349½ IVOR DARREG
349½ W. CALIFORNIA AVE.
GLENDALE, CA. 91203
[213] 243-3477

Ξενάρμονία Φ' (ΣΤ')

Xenharmonic Bulletin № 6

IVOR DARREG, 1440 LUCILE AVENUE,
LOS ANGELES, CALIFORNIA, 90026
Area Code 213
~~661-0106~~
2433477

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The Notation Question

Until the 1950's, when the price and performance of the tape recorder reached a level where the average person could have one in the home or office, there was no satisfactory alternative to musical notation available to the composer who wished to catch a new theme 'on the run', so to speak.

While elaborate graphic recorders for making a permanent record of what is played on a keyboard were developed around the turn of the century, these were beyond most composers' means, and of no help whatever to violinists, guitarists, or singers.

Disk recorders for home use were of limited quality, and much harder to use on the spur of the moment than tape or cassette machines are today. Musical shorthands never seemed to get very widely used.

Even now, with convenient cassettes and high quality reel recorders and various kinds of dictating machines greatly improved over what they used to be, many—or perhaps most—composers insist on reducing everything to writing as soon as possible—sometimes before even hearing it.

Perhaps this is due to various pressures from the visually-biassed culture in which we live. The sad result is that the tail wags the dog.

There has been too much preoccupation with notation, and this has cramped the style of virtually all experimenters with xenharmonics.

It is to be hoped that the tape recorder will reduce this notation-reaction back upon the composer's inspiration. If the new music *must* be notated, at least the transcribing can now be deferred until the composing-in-sound has been completed.

This matter of compulsory notation is tied in with the century-old interdiction or prohibition of *improvisation*. How would you feel if you were never allowed to say anything spontaneously in public, but were commanded always to read it from a book or prepared script?

The usual courses of musical training start out with the staff notation, and 'playing by ear' is looked down upon as a terrible social disgrace and unpardonable offense.

'Stupid' and 'illiterate' and stronger epithets are bandied about if someone is so unfortunate as to have difficulties with the *writing* of notation, regardless of how good the composition or performance may be.

The *Xenharmonic Bulletin* is not the place to go into this matter with all the thoroughness it deserves; but we do have to give some frame of reference for the contemporary situation as regards visual notations of music, and the feedback or retro-influence that customary staff notation and other alternative notations exert upon the composing and performing of musical sounds.

So much for the general situation. Now we must turn to the ways in which this state of affairs affects xenharmonics. The answer is—Profoundly!

Over and over and over again, with an incredible monotony, the arguments against new tunings and scales are based on the impossibility or the *impropriety* of writing down such-and-such sounds.

This has reacted against such systems as the 22-tone equal temperament, for instance. No ridicule or invective or denunciation is too coarse for the opponents of this and certain other systems to employ. These systems are condemned without a hearing! Literally.

A series of the fifths of the 22-tone temperament, which fifths are sharp by about 7 cents, arrives at a good major third, whose error of 4½ cents too flat is much smaller than that of the 19-tone system, and insignificant in comparison with the major third of the 12-tone system, which, as everyone knows, is almost 14 cents too sharp.

Familiar scales and chords in the 22-tone version are satisfactory. But, the *names* given the members of the circle of twenty-two fifths

on the standard basis of C G D A E B &c. lead to the absurd designation of the tone that is seven twenty-seconds of an octave above C as *'D-sharp'!*

How does this happen? you may want to know. Well, I'll tell you: I said the 22--tone fifth was about 7 cents too sharp and as is well known, the 12-tone fifth is two cents too flat—the 22-tone fifth is thus 709 cents, approximately. So the 22-tone fifth is 9 cents sharper than the 12-tone one we are exposed to all the time. We have a very good idea of where the 12-tone equal temperament's D-sharp-and-E-flat is.

Twelve-tone temperament makes D-sharp coincide with E-flat, i.e., nine fifths up coincide with three fifths down, by lopping off 2 cents or 1/600 of an octave from each fifth in the circle. So, for 9 fifths up there is a discrepancy of approximately 9 x 9, or 81 cents, between the 12- and 22-tone end-results.

Since this discrepancy is four-fifths of a semitone, the 22-tone end-result is closer to an E than a D-sharp, especially since the E of the 12--tone temperament is too sharp anyhow.

The tone 7/22 of an octave above C *sounds* like a major third much more than the tone 1/3 of an octave above C does. We shouldn't care how it is or may be arrived at by means of a circle of *Fifths!*

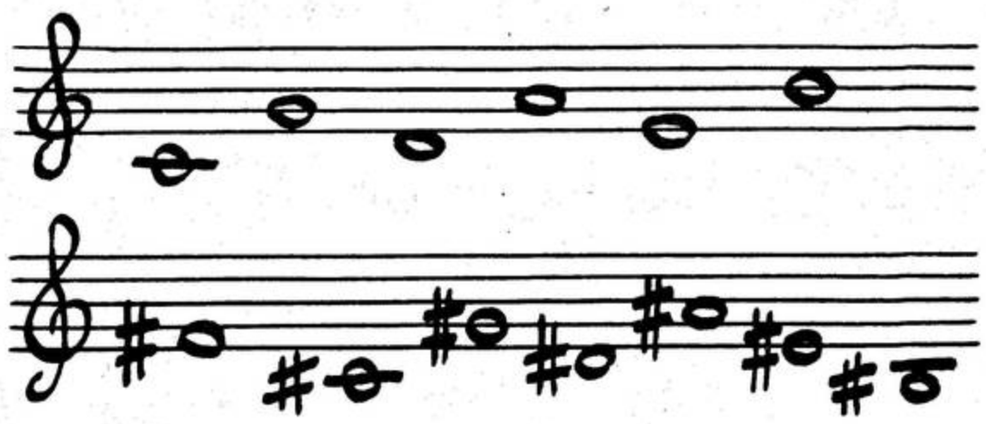
Who would have either the memory or the patience to modulate that far upward by fifths? In 12-tone temperament, modulating upward to the *fourth*, not the *ninth*, fifth to get from C to E is not that much of a strain on the memory, of course.

A recent book by Eric Regener, *Pitch Notation and Equal Temperament: A Formal Study*, refuses even to discuss 'positive' tuning-systems like 22-tone, because of this note-name or notational difficulty. This is one of a long line of such rejections of temperaments without hearing them much less attempting to compose in them.

I won't review Regener's book here because Richard Chrisman has already done this quite well in *Journal of Music Theory*.

The 12-tone circle of fifths and the fact that the twelfth fifth up or B-sharp, or the twelfth fifth down, or D-double-flat, is made to coincide with the C of the starting-point, is of little importance to musicians. It is mainly of interest to piano- and organ-tuners.

Ask an opera singer or violinist or trumpeter or bassonist to go round this:



and if they have any sense or self-respect, they will refuse and probably give you the horse-laugh you would deserve!

When it takes a student of organ or piano tuning many weeks to get the circle of 12 fifths down pat, and I have met a good many people who gave up trying in utter despair, it should be obvious enough that long chains of fourths and/or fifths do not form a part of the musician's or composer's basic vocabulary. They do not spring forth spontaneously from the average subconscious.

Indeed, the tuners ordinarily use thirds and sixths continually for checking, or they tune thirds and sixths and use fourths and fifths for checking in some of the alternative tuning-routines.

The formidable appearance of the ratio of the Pythagorean comma, the difference between 12 fifths and seven octaves, or the amount by which a chain of twelve perfect beatless exactly 3:2 fifths fails to close, 531441 : 524288, should be enough to scare you.

This is such a distant relation that I really don't think any ordinary person has any mental image of it. The interval can be heard, of course; but who among you could hear the difference between it and the simpler Didymus comma whose ratio is 81:80?

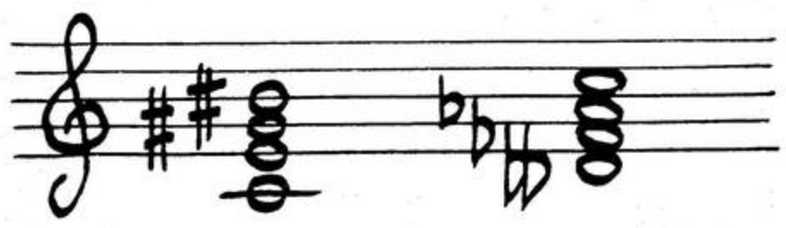
Yes, you could tune it in a well-equipped modern electronic laboratory and you could hear the beats between the two tones a skhisma (Ellis's term from Greek σχίσμα, a division or split; and he spells it this way to keep it from getting confused with or pronounced like the religious term *schism)* apart, and you could count the beats. But such a tiny interval would not get used by any performer I ever met!

What I am driving at here is that we are going to need codes for writing down finer distinctions than 12-tone temperament or ordinary notation makes; but we don't need to bother with every teeny-weeny interval that results from calculations, or that has to be reckoned with when studying the theory of tuning or constructing a new temperament.

The fly in the ointment, the stumbling-block, the exasperating, frustrating, maddening reason for confusion here is that ordinary staff-notation exaggerates the importance of the Pythagorean comma by distinguishing the B-sharp resulting from a chain of twelve fifths from the C we started from, *but it does not indicate the Ptolemaic or Didymus comma which results from the use of true, consonant 5:4 major thirds.*

It does not say whether it is to be performed in Pythagorean or meantone temperament, since it fits both equally well; and in meantone the difference between B-sharp and C is not only larger, but in the OPPOSITE direction!

If we journey to B-sharp by taking three major thirds, *three* 81 : 80 commas are involved, and if ordinary notation is understood as meaning meantone, the difference between the Pythagorean B-sharp and the Meantone B-sharp is 65 cents or nearly one of Busoni's third-tones.



Augmented Seventh Chords

C E_1 $G_2\#$ $B_3\#$ (up)

C $A^1\flat$ $F^2\flat$ $D^3\flat\flat$ (down)

$$\left(\frac{5}{4}\right)^3 = \frac{125}{64}$$

Sometimes, then, we shall have to invent or use already-invented means for indicating commas, but in practical musical compositions going along at an acceptable tempo, we wouldn't have to distinguish the two kinds of commas, or the skhisma which is the difference between them.

Ordinarily, I use Ellis's sub- and superscript numerals to refer to commas. I might do something else if it seems desirable at the time. Don't hold me to it. You and I can evade this problem in several pleasant ways, such as 19-tone, 31-tone, meantone, typewriter codes, computers, graph-notations, and the tape-recorder.

In a future *Bulletin,* I will go into the subject of tuning procedures for non-12 systems. In most cases, the owner of an instrument can use a recording of the tones or an electronic tuning-device of some kind, so the arduous piano-tuner's routine will no longer be the only game in town.

The most realistic and inexpensive and quick way is to have a guitar re-fretted to the scale you are going to use on another instrument such as an organ or psaltery or harpsichord, and tune it to that. Much much easier on the nerves and temper!

Such a guitar is also the ideal guide for learning to play these scales on violin or cello or to sing them.

A circle of 19 fifths would be even less relevant to practical musicianship than the circle of 12 fifths has been. It would not be the basis of the routine for tuning a nineteen-tone instrument by ear, and would draw needed attention from the most attractive feature of 19-tone, viz. its minor thirds and major sixths.

A circle of 22 fifths, or a preoccupation with a circle of the 22 major keys, would not help you compose new melodies or harmonic progressions, and would be worse than useless for persuading anybody to try out the unique mood of the 22-tone system.

I don't need to comment on circles of 31, 41, 43, 53, 65, 77, or more fifths!

Quartertones, or 24-tone, serves as an example of the family of systems which have more than one circle of fifths.

The tones of such systems are not all related by fifths, or to put it another way, you cannot reach all the tones by fifths up or down from C. In the case of quarter- and sixth-tones (24 and 36), the *only* way to access the non-intersecting circles of fifths is by *unfamiliar* intervals, which some people regard as a basic weakness.

Many other systems have no fifths at all. 13 and 18 are examples.

This is getting too far from our main theme, perhaps. Sorry about that. The idea is that nomenclature is not the art of musical sound. Written notes or printed names of pitches are not the melodies and harmonies they stand for.

The ease or difficulty of writing something is not relevant to the value or desirability of performing such-and-such sounds in this or that tuning-system.

The 19-tone system just happens to conform to the ordinary name-scheme and staff-notation as 12-tone, meantone, and Pythagorean temperaments do, in reaching the major third by 4 fifths up, as C-G-D-A-E.

While that makes it easier for conventionally trained musicians to compose and perform in 19-tone temperament than in 22-tone, it should not be used to decide between these or any other two systems.

It is no longer necessary to decide between systems! Modern electronic devices have eliminated this agonizing choice. Ordinarily, a tuning-system will be selected for its *mood,* as explained in *Xenharmonic Bulletin No.* 5.

Instead of letting the staff-notation or any other existing notation influence our choice of systems, we might as well survey the proposed methods of notating new scales, and suggest some further possibilities.

Immediately we are faced with a bewildering maze of alternative notations in actual use, special systems for particular instruments, allegedly simplified systems for beginners, and incredibly many attempts at notation reform.

There must be a new notation every month or so! It would be impossible to keep track of all of them.

Besides notations proper, there are fret diagrams, akin to the old tablatures, and

there are musical shorthands, as well as typewriter compatible codes for information storage and retrieval when the information is of a musical nature. The development of computer music makes it *necessary* to invent more such codes, and it behooves us who are involved with xenharmonics to take an active part in this development.

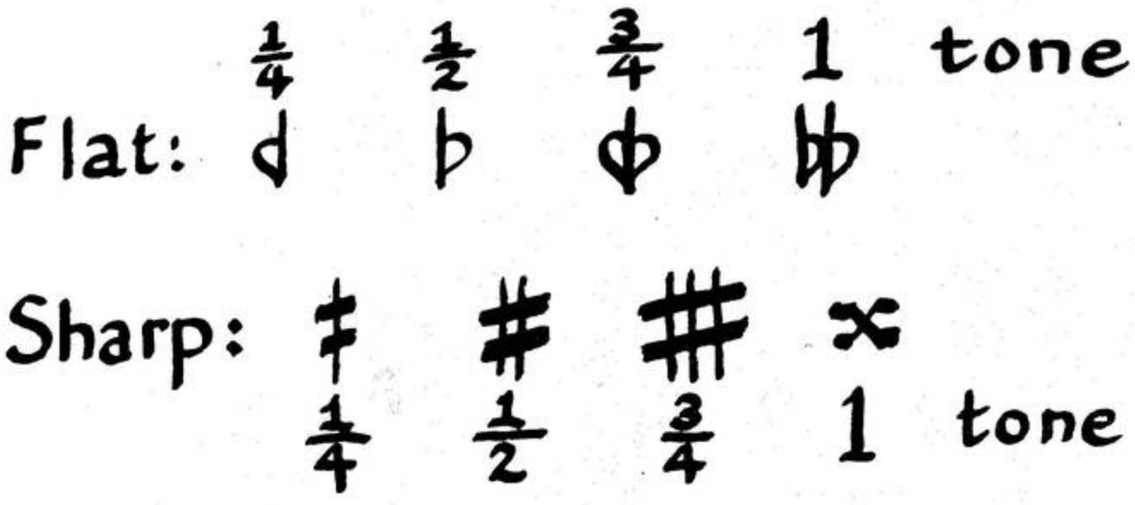
It is hard to draw a line between notations to be written and read, and visible schemes for operating an automatically-played instrument, such as theplayer-piano roll and the perforated metal disks used in antique music boxes.

At the other end of the 'scale', musical notations are not fenced off from abstract art, as a perusal of Cage's *Notations* or Karkoschka's *Das Schriftbild der neuen Musik* will prove!

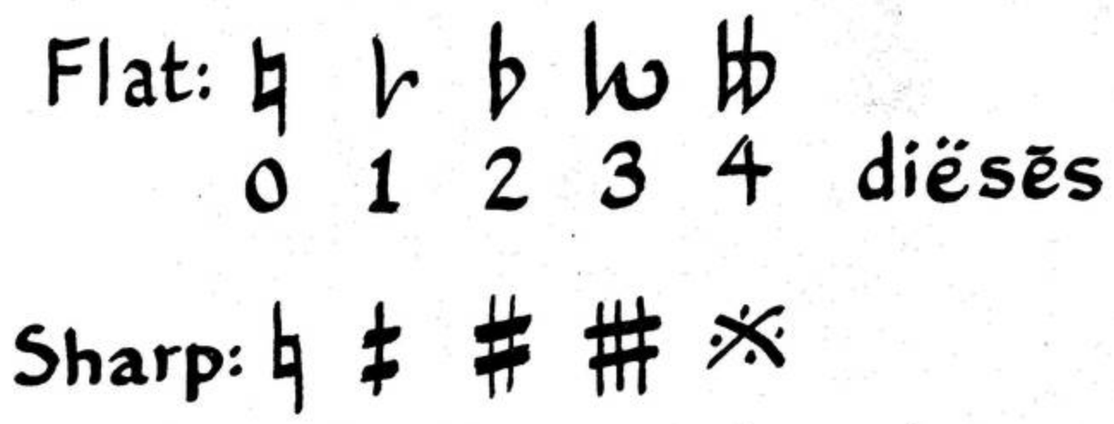
If you want to blow your mind, all you have to do is try to puzzle out the bizarre notations in the books just mentioned. But they are already obsolescent. For instance, there are what we might call *higher-order* notations: symbols or groups which stand for a sequence of sounds, or as in the 'aleatory' compositions they stand for a range of possible choices by the performer.

To put it another way, xenographics are rampant. With so many oddball notations in actual use, no xenharmonist need be shy or timid or apologetic for introducing new signs or new uses for old signs.

In a previous *Bulletin*, I have given some quartertone notations. I repeat here the Couper modification of the Vyshnegradski notation, which I have used extensively:



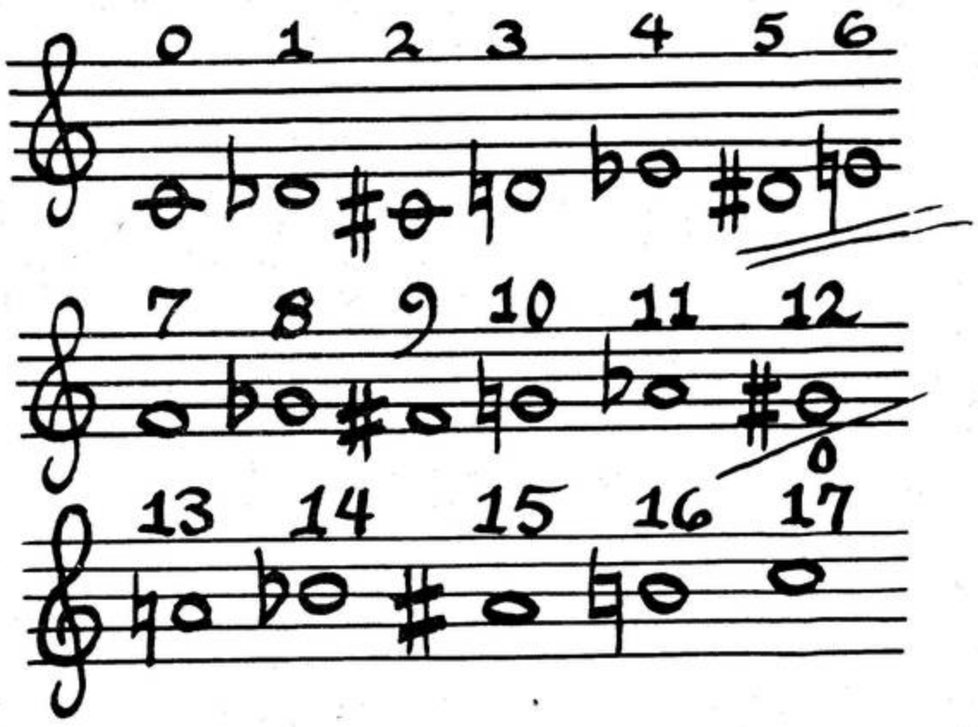
When composing in the 31-tone system, I use Fokker's notation (derived from Tartini and other sources) since a number of composers have already accepted this as standard:



While the Fokker 31-tone notation overlaps the Vyshnegradski and Couper quartertone systems so far as the sharps are concerned, this should not cause any practical difficulties.

For the 17-tone system I use ordinary notation, since there are enough sharps and flats to take care of all 17 pitches. The synonyms are odd, admittedly; but the simplicity of not having to invent new signs more than makes up for that.

This is the order of the 17 tones:



For the 34-tone system I have invented two new signs, the erect and inverted dagger or obelisk, which are then used with the 17-tone scheme given above. This is mainly to make it instantly evident that a piece is in 34 rather than 31. Here is an example:



In case you wonder about the half-flattening of the sharps and the half-sharpening of the flats in my way of writing 34-tone, it has to do with the derivation of major thirds, all of which are reached by going from one of the circles of 17 fifths to the other, which does not intersect it.

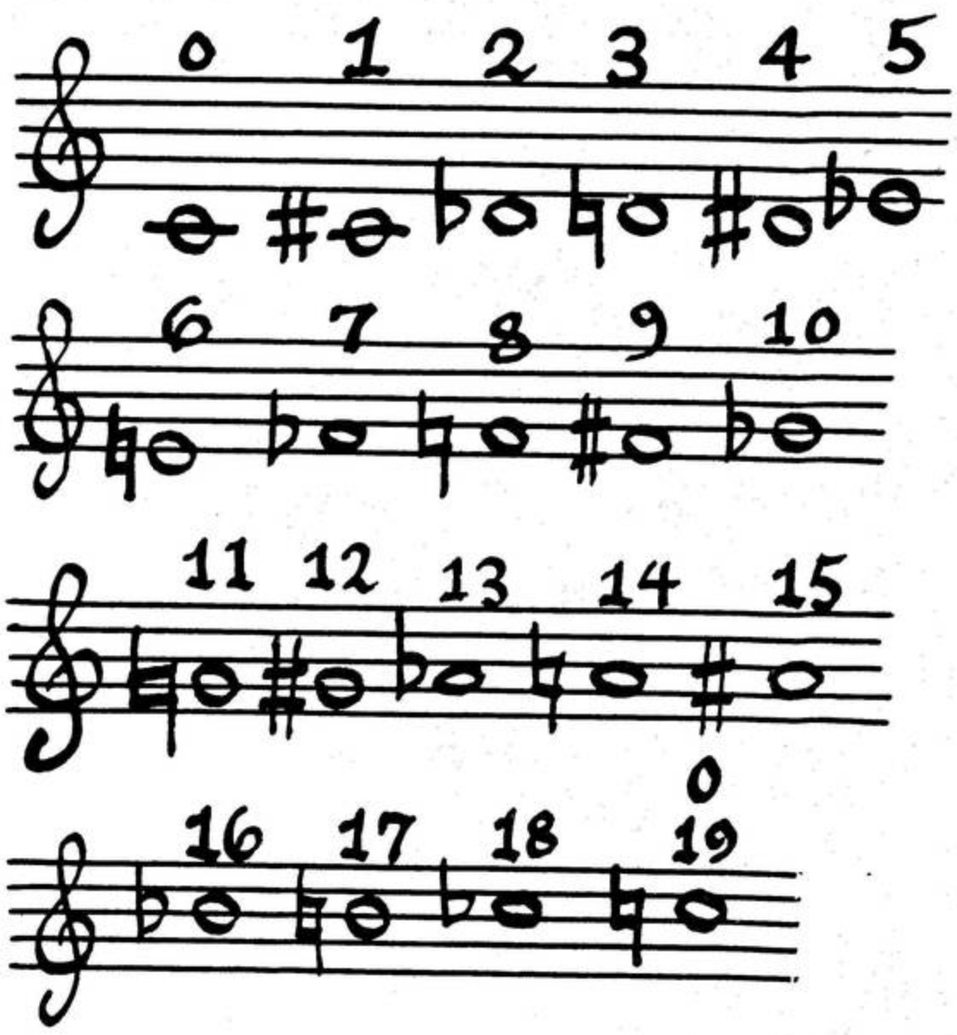
The errors of the major and minor thirds and sixths are all about 2 cents. Combined with the brilliance of 17-tone, this gives the 34-tone system an intriguing mood, quite different from that of 31-tone.

For the 19-tone system I use conventional notation, just as I do with 17-tone—but the order of designations is quite different. This is because the fifths of 17 are slightly sharp, whereas the fifths of 19 are noticeably flat, so in the 19-tone system as in meantone and 31, C-sharp is *flatter* than D-flat.

That is to say, in the 17-tone temperament, C-sharp is *sharper* than D-flat, just as in the Pythagorean system of perfect fifths.

I know, these mutually antagonistic uses of the ordinary notation's 'sharp' and 'flat' symbols are very confusing; but the alternative, of not using one of the tuning-systems in question, or of refusing to write either system in conventional notation which fits both scales so well, would be much worse.

Here is the order of the 19 tones:



In the 19-tone system, B-sharp is the same as C-flat, and E-sharp is the same as F-flat. The flats are thus the *double-sharps*, not the single-sharps, of the lower note-name in other cases: F-double-sharp is G-flat, and so on.

In the 17-tone system, A-sharp is C-flat, while E-sharp is G-flat. This is bizarre, to be sure.

In actual composition and performance, these oddities will not matter. They can be mitigated or evaded. Having composed and played and tuned instruments in both scales, for several years, I can assure you that the problem is trivial.

Perhaps two-thirds of all existing printed music can be performed in the 19-tone system without any changes in the written notes. For the 31-tone temperament this proportion would be even higher, say 70% or 75%.

Accordingly it is silly to wail and moan about there being no repertoire for new scales.

To perform existing music in other systems may require a certain amount of marking-up of the scores with special *ad hoc* alteration signs, or the employment of some kind of mental transformations—'When you see X, play Y, *unless* in context Q, where you will play Z instead.'

At first blush this procedure may seem too complicated to be practical, but there are mitigating factors. For instance, what shall we do about the comma in just intonation or in systems like 41-tone and 53-tone? As long as a century ago, Alexander J. Ellis thought up an ingenious way around this: The Duodene.

The duodene is a set of twelve tones, related by (justly-intoned) fifths and major thirds, in a 4-fifths-by-3-thirds pattern, thus:

$B^{1}\flat \quad D \quad F_{1}\#$
$E^{1}\flat \quad G \quad B_{1}$
$A^{1}\flat \quad \mathbf{C} \quad E_{1}$
$D^{1}\flat \quad F \quad A_{1}$

The subscripts and superscripts denote commas 81:80. The duodene is thus a selection of twelve tones from the infinite plane of the Web of Fifths and Thirds.

To mark up ordinary music, or to simplify the appearance of a new composition in just intonation, all you need do is put the name of the duodene inside square brackets above the staff or staves; that means that all unmarked notes are to be understood as members of that duodene. The duodene shown above is that of C. So it is called for by the Duodenal, [C].

To call for notes not members of the duodene, Ellis used slash and reverse slashes before the notes. This was for notes differing by a comma or for septimal intervals not even members of the Web of Fifths and Thirds. To go to another duodene, simply place the proper duodenal above the staff.

up / down

The proposal is so sensible and clear that no contemporary composer has used it so far as I know. They might accidentally get understood.

The obvious excuse for that, of course, is that few contemporary composers use just intonation, and since Debussy and Schönberg, tonal music has been out of favor. Until very recently, keyboards for just intonation and instruments with accurate tuning have been impossibly complicated and expensive, as well as not permitting rapid tempi. All this can be evaded by going to automatically-played electronic instruments, or to computers.

The requirements for a score to be used by a listener following a recording, rather than a performer or orchestra conductor, are in some ways less demanding. The new notations or new symbols will explain themselves if the listener plays the recording enough times.

Harry Partch wanted to use a set of just, untempered tones and evolved a number of notations for them. Certain of his instruments were given arbitrary tablatures or special ad hoc schemes; but in the main he promoted the use of *ratio-fractions* and *substitution encipherment* (my terms, not his).

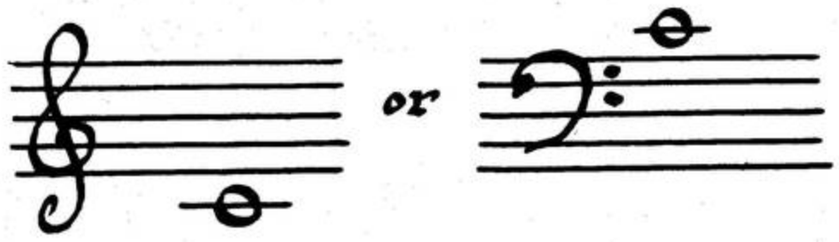
Ratio fractions may be used to supplement other notations, as for instance has been done by Lou Harrison. They may refer back to a fixed starting-point, or may be used to denote the frequency-ratio between successive tones. They may be used to specify the tuning or the retuning of a harp or similar instrument.

It is usual to employ them in improper-fraction form and in values between 1 and 2, as 5/4 11/8 10/9 7/6, but there is no need to restrict them this way. I can think of many cases where 4/5 or 5/2 or 7/1 would be appropriate. Tempered intervals would involve radical signs or approximate decimals.

I have to bring up the bizarre and in some ways disturbing subject of *substitution enciphered notation.* Suppose that you are an experienced pianist or organist, or that such a person is willing to play your compositions in some new scale.

Suppose further that you either are not interested in inventing new keyboards, or that you haven't the time, money, or patience to obtain or make such a keyboard for a non-twelvular keyboard instrument. And wait to compose and perform until it is ready.

It is quite possible to stipulate or postulate that 'middle C' or the staff-notation



shall mean key No. 25 on a standard 61-note organ manual, or Key No. 40 on a standard 88-note piano keyboard, *completely regardless* of what the actual pitch heard when such key is depressed may be—or it could even be an unpitched noise of some kind, or a 'stop' or 'combination' determining timbre, or a vowel, or a key which affects the pitch of another key or keys or other keyboard, or that determines loudness or attack characteristics.

Certain models of the Hammond organ have been fitted with an extra 'octave' (12) of reverse-colored keys at the left end of each manual, and these function as built-in combination tablets or pistons on regular organs—they may be referred to in the sheet music as 'D' or 'G-sharp' and one of them is a 'Cancel'—it turns any of the others *off.*

Partch left the conventional keyboard on a reed-organ but installed new reeds which he tuned to his 43-tone just scale—I am of course referring to *Chromelodeon I*—and then wrote for this instrument as if the old reeds were still in there! Thus he used conventional notation and a given note on a staff still meant such-and-such a key on the keyboard but produced quite another sound.

This isn't new: it is simply the ultimate consequence of the ridiculous 'transposing instrument' principle in bands and orchestras, where C is written on the staff and a saxophone plays either E-flat or B-flat in one or another octave; a clarinet plays E-flat or A, or sometime E-flat in bands; a horn plays F, some flutes and piccolos play D-flat! etc.

I guess Partch was being sarcastic: I prefer to express my disgust of transposing instruments more openly and clearly.

I could be sarcastic too: Most pianos have not been tuned for a long time. If only this majority were the Silent Majority! Instead, these pianos are in truth and in fact transposing instruments, in the key of C semiflat (a quartertone below pitch) or B, or some officially-nameless forbidden key. More often than not, they are down below pitch more at one end of the keyboard than the other.

Be it understood that I am not protesting the unconventional use of a conventional keyboard for xenharmonic tuning-systems; often this is absolutely necessary to save money or avoid waiting for months or years, or to conserve one's investment of years of keyboard practice; or to permit using one and the same instrument in different tuning-systems without taking up all the floor-space in the studio.

What I do object to is the using of ordinary *notation* as a substitution cipher, with a written octave standing for a fifth or major sixth or minor third or even with F being higher in actual pitch than G, thus concealing the fact that one is writing in a xenharmonic system, and misleading the unwary reader who accidentally stumbles on a page of such notation, say in a library search.

It should be possible for a violinist or cellist, or the player of specially fretted guitar, or a fretless guitar, or a keyboard for computer-music-entry, or of a synthesizer, to read any part of any xenharmonic score at sight. It is unreasonable to make such persons decipher conventional notation that does not mean what it says, and then have to re-encode it. That's cruel and self-defeating.

I do understand the temptation, but I am going to be very angry and stay mad if this substitution encipherment becomes a standard practice. It implies that non-keyboard music is somehow inferior to keyboard music, and furthermore than the keyboard has a divine right to rule the musical world, and worse yet, that the just or 22-tone or 19-tone sounds are inferior to the 12 equal tones; they are made to be a substitution-encipherment of what you would actually hear if you played this cipher-score on the piano or organ.

What if someone plays your score on a piano? And it comes out Ordinary Twelve-Tone?

I have had this sort of thing *done* to me so many times that I can assure you of the disastrous consequences of *provoking* our opponents into making fun of us by such irritating undertakings on our part as this enciphered staff notation.

In philosophical-psychological terms, this is Unconditional Surrender. If you do it, you are inviting or daring the 12-tone-ists to map all your xenharmonic music onto the 12-tone equally-tempered keyboard and to play it with only those 12 tones.

I'm scared that some keyboard synthesizer people will do this. Alas! It has already been done by people who made up 18-tone or other pianos and organs with the standard keyboard left on them, often with no warning.

A certain urgency is felt because so many of the proposed notational reforms have been based on the 12-tone system, so that if they came into any extensive use, it would aggravate the prejudice against just intonation and meantone, as well as other non-12 systems.

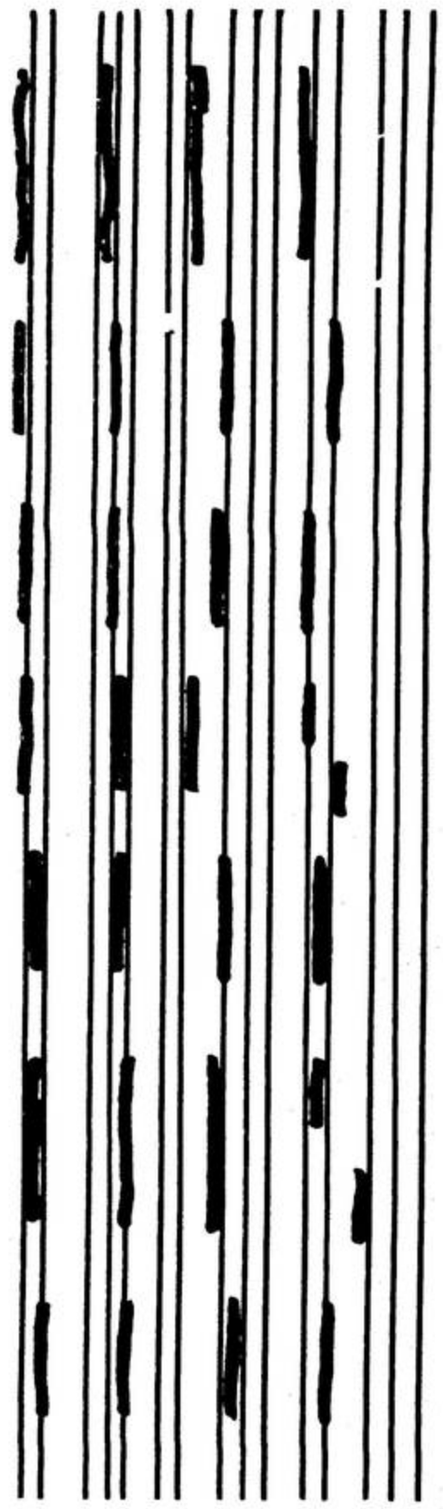
The keyboard staff is one of these reforms so obvious that it has been re-invented several times. Draw alternate groups of two and three lines, separated by somewhat wider spaces representing the pairs of adjacent white keys; add some kind of octave-mark, and you are in business!



The pianists among you will recognize the above as one of Hanon's Unconscionable Horrors; younger readers should thank their lucky stars that they don't have to endure *that!*

Turn it through a right angle, so that the lines are vertical instead of horizontal, and you have a projection or mapping of the piano keyboard onto the player-piano roll. This was actually used in a series of 'quickie' how-to-play-the-piano articles in *Esquire* magazine quite some years ago.

Something like the next example might even be readable by a photoelectric instrument:



The Esperanto word for 'keyboard' is *klavaro,* literally 'group of keys', so a similar system to the above is called *Klavarskribo* or keyboard writing, and has been much discussed in Europe.

Joseph Schillinger, the originator of a controversial system of composition, popularized the use of graph paper (cross-section paper) for 12-tone notation (e.g. using 12-to-the-inch paper) and it is claimed that he got Villa-Lobos to set New York City's skyline to music in this manner.

Naturally, any equal temperament can be notated on graph paper, and sometimes this is the best of all ways to write down a composition.

These systems based on the 12-tone equal temperament and often on its keyboard are 'sold' by a stock argument which goes like this: Late 19th (i.e. post-Romantic) and early 20th-century music (e.g. Schönberg, Scriabin, Ravel, Stravinsky, Hindemith, et al.) have had to employ an ever-increasing number of accidentals—sharps, flats, and naturals, so that the key-signature has become a nuisance instead of a help, and has quietly been abandoned. This means that the note *not* bearing a sharp or flat before it has become the rarity. Extra accidentals are required to prevent ambiguity, so that a new rule to read every note natural unless immediately preceded by a sharp or flat, has sprung up, abolishing the

traditional idea that the accidental remains valid throughout the measure in which it occurs and may even be prolonged into the next measure by means of a tie.

This said and done, the new-notation propagandist trots out unrealistic horrible examples of 'enharmonic equivalents' involving extremes like F-double-flat and B-double-sharp which I have never seen in any printed music:



This of course ignores another simplification development that has been going on very quietly and discreetly for 70 years or more: the double-sharp and double-flat become unnecessary as 12-tone tempered music moves further and further into atonality and serialism.

Such 'tonal' music as has continued to be written—popular songs for example—has continually moved away from 'extreme' keys, so that it, too, doesn't need double-flats or double-sharps. Sometimes it goes to the other extreme of 'misspelling' in order to get rid of doubles.

While some of these proponents of new notations make provision for an eventual progress beyond 12-tone, they generally ignore systems such as 17, 19, 22, and 31, which distinguish C-sharp from D-flat, and concentrate on multiples of 6 or 12 tones per octave which keep the synonymy between such pairs.

Therefore any extensive use of a 12-tone keyboard-oriented system or one which abolishes the C-sharp/D-flat distinction, will constitute a serious stumbling-block for xenharmonics.

This is why I have discussed the matter here: it is up to the xenharmonic community to make it known that there are some worthwhile and useful and exciting and interesting non-12 systems which do not contain the 6- or 12-tone equal temperaments as a subset.

Such systems as 19 function very well on a basis of using conventional notation but distinguishing C-sharp from D-flat; others such as 9 or 13 or 21 might do better by employing special notations *ad hoc;* recently Ervin Wilson has gone into this question in close co-ordination with the design of new

It is now time to look at Julián Carrillo's notation reforms. They are discussed in his book *Sistema General de Escritura Musical,* which we shall review more thoroughly in a future *Xenharmonic Bulletin.*

He begins with a battery of arguments similar to those mentioned above, against the multiplicity of accidentals in conventional notation, and also denounces the multiplicity of *clefs.*



Certain of these I *never* saw before. Only the following are in current use:



It is only fair, of course, to add that the majority of notation-reformers overplead their cases too—often going to absurd extremes. It is something like the spelling reformers who drag in affairs like *disme, comptroller, hiccough, gaol,* etc. which common sense tossed into the garbage-can some time ago.

I wish he didn't overplead his case about the clefs: the C clefs have not been used for keyboard instruments for more than a century, and the F clef on another line than the fourth, or the G clef on another line than the second, have been obsolete for a long time. The situation is bad enough without making a riproaring nightmare out of it!

This overpleading will turn some people off who otherwise might have realized the common sense of many of Carrillo's proposals, such as the abolition of transposing instruments and the abolition of *non-indication* that some instruments such as guitar, xylophone, double-bass, contrabassoon, piccolo, or tenor voice sound in a different octave than written.

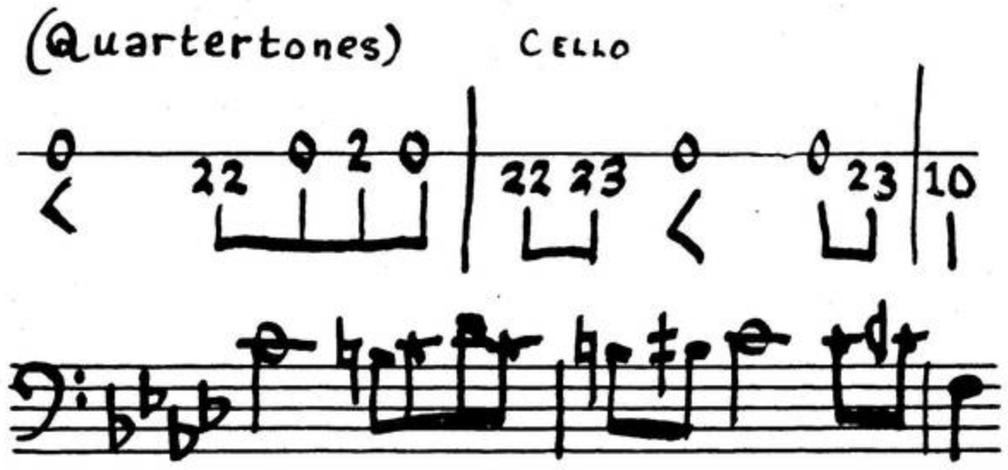
His notation was intended to be *general* or universal in that it can be extended to non-12-tone temperaments, and can be used for almost any instrument or voice.

The main idea is the abolition of the five-line staff, reducing it to one line, and then the adjacent spaces or ledger lines represent a whole *octave* rise or fall in pitch, not just a scale-step.

There are no black note-heads at all. Anyone who has had to wait half an hour for a music page to dry, and then risked blotting and smearing, or who has had to erase India ink, will deeply appreciate this.

Stems and flags for eighth-notes and smaller are retained; a new sign for half-notes had to be invented, since there is no longer any contrast between open and blacked-in note-heads.

This makes it possible to use *numerals* instead of note-heads, and the standard 12 tones are numbered 0 through 11. The 24 quartertones are numbered 0 through 23, and his sixteenth-tones would be numbered 0 through 95.



The above example from one of my early quartertone compositions should be enough to convince anybody that Carrillo's system works very well.

This is practical for any *equal* temperament and might be used for some unequal temperaments if their limits were arbitrarily set at some fixed number of tones per octave beyond which they must never go. It would not work for just intonation unless one were willing to accept a restricted number of tones and willing to puzzle out the ratio-relations that this system would hopelessly obscure.

The numbering might conceivably be extended to cents or millioctaves, in which case just or odd intervals would be represented well enough for practical purposes. But Carrillo eschewed systems which did not contain the tempered whole-tone of one-sixth-octave dimensions. His series of special pianos, and his fretted instruments, were all based on subdividing the 'tone' or 'whole-step'.

There are and will be certain types of compositions which this number system fits very well. Its main disadvantage is that it disguises the graphic up-and-down movement of the average melody or theme or tone-row.

Another disadvantage is that, even though it moves very far—a most desirable trend—toward being printable by conventional means and toward being practicable on ordinary typewriters, it stops short of this goal, and instead retains some of the hard-to-print aspects of ordinary notation.

One of these is the drawing of the single staff-line and the leger lines *right through* the numerals, which would require special types, or on the typewriter would require backspacing or returning the carriage to type a row of hyphens through the numbers, thus:

---3--5--6--5--7--11----------

A solid line could only be typed by turning the platen enough to bring the underscore to the correct position across the middle of the numerals.

Carrillo's system deserves your serious attention because it unclutters the music-page and greatly increases the legibility. It is applicable to many xenharmonic tuning systems that included fifthless or non-harmonic scales.

It accommodates atonality or serialism, and treats all equal temperaments absolutely impartially. It suggest developments in the direction of compatibility with ordinary typewriters and then with computer peripherals and printouts.

Anything that would reduce the *cost* of printing music and the time taken to write it would be most welcome at this time. The opportunity to do without staff-ruled paper is also a selling-point, as Carrillo alleges. Thus it has a future.

Like many others before him, Carrillo used a simple addition to conventional notation for rendering quartertones: short diagonal strokes somewhat like Ellis's already mentioned in this article.

/ up ¼ tone
\ down ¼ tone

We now turn to another Mexican composer, theorist, and developer of new instruments, Augusto Novaro, who also wrote on the subject of new tunings and scales, but whose book has been almost impossible to obtain.

Novaro investigated some scales that others have neglected, and furthermore developed extremely subtle variations of 12-tone and other temperaments—these are of the tempered temperament variety, or the altering of beat-rates used in tuning-routines.

The book also gives many details of design and construction of instruments, as well as the fretting of xenharmonic instruments.

At the moment, our concern is with notation, so let me summarize two ideas of Novaro's which will prove useful:

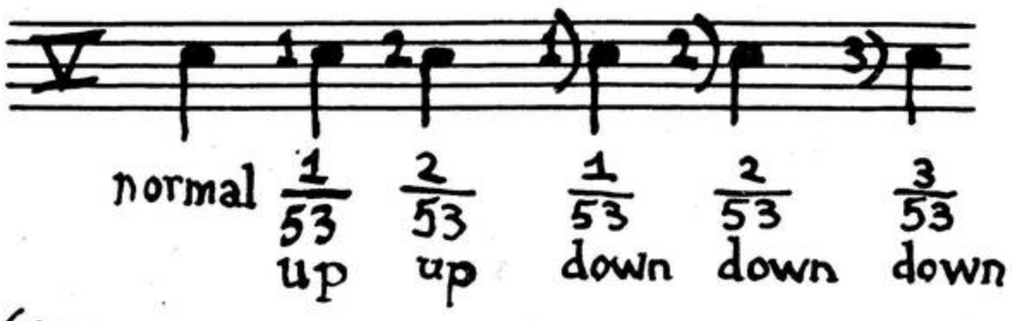
For the 53-tone system (and we may infer, presumably for other really microtonal systems having comma-like intervals) he does not continue inventing new kinds of accidentals, as works well for a system like 15-tone or 24-tone. Instead, he uses plain small numerals for fifty-thirds of an octave upward (corresponding to Ellis's superscripts for commas upward) and these numerals followed by a closing parenthesis for fifty-thirds of an octave downward (corresponding to Ellis's subscripts for commas downward).

4 4)

This would work for systems like 41, 55, 72, 84, 87, and even 171 for the intrepid.

Novaro had the good sense to realize that what is sauce for 24 is not necessarily sauce for 53, and that minus-signs would be hopelessly swallowed up and illegible on a music-page with so many horizontal lines on it.

Augusto Novaro's method for the 53-tone System:



(V means normal treble staff)

Probably few of you are going to write out really-microtonal scales in notation. You will graph them, use numerals as Carrillo did, or go whole-hog for typewritable computer-style coding systems. Yet Novaro's idea is still there if you need it.

N.B.: With these numbers, no sharps or flats are necessary, uncluttering the page!

Novaro's other idea is not new; he just presents it in a more practical and acceptable form, extends it further than usual, and then uses it so you can see the consequences.

Since he wrote about it, the general trend has gone this way, so with each passing year the reform becomes more cogent. Use only one clef.

The idea has been around for a century or so. For the saxophone and some other band instruments it is already the rule. For baritone horn (euphonium) and trombone it is optional. For all voices it is optional. For guitar it is the rule. Generally this is done for bass clarinet.

We refer, of course, to the treble or G clef, used in different octaves than the original one. Z.M.Bickford, in a series of method books for the mandolin family, called it *Universal notation*. He used a stroke or two strokes to put the clef down one or two octaves.

A teeny-weeny number *8* has come into use in recent years for this purpose, either above or below the G clef sign. Organists do this in a heavily-disguised form by using stops or couplers to get sounds one or two octaves lower, one, two, or three octaves higher, than written.



So long as the piano was the most-used instrument, the bass or F clef has been firmly held in place by the enormous number of people who took piano lessons. The steady advance of the guitar, the synthesizer, and electronic instruments is changing that picture, so there is now hope for a change.

As long as xenharmonists are flouting all the other conventions, such as 12-tone equal temperament, transposing instruments, key-signatures, &c., why not sweep away other excess baggage such as the superfluous F clef and the alto and tenor C clefs still hanging around our necks?

Are we men or mice?! It's that simple. The coming of electronic music and instruments, and the opening-up of new communication channels, and the proliferation of home listening facilities, along with the decline of older institutions and customs, make now the best time to put ourselves on the side of progress.

There is no need to scrap or re-write older music. It will be re-arranged for new instruments and for computers, and transcribed for tomorrow's music students, and all this will happen very gradually and painlessly over decades.

All I am recommending here is that no new compositions—especially xenharmonic compositions—be written with old clefs, non-indication of octave -lower-than-written, excessive use of ledger-lines, long passages under *8va.....*, and other such illogical or now-unnecessary practices.

As we said, the abolition of key signatures is almost a *fait accompli*, and the practice of reading every note natural unless it bears an accidental is almost 'in'. Some of the key-signatures that might have to be used in 31-tone music are just plain absurd: The key of A-double-sharp major would have 17 sharps—3 triples and 4 doubles—and the key of G-double-flat. . . but why go on? No one in their right mind would expect a composition with such a formidable written appearance to be performed. There will be new notations to take care of situations like this.

Personally, I take advantage of the fact that there are tape recorders! I play something on the 31-tone guitar, record it, and add a cello part if I feel so inclined, or whatever else can perform in 31-tone, and then re-record to superpose the two instruments on one tape, and then copy that tape if someone else who can't come here to my studio is to hear it.

Nobody has to know, nor care, nor worry, whether a given guitar chord is based upon A--double-sharp or B-semiflat or C-double-flat.

So for other systems. I don't go around criticizing the Podunk Symphony or the Carl Spiffleheimer Band because they won't play my 22-tone pieces; I go right ahead with the facilities I already have and fill reel after reel of tape with the characteristic twenty-two-tone mood and proof that that system works and adds to the resources of musical expression.

I care next to nothing about how these hours and hours of xenharmonic music would look if they were all written out.

Novaro's method of getting down to one clef is not to use the G-clef sign at all. It is replaced by a Roman numeral which is written

within the staff. The treble clef in 'normal' position, such that A in the second space will normally mean 440 Hz, is replaced by the Roman numeral V (five, or the fifth octave).

Roman numeral I, then, will place Contra C 33 Hz in the third space, so that the first octave-level will descend to the 32-foot or subcontra octave which begins at 16 Hz, and is as low as any ordinary musician would ever want to go.

Roman numeral II places Contra C 33 Hz on the first ledger-line below, and thus II will suffice for piano, most organs, and all the customary contrabass instruments.

Roman numeral III replaces the F clef and is a minor third lower, or major third lower than the conventional bass staff, depending on the degrees involved.

Roman numeral IV is nothing more or less than the customary use of an unmarked treble staff for the tenor voice or the guitar or banjo, or the marked treble clef or doubled treble clef as sometimes used, or the sometimes seen C clef on the third *space*—in all these cases A second space is 220 Hz, and A 440 Hz is on the first ledger-line above the staff.

Roman numeral V is the normal treble staff as used for the piano or violin, as we said above.

Roman numeral VI is the octave-higher staff as used for the piccolo, celesta, etc. This will save miles and miles of 8va----markings!

Roman numeral VII is the two-octave-higher staff as used for xylophone, glockenspiel, whistlers, or the 2-foot stops on an organ.

It is so unfortunate that there never has been a clef or diacritical mark for this two-octaves-higher condition (where A in the second space is 1760 Hz) and worse yet, that so few musicians have ever dared use the marking *15ma----*. How many people know what 15ma means?

Roman numeral VIII takes us beyond the end of the piano keyboard and beyond the highest tones in the orchestra, but the organ goes up this far, and so do synthesizers, so we will have some use for VIII after all. The clear sensation of pitch blurs when you go above 5000 Hz, which would be the fourth space of this staff. Most people can hear way up in the IX region, but such sounds are not heard as pitches, so it is unnecessary to represent them with staff-notation.

No, I'm not going to re-write the hundreds of pages of music I have written in some 40 years. But from now on I will gradually move over to the Roman-numeral idea of Augusto Novaro when using regular 5-line staves; and I will use Carrillo's ideas where they are best; and sometimes I will use 'graphic' or other notations.

It should suffice that I have written down enough xenharmonic music to furnish a representative sample. If it never gets played, it will never be heard by anyone, so the production of sound is my first task.

The writing of this article has made it evident that a good-sized book could be written about xenharmonic notations, fully as long and detailed as Cage's *Notations* or Karkoschka's *Das Schriftbild der neuen Musik.*

It is also quite obvious that xenharmonic notation-systems are going to proliferate in the near future as never before, now that the idea of escaping the Twelve-Tone Squirrelcage is really getting off the ground.

My apologies to all those whose systems are not mentioned or fully discussed here. I am surely ignorant of dozens of systems that no one has told me about. I have run out of space. As evident from a recent survey by George Secor, we are a long way from standardization in this field. Someone should collect all available xenharmonic notations until the book can be worked on.

Novaro's Cure for Clef and Ledger-Line Troubles

