# Maths & Music Bibliography

This leaflet is intended as a description of a rough selection of various literature in the fields around music theory. Many of these papers can be found on-line, or in the Library.

The vocal excerpts I used are taken from Toby Twining's quite cool CD [28], the drumming by Evelyn Glennie on [11].

[25] is *the* guide to music theory for those who want to understand the reasoning behind classical harmony (to my knowledge, there are no other introductory books on harmony that give any real attempt at reasoning). It focuses entirely on classical harmony, is a bit verbose, and Schönberg was ignorant of foundational music theory[1], but it has become the standard reference for musical reasoning.

[4] is a very sensible introduction to mathematical methods as they apply to practical music theory. His notes cover acoustics in addition to tuning, physiological aspects, and some basic AST[2]. It is available on-line, and a more developed version of the notes is due to be published by Cambridge University Press in 2006. It contains a great bibliography, and is the best single source I have come across of sensible music theory.

[16] contains a lot more about the physiology of the ear and has some cool mathematical models of the various mechanisms in the ear. For a start on the neurological theories, Lewiki is currently doing a lot of good work with songbirds, see [17] and [18].

[27] is a good book (an exapanded version of his paper [26]) on harmony and dissonance[3], in that it is very applied, and full of experiments and tests, and compositions based on the theories. It also applies the theory to create programs that dynamically adjust sounds to make them more consonant (mainly through MIDI). However, it also includes a seriously dodgy song about Fourier analysis. There is currently a lot of interesting work going on trying to expand his model.

More general books on tuning and temperment that have been recommended to me are [1], [2], and [15]. I have not read these yet.

The American school is a strong school - some of their work

[1] Actually, because of this people are more trusting of his judgement; his arguments are all *musical* in nature.

[2] see other footnote in this section.

[3] based, according to [4], on a theory due to John Pierce; his book [24] was recommended to me, but I have not yet properly studied it.

is still a little too much centred on atonal composition for my liking. They centre around what they call *Musical Set Theory*[4]. They love acronyms and harmonic transformations. I don't, but some of their work is sensible, and none of the maths goes beyond the basic group theory. [8] is a good set of lecture notes aiming to introduce you to the theories of the American school, and contains a respectful of practical analysis.

With regards to the mathematical music theory of the Zurich school, the tome [20] by Mazzola is a comprehensive account of all work done to date since his establishment of the school. It is, however, very hard going, lacking sufficient musical motivation and justification in many areas, full of big words, and the mathematics involved is *very sophisticated*[5]. The paper [7] is a more elementary introduction to the theory (in terms of American set theory), based on the equally accessible (and overall quite pleasant) thesis [6].

The theory of modulation I take as being the theory of the Zurich school is in fact a generalisation of a theory of Mazzola's due to Daniel Muzzulini which can be found in the mathematically accessible paper [21].

The paper [23] also contains an introduction to the formalism of Mazzola, and the paper [22] contains an actual calculation of some triadic structures within the same framework. As a rule of thumb, His papers in general are mathematically more accessible than Mazzolas and are more concrete in calculational terms.

The thesis [12] builds a fairly sensible and pleasantly algebraic structure around notions of certain classes of chord-transformations, and a condensed version was published as [13]. The latter paper was my main source of information on the T/I and PLR groups.

Loads of theory and algorithms from combinatorics have real and practical applications in music theory - an introduction, based around some of the formalisms of the Zurich school, can be found in Fripertinger's paper [9], with an enumeration of motifs to be found in his paper [10].

[14] has a nice title, and is probably worth reading, but our library doesn't have a copy. Similarly, [19] is the New Testament of the American school, but someone has had it out of the Usher library for a while. I've been told it's a little tough going, but quite

[4]and what we will, following Mazzola, call, *American Set Theory*, and abbreviate to AST.

[5]though, to it's defence, it is not intended to be an introductory book, but rather a compilation for people already working in the field

sensible.

[5] contains an account of a music theory based around a logical syntax. I haven't had the time or the effort available to read it at the moment, but it seems that some of it is quite reasonable actually[6].

# Bibliography

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[6] Xenakis also has a pseudo-logical theory; but this theory, much like the majority of his other theories is, to varying degrees, vacuous and nonsensical.

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