Spectromorphology

The word spectromorphology refers to how spectra change over time, how their shapes change. The term is most often used in auditory context, although the term itself points to a principle of change. The term was originally coined by Denis Smalley in 1986 [1]. Much of the material was rewritten and presented again in 1997 [2], and a broader discussion of spectromorphology and spatial issues was presented in 2007 [3].

This short article aims to present a background for Smalley's discussion, and present the main ideas in a condensed form.

Background

Musique Concrète is most often attributed to Pierre Schaeffer, and emerged as a musical genre in the first years after WWII. The post-war period was rife with experimentation and desire for new musical forms of expression, and the new technologies stimulated new forms of technology-based music such as the highly structured electronic music and the more exploration-based *musique concrete*, made from recorded sounds as a process where the composer built the music on structures that he teased out from the recorded sounds through simple editing techniques.

As part of his founding work for this genre, Schaeffer published two books, both unavailable in other languages than French, however a guide to Schaeffer's work by Michel Chion was translated to English in 2007. The publication is available online[1]. In his writings, Schaeffer started to develop a structured presentation of his thoughts and ideas, but his texts are dense and difficult to penetrate. It was Denis Smalley who took it upon him to create a clear presentation of Schaeffer's ideas, and to bring his own analytical skills to bear on structuring these thoughts. His classification system is significant in extent and detail.

In electronic music, composers would manipulate the electronic equipment and be able to write quite exacting scores that resembled traditional notation in their aim of being exact representations for reproduction of musical ideas. In musique concrète, however, no such formalization was easily accessible, since the work entailed careful listening to the sounds in different 'listening modes', and selection of material based on their 'emerging qualities' – what they sounded like. It was how the shape of the sounds was experienced that dominated musique concrète in its early years, and there was a felt need for a representation of sonic aspects, that could function as a type of grammar in discussion and analysis. GRM[2], the institution that Pierre Schaeffer created within French radio, has produced several softwares that deal with these issues, and have included the research of composer Lasse Thoresen in one of their most recent publications. Thoresen has developed graphic representation of identifiable elements in electroacoustic music [6] with a base in Schaeffer's work.

Schaeffer's work originated in electroacoustic music, where the direct experience with the sound is prime. The type of analysis that the focus on spectral shapes encourages, is most often useful in acousmatic music, where the origins and extramusical significance of sounds are ignored. The focus is on sonic qualities and how they change over time, not on what the sounds refer to. However, what the listeners perceive of "inner qualities" in sounds does not exist in a vacuum; perception of musical qualities happens within social context, in relation to and expectations of recognizable features and familiar combinations and conventions. This resides comfortably within the modernist focus on material, which can be considered as another approach to artistic escape from the confines of history.

This type of exploratory listening relies on what Schaeffer named *reduced* listening; one of seven listening modes[3]. This listening disregards source- and action-bonding for the sounds, and allows the composer to easier focus on micro-details in the sounds, and to freely construct musical structures without extra-musical implications. Reduced listening is a precondition for a spectromorphological approach, and depends on music technology for the recording, processing and intimate study of sonic detail.

[1] http://www.ears.dmu.ac.uk/spip.php?page=articleEars&id_article=3597, visited 09.12.2011
[2] http://www.inagrm.com/, visited 09.12.2011
[3] See Shaeffer, 1966 and Chion 1983 for a discussion

Typologies of sound shapes

Smalley explains that the spectrum cannot exist without its morphology: "something has to be shaped and that something must have sonic content."[4] He also proposes the idea of *surrogacy*, and explores how the perception of sonic qualities reminds the listener of the physical world; excitation, physical and imagined gesture, and links these levels of surrogacy to expectations of how sound would behave; attack, attack-decay, sustained sounds with continual excitation. Think of staccato sounds, sound that ring out after an initial attack, and for example brass- or string sounds where continual airflow or bow pressure results in long notes. These archetypes can of course be articulated in several ways.

By reference to these sonic types of behavior one finds in the articulation of notated music, the argument is that these archetypes can be useful in description, analysis and understanding of electroacoustic music, especially acousmatic music, where structural levels can only be identified through expectations that emerge during the listening process. On a sonic level the listener identifies how sounds start, how they continue and how they terminate, and it is from these aural observations that functional attributions are made, and musical structures can be identified. Further, sounds always change over their duration, and Smalley provides a descriptive list of different types of motion and growth processes, for sounds individually, in combination with other sounds, and in more textural movements.

Morphological archetypes

Following this discussion of types of motion and pattern development, a focus on the inner qualities of the sounds is necessary - the detailed behavior of their spectra. The focus in spectromorphology is not one of computational analysis, which in simple terms result in descriptions of degrees of brightness, hollowness, intensity and so on. Instead, the terminology is expanded with qualitative descriptions, such as degrees of looseness/tightness, dominance/subordination, etc. This terminology will always be subjective, but research shows surprising agreement across reference groups re. the understanding of such terms.

In acousmatic music, the listener attention is most often on the internal spectral qualities of sounds, rather than on their pitch-quality. As in instrumental music, quick passages blur individual sounds into larger types of movement, and Smalley discusses several degrees of spectral density, from the impenetrable, dense spectra of noise, to open and clear isolated sounds. From a density-perspective, this parallels what Murray Schafer has labeled as acoustic horizon, how far away it is before clarity is obscured by disturbing sounds. The focus on amplitude and spectral density is something that is shared between Schafer and Smalley, however Smalley's description is more musically oriented, and without the value judgements implicit in Schafers discussion of noise.

The continua between noise and pitch, and between harmonic and non-harmonic sounds, are important arenas for electroacoustic composition, and filled with spectral densities of varying density. Spectral space is described in dichotomies such as emptiness/plentitude, diffuseness/concentration, streams/interstices, overlap/crossover, and spectral density as a continuum from empty to saturated.

Spatial issues

Any music is experienced in space, inner or outer, and the spectromorphological discussion concerns itself with the reciprocal relationship between space articulating sound and sound articulating and creating space. From within this understanding, a vocabulary has been developed with closeness/distance, width/depth, definition of texture and trajectory, orientation spanning from frontal to multi-dimensional as keywords. Smalley discusses the spectral dimensions as open or enclosed, deep or shallow, and ties in different types of perspectives such full or empty, various types of image definition, sound trajectories in space, with paths, velocities and residues, whether the sounds approach the listener, depart, rotate, wander or cross in the listening space.

The more recent development of soundscape perspectives within electroacoustic music has brought back the notion of source bonding as significant in the meaning-making, as well as more holistic view on the multi-sensorial quality of human perception. While this development departs from the Schaefferian position of reduced listening and the earlier main body of spectromorphological thinking, it adds to the understanding of how multiple aspects interact also in the formulation of acousmatic images.

Conclusion

The spectropmorphological focus is on the experienced qualities of sound by composer and listener both, not the machine-analysis of sound. Listening must happen on several levels, and through careful listening to the sonic qualities, their changes and articulation in spatial movement, a musical grammar can be extracted. Smalley has

[4] Smalley 1997, p. 107

contributed a significant catalogue, and with the general development of technology-based music there is every reason to assume that the proposed terms will be supplemented in the future, as experiences change with the artistic intentions harbored by composers, performers and audience.

Literature list

[1] Smalley, D. (1986), Spectro-morphology and Structuring Processes, in Emmerson, S. (ed.) The Language of Electroacoustic Music. London: Macmillan: 61-93.

[2] Smalley, D. (1997), Spectromorphology: Explaining sound-shapes, Organised Sound: Vol. 2, no. 2. Cambridge: Cambridge University Press: 107-126.

[3] Smalley, D. (2007), Space-form and the acousmatic image, Organised Sound: Vol. 12, no. 1. Cambridge: Cambridge University Press: 35-58.

[4] Schaeffer, Pierre (1952), A la recherche d'une musique concrète. Paris: Éditions du Seuil

[5] Schaeffer, Pierre (1966), Traité des objets musicaux. Paris: Le Seuil

[6] Thoreson, L. & Hedman, A. (2007), Spectromorphological analysis of sound objects: an adaptation of Pierre Schaeffer's typomorphology, Organised Sound, 12:129-141 Cambridge University Press.