On the Intentional Use of Instrument Characteristics in Contemporary Classical Compositions

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Abstract: Compositional intention is likewise subjected to the (mechanical) instruments' sound characteristics and technical possibilities, for instance, the possibility to produce impulsive or stationary sounds, to form (pedaled) chord clusters, or to microtonally retune pitch during performance. These differing techniques may additionally allow of several (intended) psychoacoustical effects, as a changing fluctuation (beatings, roughness) or pitch strength—which, too, have a strong impact on timbre. So, in the latter case, the pitches' varying distinctiveness may be combined with a "metallic," "plastic," or "wooden" sound coloring. Consequently, in composing the decision for strings, either struck (piano, also prepared), bowed (violin, microtonally tuned), or plucked (harpischord), for flute, reed (organ) or free-reed (mouth organ) pipes, etc., therefore is, too, subjected to (a priori) intentional reflections aimed on the very (new) sound experience imagined.

By means of music and score examples (W. Rihm, J. Cage, G. Scelsi, G. Ligeti, O. Messiaen, T. Hosokawa) as well as spectra and spectrograms the paper sheds some light on the composers' sounding out and purposeful use of the mechanical instruments' possibilities in sound production in order to get (close to) the corresponding aesthetics of expression intended.

As in art, also in music any compositional design does very much depend on the material constants of a musical instrument, i.e., mostly, the (here: mechanical) instruments' peculiarities and possibilities in sound production are part of the composer's a priori intention. An especially good example is the great variability in instrument strings of any kind, being stimulated by either striking, plucking, or bowing, and providing more or less good possibilities to change pitch and tone color during performance. Presumably, this can be done most easily in bowed handheld string instruments as the violin, and the least easy in the grand piano, where the string preparations, as in Cage's Sonatas, usually are to meticulously be done in advance. This is, of course, not only due to this practical aspect, but also to the instrument's peculiarities as regards stimulating and manipulating a sound: A sound, as the violin's, which is stationary rather than impulsive (apart from pizzicato) provides a much better possibility of any retuning while playing taking place and being perceived—what is difficult if not technically impossible in an impulsive sound (in the piano, though, a tone can be made more stationary by means of pedaling it). Hence, whereas in the first case—in the violin—the change in sound structure and spectral composition predominantly happens successively over time (fluctuations as vibrato or beatings), in the latter case—in the prepared piano—it is the more or less damped percussive impulse character due to string preparations that mainly becomes manifest in pitch strength and tone color. This aspect of sound stimulation and, consequently, the way of a sound event unfolding over time (its "behavioral pattern") thus does concern, too, the kind of representing and visualizing audio signals, what can also be seen in the examples shown in Figures 1–6: Whilst the short, impulsive sound produced by a piano prepared according to John Cage's instructions (Sonata no.2 for prepared piano, 1946–8) shows a noisy spectrum and fast decay (Fig.1), the beatings in the violin strings microtonally (re)tuned on demand of Giacinto Scelsi's intention (Xnoybis for violin, 1964) happen over time and here, in the FFT spectrum's vertical section (2048 samples), can be seen only in the spectral peaks' close occurrence (Fig.4). In addition to the stimulation by either striking or bowing, on the basis of two contemporary classics excerpts two different kinds of plucked strings are displayed: Where the harpsichord in György Ligeti's Continuum (1968) typically shows a much greater amount of higher spectral energy as in—even non-prepared—piano, as more it is to be played in an extremely fast and hardly to resolve way literally merging into a "continuum" (Fig.2), the harp in Landscape II (1992) by Toshio Hosokawa shows a soft and distinct arpeggio, though dissonant sound (Fig.3). In contrast to the rushing harpsichord filling the whole spectrum, in the "Japanese Landscape" (thus holding "white" areas) the mixture of plucked (harp) and bowed (string quartet) string instruments is especially appealing. Another composition by the same composer (Landscape V, 1993) combines string quartet with the Japanese mouth organ shō; here it is the possibility of forming dynamically swelling sounds and spectrally dense thus highly dissonant complex chords what makes this, however ancient, instrument more often being used in contemporary classical compositions.

For reasons of space, the important features in the aforementioned compositions are shortly listed below:

John Cage: Sonata no.2 from Sonatas and Interludes for prepared (large grand) piano, m.17: D2–Bb4, prepared by screws and rubber (on instruction, all strings), providing a dull, metallic sound, fast decaying and poor in overtones.


Toshio Hosokawa: Landscape II for harp and string quartet, m.152: harp arpeggio C2–E3–G3–F#4 [VI.I Flag.-C7].

Giacinto Scelsi: Xnoybis for violin, IIIrd movement, m.8: 2nd/3rd strings: C#5(+4)–D5, yielding a quarter-tone-distance (=50 cents, nominally 16.72Hz), here the beating is about 20Hz, the demanded ample vibrato 6 periods/sec.
FIGURE 1. String, struck: John Cage, Sonata no. 2 for prepared piano (> dull noisiness, material-induced sound quality).

FIGURE 2. String, plucked #1: György Ligeti, Continuum for harpsichord (> very dense and dissonant sound structure).

FIGURE 3. String, plucked #2: Toshio Hosokawa, Landscape II for harp and string qu. (> distinct though dissonant sound).

FIGURE 4. String, bowed: Giacinto Scelsi, Xylophyls for violin (> strong beatings due to microtonal tuning of the strings).