** -- called "Tapping Music"; Polansky: **Three Monk Tunes**)

### **F. Instrument Building**

- 1. Percussion as good place to start
- 2. Examples: Partch, Dennis Murphy, Daniel Schmidt, Lou Harrison and Bill Colvig, Tony Pizzo (instruments made from "available materials")



## Percussion

### IX. Fretted Strings

#### A. Guitar

1. Types and ranges of various members of the family; generic guitars: uds, lutes, and the idea of a resonated box, neck, and frets
2. acoustic
  - a. steel-string
    1. arch top, flat-top, dreadnaught, "00", twelve-string, cutaway, F hole, resonator guitars (National Co.)
      - a. examples of resonators guitars as "pre-electric" jazz instruments: Django Rheinhardt, Oscar Aleman
  - b. gut and nylon
    1. classical, bajo sexto, flamenco, guitarron, tenor, gut-strung plectrum (Merle Haggard's band), electric classical (Chet Atkins)
3. amplified guitars
  - a. history: Charlie Christian, Les Paul, George Barnes, T-Bone Walker
  - b. solid-body "Fender" styles
    1. single and double wound pickups
    2. bridge (tail) and neck pickup
    3. "whammy bars", special effects, sustain, effects pedals, action
  - c. semi-acoustic
    1. Kenny Burrell, Jim Hall
    2. amplified steel string (hot-dots, contact mics, and other methods)
4. Techniques
  - a. harmonics: artificial and natural
    1. Lenny Breau/Chet Atkins
      - a. e.g. Lenny Breau: **Quietude** album
    2. "split" string harmonics
      - a. theory, technique
      - b. similar to double-venting flute
  - b. use of the pick
  - c. extended techniques (percussive, behind the bridge, prepared, scalloping, etc.)
    1. Eugene Chadbourne, Derek Bailey, and others
    2. "two-handed fingerings"
      - a. Chuck Wayne and split voiced chords
      - b. use of the right hand, e.g. Polansky: **Hensley Variations**
      - c. "three-handed guitar",

## Fretted Strings

- Polansky: **Milwaukee Blues**
          - d. hammering: Stanley Jordan
          - e. Chapman stick
        - d. notations
          - 1. chord symbols
          - 2. tablatures (lute and traditional)
  - 5. Tuning
    - a. variant tunings: drop D, tunings in 5ths, multiple courses, open tunings
      - 1. "tuning to the chord"
      - 2. seven- and eight-string tunings
    - b. frets
    - c. Tom Stone and intonation systems
    - d. fretless guitars
    - e. bending
    - f. typical tuning procedures, and accrued (8 cents) intonation inaccuracy
    - g. extended ideas: e.g. tuning (particularly) bass to extended harmonics
      - 1. e.g. G-string of bass (3rd harmonic) to A-string (7th harmonic) to achieve blues and funk intonations
      - 2. James Tenney: **Septet for Six Electric Guitars and Electric Bass**
        - a. use of high harmonic tunings for guitars and bass
      - 3. Glen Branca and "harmonic guitars", relation to Partch (e.g **Intrusions**)
6. Classical guitar
  - a. Right-hand styles
    - 1. nail vs. flesh
    - 2. ponticello and tasto
    - 3. rascatto
    - 4. speed and scale patterns
    - 5. the thumb
  - b. Idiomatic and non-idiomatic voicings
    - 1. position playing
    - 2. the barre
      - a. half-barre
      - b. full, or grand-barre
      - c. split-fret barres
  - c. Literature
    - 1. Sor, Torroba, Carulli, Guillani
    - 2. Brower, Villa-Lobos
    - 3. transcriptions: Bach, Vivaldi, Scarlatti
    - 4. Segovia/Sor studies as technical standards for idiomatic techniques
7. Jazz guitar
  - a. Plectrum and non-plectrum playing

## Fretted Strings

- a. combined technique
  - b. cutaways
  - c. altered tunings
  - d. comping and soloing
  - e. Examples: Wes Montgomery (octave, thumb techniques), (right hand technique, George Barnes (left-hand effects: bending, appoggiaturas), Tommy Tedesco (speed),
  - f. Some variants
    - 1. ragtime and "drop thumb" styles  
e.g. Ton Van Bergyk
    - 2. blues styles
      - a. electric: Jimmy Johnson, Buddy Guy, Albert King, Lonnie Johnson, Lightnin' Hopkins
      - b. acoustic: Blind Willie McTell, Rev. Gary Davis, Blind Blake, Robert Johnson
8. Flamenco
- a. radically extended right hand technique
  - b. finger independence
  - c. percussive effects
  - d. rolls, and use of the pinky
9. American traditional styles
- a. Bluegrass
    - 1. use of Martins
    - 2. evolution of styles
      - a. Riley Puckett, Charlie Monroe, Lester Flatt (the "G" run)
      - b. the capo ("cheater bars") and "gear ratios" (primary keys)
    - 3. evolution of the solo
      - a. Doc Watson and Clarence White use of mike, shaved struts, extending bass connections, explorations of higher positions, use of fiddle licks
      - b. soloistic problems (volume, loss of rhythm, the "classic" Bill Monroe approach to the guitar)
      - c. cross-picking (e.g. Bluegrass Cardinals and white gospel styles, like Shuffler Family)
      - d. modern masters, e.g. Mark O'Connor, Dan Crary, Tony Rice
  - b. Rock
    - 1. Les Paul and early experiments
    - 2. James Burton, Carl Perkins and the advent of the Telecaster sound
      - a. Carl Perkins with Johnny

## Fretted Strings

Cash: **"I Walk the Line"**

b. James Burton recordings with Elvis Presley, and with Merle Haggard (excellent example, final solo from **"Got Lonely Too Early This Morning"**, on Merle Haggard:

**Serving 190 Proof** album; string bending, rhythmic sophistication, timbral development, chromatic usage), and with Gram Parsons (e.g., **"Return of the Grievous Angel"**, accompanimental style, imitation and complementation of pedal steel, solistic style);

Roy Nicholls, solo on Merle Haggard: **"Whatever Happened to Me"**

c. Albert Collins (the "master of the Telecaster")

3. the Yardbirds and the next generation

4. Hendrix and beyond

### B. Slide steel, dobro, lap, and others

1. Dobro and Hawaiian lap guitar

a. History of use in U.S. (Hawaiian tour of 1927)

1. Kalamas Quartet

2. King Benny Nawahi, Kane's Hawaiians, Sol Hoopii Quartet

3. slack key guitar: Gabby Pahinui and others

b. amplification

1. Bob Dunn of the Musical Brownies:

**"Sweet Georgia Brown"**

2. Leon MacCauliffe of the Texas Playboys:

**"Steel Guitar Rag"**

c. use of the steel

d. tuning possibilities

1. sixth and major tunings

e. the dobro

1. National and the Doprera Bros.

2. Mike Auldridge, Stacy Phillips, Jerry Douglas and other examples

3. right-hand technique (flatpick vs. finger-picked)

4. left-hand problems

a. intonation

b. "positions" (half-bars, double function chords)

5. string "pedal"

f. pedal-steel

1. the pedals: volume and tuning

## Fretted Strings

2. knee-pedal
3. double neck functions
  - a. jazz, country, and honky-tonk tunings
  - b. sixth, ninth, eleventh, thirteenth chords (the "swing neck")
4. the Sho-Bud, e.g. solo from "**Making Believe**"; Buddy Emmons; Doug Jernigan
5. the pedal steel and the imitation of the voice (e.g. Buck Owens, Kitty Wells)

### C. Mandolins

1. The family (ranges, characteristics, history, uses)
  - a. mandolin
    1. round-back and flatback
    2. "A" style and "F" style
      - a. Lloyd Loar, Flatiron, and other experiments
  - b. mandola and octave mandolin
  - c. mandocello
    1. Jody Diamond: **Hard Times** for mandocello and gamelan
  - d. mandobass
  - e. bazouki, balalaika, ud, domra
  - f. Borneo "lute" music
    1. gambu: use of drone string, right hand style, tuning
  - g. other perversions: mandobanjo, banjolin, resonator mandolin, and the Sears Roebuck Co.
  - h. The Mandolin Ensemble
    1. turn of the century phenomenon
    2. mail-order music
    3. modern examples: Dave Apollon: "**Russian Rag**"; Berkeley Mandolin Ensemble; Los Angeles Mandolin Orchestra; Mike Marshall's Modern Mandolin Quartet
    4. Alrich, Polansky arrangements of two political songs by Ruth Crawford: "**Sacco, Vanzetti**" and "**Chinaman, Laundryman**"
  - i. other European variants
2. Techniques
  - a. playing styles
    1. picking
      - a. tremolo: wide range of possibilities  
nylon, plastic, thumb picks, steel picks, finger picks
      - c. single vs. double string picking
      - d. up and down strokes
      - e. simulation of string phrasing for transcriptions

## Fretted Strings

2. left-hand fingerings and possibilities
  - a. violin scale patterns
  - b. typical mandolin patterns
- b. Classical
  1. examples: Schoenberg: **Serenade**, Mozart: **Don Giovanni**; Hummel, Beethoven, Vivaldi
  2. modern virtuoso technique (e.g. Keith Harris, Leo Gochberg, Neil Gladd)
  3. transcription
- c. bluegrass
  1. role of mandolin
    - a. off-beats, kickoffs, solos, embellishment
  2. examples: Bill Monroe ("blues influenced", tight wrist), Jesse MacReynolds style (cross-picking), more modern approaches (David Grisman, Sam Bush, John Reischman, Frank Wakefield, Andy Statman)
- d. "pre-bluegrass"
  1. Monroe Bros., Louvin Bros., Blue Sky Boys
  2. blues: Yank Rachel
- e. jazz
  1. Jethro Burns and four-part harmonic reduction
  2. Andy Statman: **"Oh Susanna"**
- f. cross-cultural styles
  1. Klezmer
  2. Italian styles (e.g. Rudi Cipolla)
- g. extended techniques
  1. retunings (Wakefield, Cipolla)
  2. "split-string" technique
    - a. application to mandocello
  3. amplification, electronic effects
    - a. examples: Tiny Moore (4-string electric), Polansky: **V/I: (Born to Boogie)**; **Little Maggie**; Ingram Marshall: **Gradual Requiem**
  4. harmonics
    - a. artificial
    - b. natural
    - c. split-string

## D. Other fretted strings

1. Banjo
  - a. five-string
    1. basic construction (the short string)
  - b. fretless, bluegrass, and mountain banjos
  - c. the "fifth-string"
    1. capos

## Fretted Strings

- d. tunings
  - 1. bluegrass
  - 2. modal and mountain tunings
  - 3. Tom Stone experiments with just intonation necks
- e. playing styles
  - 1. frailing
  - 2. clawhammer and other mountain styles
  - 3. examples: Grandpa Jones, Tommy Thompson, Doc Boggs
  - 4. Scruggs style
    - a. history
    - b. three-finger picking technique
    - c. universal acceptance
    - d. examples: **"Flint Hill Special", "Earl's Breakdown"**
    - e. Scruggs' pegs
  - 5. chromatic and modern styles
    - a. Bill Keith
    - b. Alan Munde, Bela Fleck and bop-banjo
    - c. examples: Tasty Licks, Slim Richey's **Jazzgrass**
- f. Tenor banjo
  - 1. tunings
  - 2. idiomatic usages
    - a. chording and reductions
    - b. right-hand patterns
    - c. six string banjo
    - d. e.g. Johnny St. Cyr
- 2. ukelele
  - a. baritone and tenor
  - b. e.g. Roy Smeck
- 3. tiples, charangos, lutes, harp-guitars, and other variants
- 4. pipa playing (Lui Pui-Yuen **"The Warrior Takes off His Battle Armor"**)
  - a. tremolo technique, deadened strings, percussive, harmonics, bending, multi-fingered rascatto
- 5. dulcimers
  - a. fret patterns and scales (mixolydian basis)
  - b. string techniques and tunings
  - c. hammer and "mountain" (Appalachian)
    - 1. zithers
    - 2. e.g. Khmer Khim (hammer dulcimer) and Takae (plucked zither)
  - d. plucking and fingering techniques
    - a. quills and "noters"
  - e. Tony Pizzo's "generic dulcimer"
    - 1. fretless

## Fretted Strings

2. equivalent to lap steel
3. slide under strings



Others

Cowell, Reigger, Luening, and others  
4. folk usage: Cajun, Norteno (Flaco and Sanitago Jimenez),  
Polka, Sicilian

**APPENDICES**

**SOME SELECTED REFERENCES**  
**New Instrumentation/Orchestration**  
**Larry Polansky**

**Preface**

This partially annotated collection of sources is not meant in any way to be an exhaustive bibliography of orchestration and instrumentation. Rather, it is a more or less personal document, comprised of materials that have been of interest to me as a teacher, composer, performer, listener and reader. The annotations are also highly personal -- and are to be regarded as rather subjective recommendations of and reactions to the selected writings. Such a bibliography could (and did, in fact) become an inexhaustible hydra-like affair, and in many cases (particularly in regard to non-western sources), I have tried to simply provide some roots of the trees along which reader and student might proceed -- listing major and worthwhile surveys or journals that might offer the interested composer much more specialized references should she wish to continue. My idea is that contemporary orchestration and instrumentation should include world musics, electronic music, and theories of intonation and form. However, I have been parsimonious in my listing of sources in these areas. I have listed some selected references (like Chowning's article on FM) that will give the reader a certain broad literacy in all aspects of the production, notation, and as Varese would say, the "organization" of sound. This is not in the interest of eclecticism, but in the hope that any orchestrator would share my feeling that no notion of sound is any more or less arcane or germane than the composer wishes it to be.

In some sense, I feel that this list of references forms a guide for independent study that at least as important as the outline which preceded it. I hope that each of these references might lead to many other sources in the composer's search for information.

## References

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— A very fine, more conservatively oriented text on contemporary music orchestration. Has come into wide use as text, and is a good second reference to Blatter's text. Extensive and illustrative examples from well-chosen works.
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- Altenberg, Johann Ernest, **Trumpeters and Kettledrummers' Art**, translated by Edward Tarr, Nashville, The Brass Press, 1974  
—Important treatise on the Baroque trumpet.
- Ammer, Christine, **Musician's Handbook of Foreign Terms**, Schirmer, 1971  
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—THE book on bagpipes, including descriptions of the major types, construction, technique, and repertoire.
- Balungan: A Publication of the American Gamelan Institute**, Jody Diamond, editor; Box 9911, Oakland, CA., 94613  
—An excellent publication about music from Southeast Asia and its hybrid manifestations in the west -- especially useful for contemporary composers wishing to work with gamelan and related forms.
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**Trumpets, Horns and Music**, Michigan State University Press, 1963
- An excellent scholarly work on the evolution, history, and musical development of the brasses, full of well-chosen examples and diagrams and a fine bibliography.
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- Bartolozzi, Bruno, **New Sounds for Woodwinds**, Oxford, 1967
- A pioneering and still valuable work, especially for double reed extended techniques. Example disk is good source. This book has been superseded somewhat by later works (Dick, Heiss, and others), but it is still an important and comprehensive place to start learning about multiphonics and other "extended" techniques.
- Basart, Ann, ed., **Cum Notis Variorum: The Newsletter of the Music Library, University of California, Berkeley**
- An entertaining and always educational periodical, with an almost unbelievably energetic editor. This journal can be an important resource in keeping abreast of new publications, especially ones you would not normally run across in the stores. It also contains fine articles in almost every area of music. For example, issue #98 contains a "Checklist of Dictionaries in Music, Theatre, Library Science, Publishing and Printing".
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Benn Ltd., Instruments of the Orchestra Series
- Part of an excellent series tracing history of manufacture, idiom and technique for all the instruments. This book contains an excellent and very complete bibliography about the flute.
- The Oboe**, Benn Ltd., Instruments of the Orchestra Series, Norton  
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- Bekker, Paul, **The Orchestra**, Norton, 1936, 1963
- Benade, Arthur, **Horns, Strings and Harmony**, Anchor, 1963
- Berlioz, Hector, **Treatise on Instrumentation**, Belwin Mills Publishing, (reprint), 1948
- This work is a masterpiece of composer-written music theory, and is often overlooked as a work about orchestration as a forward looking discipline. This is primarily an experimental work, and for its time, comparable to Partch's **Genesis...** in the way that it provides the reader with an extraordinary composer's point of view on the possibilities of evolution in the art. Almost more than any other 19th century composer, Berlioz thought formally about instrumentation and how to expand the orchestrational possibilities of his sound-world. This book is not a text of things past but; more, a manifesto for things that were to be the future.
- Binder, Daniel, **A Formal and Stylistic Analysis of Selected**

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--An invaluable classification of percussion instruments, but not particularly detailed about playing styles and techniques. The world music references are a bit dated.
- Blatter, Alfred **Orchestration/Instrumentation**, Longman, 1980  
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- Boehm, Lazlo, **Modern Music Notation**, Schirmer, 1961  
--A good, cheap, quick reference for ranges, notations, translations. Use it with care, for it is a bit conservative as to range.
- Boretz, Benjamin, and Cone, Edward T., ed., **Perspectives on Notation and Performance**, Norton, 1976  
--An excellent collection of reprints from **Perspectives of New Music** on contemporary notation and performance, including several of the articles mentioned already in this bibliography (Heiss on flute double-stops, Zukofsky on violin harmonics). Of particular interest are the articles by David Behrman ("What Indeterminate Notation Determines,") Kurt Stone ("Problems and Methods of Notation,") and two more articles by Heiss on the flute and woodwinds, but all the articles are of course worth reading.
- Bornstein, Robert G., (compiler and editor), **Range and Transposition Guide to 250 Musical Instruments**, Holly-Pix Music Publishing Co., Sherman Oaks, CA
- Boyden, David D., **The History of Violin Playing from its Origins to 1761 and its Relationship to the Violin and Violin Music**, Oxford University Press, 1965
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- Bruderhans, Zdenek, "Circular Breathing and the Flute," in **The Instrumentalist**, August, 1981
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--An important catalog of contemporary notation experiments. Landmark exploration in the correspondence of visual to aural forms.
- Canwright, David, "On Piano Tuning," in 1/1, **Journal of the Just Intonation Network**, Vol. 1, #4, Autumn, 1985  
"A Justly-Tuned Guitar," in 1/1, Vol. 2, #2, Spring, 1986
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--A good statement of Cardew's political-musical ideas, and surprisingly interesting from the standpoint of "radical" orchestration per se, especially if one considers these ideas as the progenitors of such ensembles as the Portsmouth Sinfonia.
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--An entertaining and informative history of western orchestration from the Brandenburgs to Elgar. Very English.  
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--An extremely sensible and practical book written by a harpist for composers. A bit conservative with regards to extended techniques and new music, but very valuable for writing idiomatic harp music.
- Chalmers, John, "**Computer Generated Tuning Tables**," **Xenharmonikon #1**, Spring 1974 (n.b. **Xenharmonikon** is now available on microfilm  
--Often referred to as the "1200-tone to the octave equal temperament charts", these are computer generated cent-by-cent tabulations of all just ratios in decimal form, as well as the ratios' inverse, by one of the patriarchs of contemporary experimentation in intonation. I use these tables almost as much as I used to use range and transposition charts of the instruments, and I can't imagine how anyone interested in intonation can get along without them.
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— One book that I can unreservedly state all musicians will enjoy, no matter their specialty. This book contains over 4000 drawings of instruments from all over the world, with countless other charts, diagrams, tables, illustrations and photographs which, taken together comprises a complete, relatively unbiased, authoritative, informative and entertaining book on music. There are sections of the book on all the instrument categories (idiophones, aerophones, membranophones, etc.) as well as on the world's ensembles. The drawings are excellent, and each is captioned with a brief, literate, and technical description of the varied instruments. Contains a fine bibliography about world music instruments.
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- An interesting article about the overall orchestrational concepts in this classic work, with good overviews of Webern's instrument selection process, uses of register, and the orchestrational concept of the very unusual row. The Webern **Concerto** is, like **Pierrot** and **Sacre...**, one of the

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--The classic paper on the well-known "plucked-string" algorithm
- Kennan, Kent, **The Technique of Orchestration**, Prentice Hall, 1970  
--Fine, all-around orchestration book, interesting in that it is among the most technically challenging for the student in its attention to details, fingerings, slide positions, etc. Especially good book for brass techniques.
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--A terrific article by the master of these matters on extended writing for string harmonics. This article provides a wealth of well-organized technical information and tends to be a frequently used reference.



## WORKS AND MUSICAL EXAMPLES CITED

### New Instrumentation/Orchestration Larry Polansky

Roman numerals indicate sections of syllabus where the examples are cited. Commercially published scores are not fully cited unless some unusual situation exists, for example, when a reference to a particular edition occurs in the syllabus. (AC) means available from the composer. Recordings are cited by record company and number if the work is not commonly found in music libraries, or AC, or otherwise indicated. Section IX, **Fretted Strings**, is only given a few citations, because of its greater length and degree of specialization, and because most of the examples are of specific guitar and mandolin players who can be found in most record shops. There are also several fine books and periodicals listed in the bibliography that might serve as a resource for that section. Many of the citations are more or less arbitrary examples of a particular idea, and are not meant to be the sole illustration. For example, Miles Davis' album **Steamin'** is used to show his particular stylistic use of the mute in that period, but other albums, like **Workin'** or **Cookin'** might have been used just as effectively. This is often true with jazz, traditional, and popular examples cited below -- less so with specific works by "classical" composers and performers.

Examples

- Alan, Mehmet  
    **"Macka horon havasi,"** kemence solo from **Folk Music of Turkey** compiled and edited by Wolf Dietrich, Topic Records 12TS333 (III)
- Allen, Susan  
    **New Music for Harp,** Arch Street Records (VI)
- Alrich, Alexis  
    **Didymus Set for Harp** (AC), excerpted on **Tellus** Cassette Magazine, Just Intonation Issue, 1986 (VI)  
    **"Chinaman, Laundryman,"** arrangement of Ruth Crawford song for mandolin, mandola, mandocello and guitar, Frog Peak Music, song published by Merion Press (IX)
- Anger, Darroll  
    **Fiddlistics,** Kaleidoscope F-8 (III)
- Anderson, Miles  
    **Miles Anderson Plays His Slide Trombone,** Avant Records 1006 (V)
- Armstrong, Louis  
    with Earl Hines, **"West End Blues"** (1928), **The Louis Armstrong Story Vol.3** Columbia CL 853 (V)
- Bach, J.S.  
    **Partita in E Major for Solo Violin** (III)  
    **Six Suites for Unaccompanied Cello** (III)
- Bartok, Bela  
    **Third String Quartet** (III)  
    **Fourth String Quartet** (III)
- Basie, Count (and Neil Heftie)  
    **"L'il Darlin',"** Basie Roulette Birdland Series R-52003 (IV)
- Beethoven, L.V.  
    **Third Symphony "Eroica"** (III,IV)  
    **String Quartet in C# Minor Op. 131, (#14)** (III)  
    **Symphony #9** (III)  
    **Symphony #5** (III)  
    **Symphony #2** (IV)  
    **Symphony #7** (IV)  
    **Andante and Variations in D for Mandolin and Harpsichord** WoO 44 #2
- Berio, Luciano  
    **Sequenza** for flute (IV)  
    **Sequenza** for trombone (V)  
    **Sequenza VII** for oboe (IV)
- Berlioz, Hector  
    **Symphony Fantastique** (I,IV,V)  
    **Harold in Italy** (III)
- Biederbecke, Bix  
    **"Singing the Blues"** (V) and **"Mississippi Mud"** (V)

Examples

- Bix and Tram**, Columbia CL 845
- Blanton, Jimmy  
    **"Pitter Patter Panther" "Mr. J.B. Blues,"** (1940),  
        **The Indispensable Duke Ellington**, Columbia Records (III)
- Bobo, Roger  
    **Tuba** (V) Crystal Records 5392 (includes Leo Kraft's  
        **Encounters II**)
- Boehm, Mark,  
    Copy of James Tenney's **Chorales for Orchestra**, in  
    **Pieces: A Second Anthology**, Michael Byron, ed. (I)
- Boulez, Pierre  
    **Sonatine for Flute and piano** (IV)
- Borneo  
    **"Rambong,"** gambu solo, **Musique de L'Asie**  
        **Traditionelle , Vol. 6**
- Braff, Ruby  
    with George Barnes Quartet, **To Fred Astaire with Love**,  
        RCA APL1-1008 (V)
- Brahms, J  
    **Symphony #1 in C minor** (III,IV)  
    **Symphony #4** (IV)  
    **Quintet for Clarinet or Viola and String Quartet**,  
        Op. 115 (III,IV)
- Breau, Lenny  
    **Quietude**, Electric Muse Records, UMM 1001 (IX)
- Bresnick, Martin  
    **Conspiracies**, for flute, (AC) CRI Recording 468 (IV)
- Brothers Johnson  
    **Look out for #1**, AM Records SP-4567 (III)
- Brown, Chris  
    **Alternating Currents** (AC), forthcoming, Cold Blue Records (VI)
- Bruner, Cliff  
    with Milton Brown and his Musical Brownies (e.g.  
        "Goofus") MCA Records 1509 (III)
- Burton, Gary  
    **Alone at Last**, Atlantic SD 1598 (VIII)
- Cage, John  
    **Nocturne** (III)  
    **Freeman Etudes** (III)  
    **Sonatas and Interludes** (IV)
- Cambodia  
    **"Solo by a young man, with a leaf vibrating between his**  
        **lips,"** on **Musics of the Cambodian Forests**, Anthologie  
        De La Musique Des Peuples, AMP 2902 (IV)
- Carter, Elliot  
    **8 Etudes and a Fantasy for Woodwind Quintet** (IV)
- Chambers, Paul  
    **"Freight Trane,"** the Kenny Burrell Quintet with  
        John Coltrane, Prestige PR 7532 (III)

Examples

- Ciptosuwarso, S.  
    **Pangkur-Pamijen**, performed by Riris Raras Irama,  
    Kusumo Recordings K.G.D. -018 (cassette)  
    (contains several solos on standard central  
    Javanese piece, including siter and gambang  
    cited in text) (VII, VIII)
- Clements, Vassar  
    with John Hartford, **"Holding"** on **Aero Plain**,  
    Warner Bros. 1916 (III)
- Corner, Phil  
    **Bell Path, Formal; Pieces: A Second**  
    **Anthology** (I)  
    **Metal Meditations**, AC (I)  
    **Gamelan ElektriKa**, AC (I)
- Coltrane, John (with Kenny Burrell)  
    **"Why Was I Born"** (IV), Prestige PR 7532
- Cowell, Henry  
    **Aeolian Harp** (VI)
- Crumb, George  
    **Voice of the Whale** (VI)  
    **Ancient Voices of Children** (VI)
- Davidowsky, Mario  
    **Synchronism #6** (VI)
- Davis, Miles  
    **Birth of the Cool**, various usages of French Horn, (Junior  
    Collins, Sandy Siegelstein, Gunther Schuller),  
    (1949-50) Capitol T19 (IV)  
    **Steamin' with the Miles Davis Quintet**, (1956)  
    Prestige P-7200 (V)
- Debussy, Claude  
    **Nuages** (I)  
    **Sonata for Violincello and Piano** (III)  
    **Rapsodie for Saxophone and Orchestra** (IV)  
    **Sonata for Flute, Viola, and Harp** (VI)
- Delusse, Charles  
    **Air a La Greque** Diapason Press, Utrecht (IV)
- Dobbins, Lori  
    **Four Songs for Chamber Orchestra** (AC) (VI)
- Dolphy, Eric  
    bass clarinet on **"God Bless the Child** and **"When**  
    **Lights are Low," The Berlin Concerts**, Inner City  
    Records 3017 (IV) and **"Green Dolphin Street"**  
    on **Outward Bound**, Prestige
- Dunn, Bob, with Milton Brown and His Musical Brownies  
    **"Sweet Georgia Brown"** and **"There'll Be Some Changes Made,"**  
    **Taking Off**, Topic Records STR 804 (IX)
- Druckman, Jacob  
    **Valentine for Solo Bass** (III)
- Ellington, Duke

Examples

- "Rose of the Rio Grande"** (Juan Tizol, valve trombone and arranger, and Lawrence Brown Trombone),  
**"Caravan"** (Juan Tizol), **The Ellington Era 1927-40**, Columbia Records; **"Don't Get Around Much Anymore"** (L. Brown, 1940), **The Indispensable Duke Ellington**, 1940 (IV)
- Europe's Society Orchestra  
**"Castle House Rag"** and **"Castle Walk,"** New World Records, **From Rags to Jazz**, NW 269 (III)
- Felciano, Richard  
**Alleluiah to the Heart of Stone**, for reverberated recorders, for Franz Brueggen, (AC), and E.C. Schirmer (IV)  
**and from the abyss** (for Floyd Cooley), Opus One Records #29 (V)
- Feldman, Morton  
**King of Denmark** (for solo percussion), on **Max Neuhaus: Electronics and Percussion**, Columbia MS 7139 (VIII)
- Ferneyhough, Brian  
**Recontre**, Pierre-Yves Artaud (flute), includes **Cassandra's Dream Song** and **Unity Capsule**, Edition Peters Records, STIL 3108 S 83 (IV)
- Garland, Red  
**"Bye Bye Blackbird," 'Round About Midnight** The Miles Davis Quintet Columbia CS8649 (VI)
- Gaye, Marvin  
**"I Heard it Through the Grapevine"** (III,VI)
- Goldstein, Malcolm  
**Yosha's Morning Song**, included in his book, **From Wheelock Mountain**, published by Michael Byron, now out of print, (AC) (I)
- Goode, Daniel  
**Clarinet Songs** (AC) (IV)
- Gochberg, Leo  
**Two Pieces for Mandolin and Mandolin Etudes**, Plucked String Editions, PSE 011 (IX)
- Gresham-Lancaster, Scot  
**Allegory: The Beached Whale** AC (IV)
- Haggard, Merle, with James Burton, guitar  
**"Got Lonely Too Early This Morning,"** from **Serving 190 Proof**, MCA-3089 (IX)  
**"Whatever Happened to Me,"** Roy Nicholls, guitar, from **I'm A Lonesome Fugitive**, See For Miles Records 49 (Re-issue of Capitol Record) (IX)
- Hassell, Jon  
**Vernal Equinox** Lovely Music Records 1021 (V)
- Harrison, Lou  
**Pacifika Rondo in Pieces: A Second Anthology**, Recorded on Desto Records DC 6478 (I,V)

Examples

- Canticle #3** (IV)  
**Bubaran Robert** (V), available from the American Gamelan Institute Archives (V)  
**Two Pieces for Psaltery**, Desto DC 6478 (VI)
- Hemke, Fred  
**Contest Music for Saxophone**, Lapidar Records 84627 (IV)
- Hmong  
**"Four songs played on the jew's-harp by Sua Yeng To,"** on **Hmong Music from Laos**, Anthologie de La Musique Des Peuples, 8-2911
- Holley, Joe  
with Paul Anastasio and Frank Hicks, **We Ain't Misbehavin'**, Arhoolie Records 5032, and various Bob Wills and the Texas Playboys records from the late 1940's and 1950's (III)
- Hummel, Johann Nepomuk  
**Sonata in C for Mandolin and Piano** (IX)
- Ives, Charles  
**Second Piano Sonata, "Concord"** (VI)  
**Majority** (VI)  
**Fourth Symphony** (VI)
- Jarrell, Tommy  
**"Cumberland Gap," "Jack of Diamonds,"** and **"When Sorrows Encompass Me Round,"** on **Back Home in the Blue Ridge**, County Records 723 (III)  
**"Soldier's Joy,"** on **Sail Away Ladies**, County 756 (III)
- Jarvinen, Arthur  
**Raison d'Etre** (VIII) (AC)
- Johnston, Ben  
**Fourth String Quartet (Amazing Grace)**, (AC) (III)
- Kalama's Quartet, Sol Hoopi, King Nawahi's Hawaiians and others  
**Hawaiian Steel Guitar Classics, Vol. 2**, Folklyric Records 9087 (IX)
- Kraft, Leo  
**Encounters II** for solo tuba, MCA Music Editions (V)
- Kuen, Wong  
**"Pigeons Flying,"** ti solo, **Hong Kong**, EMI/Odeon C064-17968 (IV)
- LaFaro, Scott, with the Bill Evans Trio  
**Sunday at the Village Vanguard**, Riverside Records 9376 (distributed by Fantasy, OJC-140) (III)
- Larsen, Libby  
**Bronze Veils**, for trombone and percussion (AC) (V)
- LeCaine, Hugh  
**Pioneer in Electronic Music Design: Compositions and Demonstrations 1948-72**, produced by Gayle Young, JWD Music and the Hugh LeCaine Project, 1985, JWD02 (VI)
- Lentz, Daniel

Examples

- Sun Tropes, in Pieces: A Second Anthology, (I)**  
Lewis, George  
**Chicago Slow Dance**, Lovely Music Records 1101 (V)
- Marshall, Ingram  
**Gradual Requiem**, New Albion Records NA002 (IX)
- McCauliffe, Leon  
with Bob Wills and the Texas Playboys, **"Steel Guitar Rag," Western Swing**, Old Timey Records 105 (IX)
- Mingus, Charles  
**"Bird Calls"** and **"Better Git It In Your Soul,"**  
**Mingus Ah Um**, Columbia CS 8171 (III)
- Mitchell, Red  
(with Jim Hall) **"Fly Me to the Moon,"** Artists House Records (III)
- Montgomery, Wes  
**"Body and Soul"** from **Movin' Along**, Riverside Records 9342 (six string bass) (III)
- Mozart, W.A.  
**Symphony #41 "Jupiter"** (III)  
**String Quartet in G Major, K. 387** (III)  
**Bassoon Concerto in Bb, K. 191** (IV)  
**Don Giovanni** (IX)  
**Flute Concerti, K. 313 and K. 314** (IV)
- Mumma, Gordon  
**Hornpipe**, Mainstream Records 5010 (IV)
- Nancarrow, Conlon  
**Study #41 a-c and Study #3 a-e**, Arch Street Records S1768, and published by Soundings Press in **Collected Studies for Player Piano, Vols. 2 and 4** (VI)
- Navarro, Fats  
with Tadd Dameron, **Live at the Birdland, 1949**,  
Jazz Anthology Records 5176 (V)
- Neilson, Carl  
**Clarinet Concerto** (IV)
- Newell, Andrew  
**The Rolling of Worlds** (AC) (I,VI)
- Niblock, Phil  
**A Trombone Piece from Nothing To Look At**  
**Just A Record**, India Navigation Records 1026 (V)
- Oliveros, Pauline  
**The Wanderer**, Lovely Music Records 1902 (X)
- Ory, Kid  
**"Ory's Creole Trombone,"** Louis Armstrong and His  
**Hot Five**, Columbia CL 851 (V)
- Owens, Buck  
**"Makin' Believe,"** pedal steel solo (IX)
- Pahinui, Gabby

Examples

- Gabby**, Pannini Records, PS-1002 (IX)
- Parsons, Gram, with James Burton, guitar  
**"Return of the Grievous Angel,"** from **Grievous Angel**,  
Reprise Records, MS 2171 (IX)
- Partch, Harry  
**Intrusions**, for various instruments and voice, including  
adapted guitar. Scores availble at several libraries  
(U. of Illinois among them), and recordings available  
on Gate V records, or through the Just Intonation  
Network Archives, 535 Stevenson St., San Francisco. (IX)
- Pastorius, Jaco  
**Jaco**, Epic Records xl698 (III)
- Penderecki, Krystof  
**Threnody for the Victims of Hiroshima** (III)
- Polansky, Larry  
**Will You Miss Me**, in **Xenharmonikon IX**, 1986 (III,IV)  
**Another You (17 Variations for solo harp in just intonation)**  
(AC) and forthcoming from Diapason Press, The  
Netherlands (VI)  
**Four Violin Studies (what to do when the night  
comes for Jim Tenney)** (AC) (III)  
**Movement for Andrea Smith (My Funny Valentine for  
Just String Quartet)** (AC) and **Xenharmonikon VI**,  
recorded on **Tellus Cassette Magazine**, Just Intonation  
issue (III)  
**Little Maggie** for solo violin, (AC) (III)  
**Sh'ma: Fuging Tune in G, Soundings #11**, (III)  
**Movement for Lou Harrison for four contrabasses in  
Just Intonation**, (AC) (III)  
**Hensley Variations** for flute, viola and guitar  
(Opus One Records), Frog Peak Music Pub. (X)  
**Milwaukee Blues** for two tap dancers and five  
saxophones (AC) (IV)  
**Quartet in F for Paula Ravitz** (AC) (IV)  
**V'leem'shol**, for five flutes (AC) (IV)  
**Four Voice Canon #5**, for four percussion, on **Cold Blue  
Records Second Anthology** (VIII)  
**"I Got A Woman"** (arrangement of Ray Charles) (AC) (IV)  
**Around the Horn** for natural horn, (AC) (IV)  
**"California Public Radio Theme"** for piccolo trumpet,  
gamelan, Tunisian skin drum and mandolin, (AC) (V)  
**Piano Study #5 for Just Fender Rhodes** (Xenharmonikon VI)  
(VI)  
**Psaltery** (AC) (VI)  
**V/I (Born to Boogie)** (AC) (IX)  
**Three Monk Tunes** for tap dancer and percussionist (AC) (VIII)  
**Little Maggie** (for two mandolins) (AC) (IX)  
**"Sacco, Vanzetti"** arrangement of Ruth Crawford song for  
mandolin, mandola, mandocello, and guitar,



Examples

- Frog Peak Music (IX)
- Pryor, Arthur  
    **"Trombone Sneeze," The Sousa and Pryor Bands** New  
    World Records 282 (V)
- Pui-Yen, Lui  
    **"The Warrior Takes off His Battle Armor,"** pipa solo,  
    Hong Kong EMI/Odeon (IX)
- Reck, David  
    **Five Studies for Tuba Alone,** Peters Edition (V)
- Reich, Steve  
    **Piano Phase** (VI)
- Riegger, Wallingford  
    **Study in Sonority for 10 Violins** (III)
- Rosenboom, David  
    **A Precipice in Time** (AC) (I)  
    **And Come Up Dripping,** for oboe, Composer Performer Edition (IV)  
    **In the Beginning** for trombone, in 1/1 #3; recorded  
    on Mills Centennial Record, Mills College, 1976 (V)  
    **Is Art Is** (VI) with J.B. Floyd, **Suitable for**  
    **Framing** (score included), ARC Records 1000
- Ruggles, Carl  
    **Angels** (V)
- Schimmel, William  
    **Accordion Revisited,** Finnadar Records 7 90234-1 (X)
- Schoenberg, A.  
    **Phantasy for Violin with Piano Accompaniment** (III)  
    **Serenade for Seven Instruments and Bass Voice** (III,IX)  
    **Pierrot Lunaire** (III,IV,VI)  
    **Three Piano Pieces Opus 11,** (VI)  
    **Six Little Piano Pieces Op. 19** (VI)  
    **Herzogwechse** (VI)  
    **Woodwind Quintet, Op. 26** (IV)
- Schwarz, Richard  
    **Brujo,** for solo trap set, **Soundings 14**  
    (forthcoming) (VIII)
- Schwartz, Martin  
    editor and compiler, **Klezmer Music,** Folklyric Records  
    9034 (IV)
- Scott, Stephen  
    **New Music for Bowed Piano,** New Albion Records 0004 (VI)
- Scruggs, Earl  
    with Flatt and Scruggs, **"Earl's Breakdown"** (1951),  
    Columbia 20886 (IX)  
    **"Flint Hill Special," The World of Flatt and Scruggs,**  
    Columbia K6 31964 (IX)
- Staley, James  
    **"Roulette at Mills College,"** performance recorded at the  
    Mills College Center for Contemporary Music (V)
- Statman, Andy,

Examples

- The Andy Statman Klezmer Orchestra: Klezmer Suite,**  
Shanachie Records 21005 (IV)  
**"Oh Susanna"** (with Pete Rowan and his Red Hot Pickers),  
Sugar Hill Records 3733 (IX)
- Stewart, Slam  
with Don Byas, **"I Got Rhythm,"** Atlantic Records SD-310  
and reissued on **Smithsonian Collection of Classic  
Jazz** (III)
- Stravinsky, Igor  
**Le Sacre du Printemps**, International Edition (I,IV,V)  
**Three Pieces for String Quartet** (III)  
**Firebird Suite** (III,VI)  
**Histoire du Soldat** (III,IV,V)  
**Petruschka** (III,IV,V,VI)  
**Octet** (V)  
**Le Sacre Du Printemps** arranged for two pianos (VI)
- Subramanian, L.  
**Le Violon de l'Inde de Sud**, Ocora 558585/6 (III)
- Teitelbaum, Richard  
**Blends and the Digital Pianos**, Lumina Records L005 (VI)
- Tenney, James  
**Three Indigenous Songs, Soundings 13** (I,IV)  
**Koan for Malcolm Goldstein, Soundings #13,**  
Peter Garland, ed. (III)  
**Quintext**, for string quintet, **Soundings #6**, (III)  
**Beast, Soundings #13** (III)  
**Septet for Six Electric Guitars and Electric Bass,**  
Frog Peak Music (X)  
**Seeds, Soundings #13** (IV)  
**Spectral CANON for CONLON Nancarrow**, Cold Blue Records Anthology  
L10 (VI)
- Trambuaer, Frankie  
**"For No Reason At All in C,"** Bix and Tram, Columbia  
Records CL 845 (IV)
- Tsui, Wah-Num  
**"Happiness Upon the Grassy Plain,"** Hong Kong, EMI (III)
- Varese, Edgard  
**Octandre**, E.C. Kerby Ltd. (IV)  
**Integrales**, E.M Kerby Ltd. (IV)  
**Density 21.5** (IV)  
**Hyperprism** (V)  
**Ionisation** (VI, VIII)
- Venuti, Joe  
with Eddie Lang and others, **Stringin' the Blues,**  
(1927-32), Columbia C2L 24 (III)
- Wagner, Richard  
**Siegfried Idyll** (I)  
**Tristan und Isolde** (IV)
- Webern, Anton

Examples

**Six Bagatelles for String Quartet (III)**

**Konzert, Opus 24 (general)**

Wolff, Christian

**Burdocks (I)**

Xenakis, Iannis

**Theraps** for solo bass (III)

**Psappa** for solo percussion (VIII)

**Mikka** and **Mikka S**, for solo violin (III)