EUPHONY – A CASE FOR EVOLVING ACOUSTICS LANGUAGE TO INCLUDE POSITIVE OR VALUED SOUND

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ABSTRACT

The language we use to describe acoustics is well defined, in terms of parameters, and has evolved since ancient Greece when the word acoustics was born; but our language does not stand still and continues to evolve based on the need to keep pace with changing times and needs. Sound is the word used to describe acoustic energy in air or another medium, which can be heard when it reaches the ear. This deals with the physics. The terms used to describe unwanted sound is “noise”, which is also part of popular vernacular. There is no single word to describe sound that represents positive or valued sound, as perceived by the listener. That is to say sound which has some value to the soundscape or human health and well-being. As acoustics moves from times that focused on dealing with the noise that was a consequence of the industrial revolution, towards a more positive appreciation of sound in our environments (both inside and outside) and the emergence of soundscapes and soundscaping acousticians need to evolve the language they use. A case is made for adopting a new term to describe sound that has value in the environment, which originates from Greek, and it is argued that this will assist the acoustics industry to make acoustics more accessible, to enable a wider understanding of the value to society, and also allow the benefits of acousticians work to be more effectively communicated. In this way the value of acoustics through good design can include for and quantify sound that has positive effects and outcomes, in a more balanced and considered way than it can currently.

1 INTRODUCTION

There is no word commonly used to describe sound that is positive or valued, as perceived by the listener, nor does such a word appear in the vernacular by society for that purpose. This paper describes a case for evolving the language and terminology used within the field of acoustics, initially by professionals to describe this type of sound specifically, to create a construct within which acousticians and also the public can achieve better access to a shared understand of how acoustics can benefit and add value to society, assisted by good design. In other words, what “*good*” sounds like?

At this stage acoustic terminology has evolved primarily to describe characteristics of the physics related to the sound *objectively*, or in dealing with an adverse response to sound. This is helpful in dispassionately describing the sound in question, but it is problematic for our field to communicate whether the sound itself is detrimental or positive to the health and well-being of those hearing it. Often the context is all-important, with consideration of how the sound is perceived by the listener being critical. With two ISO standards now published, the emergence of soundscaping as a field, demands a rethink of the way in which sound is described that has a positive or valued effect on a listener. A suite of words are explored and discussed, with one proposed for adoption and use more widely, in order to enable the topic to develop and become more accessible and fully integrated into acceptable acoustics terminology. The intention of this paper is to create a framework within which such new parameters and language can develop in association with sound that is perceived to have value, or high quality.

2 TERMINOLOGY

2.1 Historical

A search for a synonym to describe pleasant sound, or one with some quality or value, is impossible should it be found that one does not exist; however, as given the evolutionary nature of language, it is considered there may be some appropriate words no longer in common circulation, that could be harnessed now that there is cause to use them. Therefore, a historical linguistic study is considered appropriate to explore links to commonly used key words within the field of acoustics.

2.1.1 Sound

The etymology of the word "*sound*" has several meanings. It can be derived from the Anglo-Saxon, or Old Norse word "sund" c.1300, which also means "a strait", or "swimming". This is interesting because of its link with the natural features of the landscape. In the late 1400 emerged "soun" from the Old French word "son" meaning sound, musical note, voice, and Latin word "Sonus". It can also be found that in c.1200 the Old English used "gesund" meaning safe or healthy. This too has Old German links, as in the post-sneezing interjection "*gesundheit*". Foundations also come directly from Latin with "sonare" meaning to make sound [1].

With so much laminated evolution of the word, with its many meanings, it is perhaps reassuring that these coalesced into its more recognisable form, based on the physics of sound, although it resonates still with the other ways in which it is still used.

The Oxford English dictionary describes sound as *"vibrations that travel through the air or another medium and can be heard when they reach a person's or animal's ear*". This definition is preoccupied with the physics and biology of the mechanism and does not concern itself with the quality of that energy. It is also defined in a more familiar way to acoustician as *"mechanical radiant energy that is transmitted by longitudinal pressure waves in a medium (such as air) and is the objective cause of hearing*"[2].

2.1.2 Acoustics

The word acoustics comes from the Greek *akoustikos*, from the verbal adjective *akouein* "to hear" [3].

This Greek province, and our continued use of the word today is fitting, given that the amphitheaters of the ancient world are the beginning of the overt material influence of acoustics on ancient and then modern society, and the importance of dramatic performance and communicating with the masses marks the beginnings of our political system [4]. In the 6th Century BC Pythagoras explored why certain combinations of musical sounds seems more beautiful than others, studying vibrating strings and harmonics [5].

How it is that no word has stood the test of time for sound that has value is perhaps telling of the needs of society over that time and the growing preoccupation with controlling sound when it becomes too much, rather than to identify it as something worth introducing, protecting or preserving. This negative association has found its way into common parlance, and has become "noise", whereas acoustics is perhaps more forgivingly used in a more neutral way to suggest the quality of the space, which could be good or bad.

As an acoustician, my experience is that people generally only notice the acoustics if it is poor, in relation to its intended use; whereas where it is good then the quality of the sound experienced supports the intended use. This is best illustrated with chanting or choral song in a church, as opposed to the problems this same acoustic effect can cause with speech. The former example can give the sound an almost transcendent and uplifting quality, whereas the speech would be perceived as blurred and unintelligible.

Music is described as complex by ordered sound [6], which has the ability to change how a person feels because of the links to memory [7], whereas sound that is not music is not generally accepted to do that in the same way. Therefore music has developed a value in a way that a pristine aural environment has not, as yet. It is however, becoming clearer that sound in the environment may also have this almost magical quality, in terms of well-being, as is often an antidote to noise [8]. This is something which soundscaping is seeking to capture and make use of in the good design of urban environments [9].

2.1.3 Noise

Noise is commonly defined as "*unwanted sound judged to be unpleasant, loud or disruptive to hearing"* [10]. The most recent definition is within ISO 12913-2:2018 which states noise is *"sound that is deemed to be unpleasant, unexpected, undesired or harmful*" [11].

Early known references to noise are found in c. 6th Century BC where the council of the province of Sybaris, a Greek colony in the Aegean, ruled that potters, tinsmiths, and other tradesmen must live outside the city walls because of the noise they make. A century later Hippocrates clearly identifies tinnitus - the ringing in the ears, often caused by prolonged exposure to noise. In 44 AD Julius Caesar rules that 'no one shall drive a wagon along the streets of Rome or along those streets in the suburbs where there is continuous housing after sunrise or before the tenth hour of the night" [12].

The commonly used quote "one mans noise is another man's music" identifies that it is not just an inherent quality of the sound, but the response of the listener that make something noise. References to this phrase can be found in document matches to 1957 [13] but is thought likely to be tracked back in concept, at least to the first century BC poet and philosopher Titus Lucretius Carus who was a Roman poet and philosopher. His major work was De Rerum Natura (On the Nature of Things) where he said "What is food to one, is to others bitter poison" (Book IV, line 637) [15]. This leads on well to show how the meaning of the word has evolved, and in the debate over the Noise Abatement Bill of 1960 became "one man's meat is another man's poison"[16].

The etymology of the word "noise" is uncertain, but it is thought to come from two main meanings. The Latin is "noyse", "nausa" . The temptation to make the link with "Nausea" is great, but it is thought this cannot be relied upon [17]. However, the feeling of loathing and disgust [18], which in turn can be traced back to "Naus" meaning ship in Greek is also a purported link. The possible link with water suggests its origins are more tied into a feeling resulting from the movement of a ship, which is perhaps why the link with a feeling of loathing and unpleasantness emerges. When applied to sound this remains a key part of what noise means today. In Middle English it is also linked with the sense 'quarrelling' [20], so it appears not to originate explicitly from an interpretation on sound, but more the effect on a person listening to sound that has particularly unpleasant qualities or associations.

Archaically (c. 1300) the verb would be used to described something that should be "noised" about, i.e. to talk about or make publicly known, to praise or to talk loudly [21].

The reference to noise appears in numerous ways in the old testament of the Bible, but most commonly in relation to either the sound made by humans, or that made by the environment around them or by God. In fact, it is a very noisy book; 30 references to noise are subject to bible study guides [22].

A selection are extracted here to illustrate how embedded noise is. The translations allow some space for interpretation, but often there is an association with a tumult, such as the noise of thunder (Revelation 6:1), or "*with a great noise"* (Peter 3:10) or "*outcry"* (Job 36:33) and "*joyful noise*," (Isaiah 16:10). Two particularly interesting references relating to mankind are reference to *"a voice of noise*

from the city" (Isaiah 66:6), *"a voice of tumult from the city"* (Jeremiah 10:22) [1] . Is it perhaps the reference to a joyful noise that is of most interest, inferring that noise too can be positive, albeit still loud.

It became part of the vernacular as it was used by poets. In one of Chaucers' early poems [23], The Book of the Duchess, is one of the richest text relating to noise. He focuses mainly on the noise created by people, animals, and music, rather than that of nature; but plays with the contrast and texture that this creates. The reader awakens to birds singing loudly on a spring morning. They follow sounds of hunting-horns, of people and horses being readied for the hunt. The dreamer finds themself involved as the hounds are uncoupled and the hunt streaks into the forest with traditional cries and shouts. The poem thus starts with noise, but as the dreamer becomes separated from the hunt he finds himself deep in a quiet grove where he interviews a man in mourning. This scene possesses serenity.

Shakespeare writes mentioning both noise and sound both positive and negatively in 1610-11 in the Tempest "*Be not afeard; the isle is full of noises, Sounds and sweet airs, that give delight and hurt not. Sometimes a thousand twangling instruments will hum about mine ears, and sometime voices"* [24].

Dickens, who personally took great interest in the control of noise pollution created as a result of the industrial revolution [25], used it in his works often when describing industrial England. In The Christmas Carol it was however the noise of children that he used to great effect on Scrooge "*The noise in the room was perfectly tumultuous, for there were more children there, than Scrooge in his agitated state of mind could count"* [26].

With a greater preoccupation with improving health in society Florence Nightingale also dedicated a whole chapter to noise in her Notes on Nursing of 1860 [27], in which she said "*Any sacrifice to secure silence for these cases* " in which she was referring to patients with "*particularly irritable nerves*"…"*is worthwhile, because no air, however good, no attendance, however careful, will do anything for such cases without quiet"*. This illustrates from one of the most respected early pioneers of health passing on the inextricable link in her mind between sound and the effect on the listener and importance to restoring their health.

Noise appears to elude a simple definition, perhaps because of its layered etomological history. It remained a description for the listener to attribute, and so becomes open to interpretation for artists as well as the study of sound scientifically.

In the Art of Noise, Luigi Russolo in 1913 set out the futurist manifesto, and as an artist and eventually a composer he said " *We want to score and regulate harmonically and rhythmically these most varied noises. Not that we want to destroy the movements and irregular vibrations (of tempo and intensity) of these noises! We wish simply to fix the degree or pitch of the predominant vibration, as noise differs from other sound in its irregular and confused vibrations (in terms of tempo and intensity)."* [28]. He explored the idea of "noise-sound", dealing with the dissonant effects on music by drawing from the influence of industrial noise on human existence.

Hainge took the discussion to a philosophical level, in a more modern setting [29], suggesting that the twentieth century is the age of noise, and on the rise in the post-industrial era. He suggests that the perceived assault on silence is a consequence of this, and that the efforts to tackle this simply increase the noise further. He suggests the long held opposite to noise is the orderly harmony of music, and that the retreat into this becomes all the harder as a result of music itself becoming noisier.

He likens the viral chaos associated with the information age as being a new type of noise or bombardment, which we attempt to filter to get clarity.

[1]

If the 20th Century it was the discipline of environmental noise abatement, which developed as part of a drive to control and reduce noise. John Connell OBE establishing the Noise Abatement Society in 1959 and successfully lobbied the Noise Abatement Act 1960 through UK Parliament, which enabled for the first time noise to be classified as a "statutory nuisance"[30]. The regulatory horizon has therefore become one dominated by reducing noise since then, but what we fill the void created by this work is less clear, except for the perceived ideal of silence perhaps.

These days with planning policy supporting a drive to approve and stimulate the building of more housing and over 82% of people live in urban settlements in the UK, and the trend is rising [31]. Society faces a problem because of this trend, and the challenge is what needs to be done to avoid the creep of residents into existing vibrant areas resulting in residents complaining and secure regulatory interventions that ultimately making the area quieter and potentially killing the vibrancy that was valued. This is a balance which needs to be found to achieve sustainable communities, but which requires the counter measure to noise (i.e. sound which has value) to be defined.

2.1.4 Silence

The Oxford English dictionary described Silence as *"Completed absence of sound",* from the middle English and old French Latin *"silentium*". It is in reality difficult to achieve, and perhaps as much a state of self as a thing that is not heard. The absence of sound can be experienced when spending time in an anechoic chamber, but this is anything but silent as the body becomes the noise source.

This idea is illustrated artistically by the musician John Cage, and his piece four minutes and thirty three seconds, composed in 1952 [32]. The score has three movements of not playing instruments, revealing the sounds of the environment in which the performance is located, and that of the audience. It is known as 4'33" of silence, but in fact is simply the absence of music, filled by other sound.

This ability to survey the environment for activity, using the ability to detect sound against a background of natural sound, was essential for our survival of early humans, seeking to keep safe in our habitats and in the dark. This is the world in which we evolved as mammals, and in which we developed our ability to rely on sound for threat detection relies on our ability to hear the threat. In today's world we encounter man made noise, which reduces our ability to hear the threats around us clearly. Judging sound distance is a crucial survival skill, whether you're a rabbit or a human [33]. It is therefore a need for us to have what we might perceive as "*silence*" to be able to hear what we need to hear. However, the high levels of background noise in cities cause a degree of auditorily blindness or impairment for humans, causing the need to filter out noise, which increases cognitive load [34]. Silence is the way we can reconnect with the world, and quietening our self-noise is a skill we now recognise in practices such as meditation [35].

It is a matter of physics that energetic silence will not occur until the universe is at an end and all atomic activity stops, and until that time there cannot be true silence in the electromagnetic spectrum. However, sound is restricted to the part of the spectrum where energy can be carried in molecules of gasses as a carrying medium, and be detected by the ear as sound. On that basis silence is limited the concept that a human's is unable to detect sound between 20Hz and 20kHz; with pressure levels that are at least getting down to the minimum audible threshold, in practical terms.

Society perhaps takes silence to mean a more esoteric thing like respite, or peace and quiet, and in today's digital world it is perhaps more important than ever for people to make space to find silence within it.

2.1.5 Desirable Sound

When sound was used in relation to design, and that design supported well the sound of a space the term acoustics is often used as a noun, and requires an adjective to give it life, and describe it as either awful, bad, poor, acceptable, good, great or exceptional. This range allows us it consider what we want.

The word “vibrant” is often used to describe cities with a “buzz” of life, in which sound must play a part, but it is equally useful for colour and visual stimulus, and so more of a broader term to describe a sense of energy. This in itself could be desirable or not, depending on its context and so is not the word we are looking for.

A valued sound is one that is wanted in the environment, and one which might also have positive effects of mental or physical health and well-being. These examples (vibrancy particularly) are as close as we currently get to a single word describing the opposite of noise.

Music is often used as the example of sound that is positive, and desirable, although that is again a matter of judgment by the listener (for example, whether you might like rap or classical). This is unhelpful when trying to find universal language, and even the words used by musicians, in relating to the quality of a sound, are often at odds with those used by acousticians. The language is still developing because of the relatively recent attention to designing for the musician experience, rather than the audience [36].

As such the complex sound field on stage is more focused on the ease of hearing each other (ensemble) and connection with and support of the sound from their own instrument [36]. It is terms like loudness, clarity, intimacy, reverberation that are perhaps more focused on the audience, and mean something slightly different to musicians, who do not experience the sound in the same blended way. This illustrates the need to continue to evolve the language that we use, to correctly communicate the phenomena that is being experienced. The collision of types of sound requires a new way of thinking, as Schulte-Fortkamp [37] recognizes in her paper, suggesting that *“Soundscape is a paradigm shift in the area of noise and noise control*”.

2.2 ISO Standard on Soundscape

The ISO standard 12913-1 :2014 Acoustics Soundscape Part 1 : Definition and conceptual framework has begun to identify a suite of words that can be used in a standardised palate of subjective terminology, in relation to the subject of soundscape; which is defined as the acoustic environment as perceived or experienced and/or understood by people, in context.

ISO 12913-2: 2018, introduces the indicators which can be used to describe a soundscape, as sound source taxonomy, separated into type of place (i.e. urban, rural, wilderness, underwater), type of sound sources (i.e. technology, nature or human beings) and sound sources (i.e. footsteps, motorized vehicle). However, it is careful to create a common framework, but not to prescribe a value judgement or connotation to the sound. It starts from the premise of human perception and then applies physical measurements to objectively quantify the soundscape.

Certain psychoacoustic measurements like loudness, sharpness, roughness, tonality and fluctuation strength were used as well as acoustic parameters like $L_{Aeq,T}$, $L_{Ceq,T}$ and Loudness exceeded for 5% of time ($L_{AF5,T}$) and Loudness exceeded for 95% ($L_{AF95,T}$), root mean cubed loudness N_{rmc}.

This does not tackle the missing link, which asks “*what makes a soundscape that has value, or high quality?”*

As part of the questionnaire method A in part 2 touches on “Perceived affective quality” 8 point response scale is used, rating from strongly agree to strongly disagree:

1. Pleasant, 2. Chaotic, 3. Vibrant, 4.Uneventful, 5.Calm, 6.Annoying, 7.Eventful,
8. Monotonous

This was followed in part 3 by the assessment of the surrounding sound environment, which was rated as a 5 point scale from “very good”, “good”, “neither good nor bad”, “bad” or “very bad”.

The questionnaire in part 4 relates to an overall appropriateness of the soundscape as a 5 point scale from “not at all”, “slightly”, “moderately”, “very” or “perfectly”.

There seems to be missing a link between what response to the 8 scales makes the quality good, but it might be the case that sound that is rated as strongly pleasant and vibrant might improve quality of the soundscape; whilst one that is strongly not pleasant , strongly chaotic, strongly vibrant, strongly not uneventful, strongly not calm, strongly annoying, strongly monotonous might be described as “noise”.

It might be considered then if a good to very good quality could be identified that a subjectively good or very good soundscape that is rated as very or perfectly appropriate would then justify being identified as a soundcape with high value, and for which there is currently no one descriptor;

As just demonstrated this needs simplifying. It appears that the framework for assessment now exists, but the language does not yet.

3 CANDIDATES

3.1 Euphony

Euphony is from the Greek word *euphōnia,* which is from *euphōnos* meaning *“well sounding”* or in Chinese 諧音.

The dictionary definition of Euphony is a description as the quality of being *“pleasing to the ear*” [38]. It is used mainly in relation to poetry and language, indicating a degree of harmony has been achieved. It is almost referred to as a rule in relation to language and the way the sounds of the vowels and consonants mix.

The opposite word is the far more familiar “cacophony”, meaning a harsh or discordant sound. It is helpful to have understanding of the balance in terms. Given the close relationship between noise and cacophony the parallels with valued sound are therefore enticing for Euphony, if it has a broad enough meaning.

Euphony has also been closely linked with music, and the harmonious blending of the sound from instruments [39]. Symphony is a more musically associated term, addressing the blend of music, by Euphony offered the additional sentiment that the blend is a desirable one.

It also links to a group of words that we know well, and relate to sound. A foundation class pupil of 4 to 5 year old will have a good idea of what a “phonic” is, and the sound of letters becomes an important building block for why Euphony makes good sense. The phonic identity of Paley Park is the term used by Rehan in his soundscaping work [9]. The word Euphoric also is widely understood to mean a good feeling, so Euphonic fits neatly into the family of familiar words with which both the public and our profession are likely to have some degree of comfort around using and being understood by the public.

3.2 Mellifluous

This word originates from a link with bees, and means “yielding or producing of honey” or *“pleasant to listen to”*. It actually comes from the Greek mythology relating to Mellisa the nymph, who discovered that one could eat the smooth sweet substance that bees make, known then as “*meli*” and now as honey. Honeybees take their scientific genus name for the most common species of bee, which is the European or western honey bee, and is called Apis Melliffera.

Whilst perhaps more connected to the idea of a sound being so melodious as to be smooth as honey is appealing, but not perhaps broad enough in its meaning to be a serious contender.

3.3 Susurration

This word means “whispering or rustling”, and the susurration of the river was smooth and calming. This onomatopoeic word is perhaps more suited to a category of sound that might be considered to be more related to tranquillity, but this is therefore worth including as a candidate to expand our palette and choice when our profession describes valued sound that fits this meaning[40].

3.4 Canorous

Meaning melodious or resonant, and relates to song or speech primarily [41].

3.5 Sonorous

This relates to the voice, and means capable of a deep and ringing sound, which also extends to meaning a majestic and thunderous sound of high volume; such as a sonorous waterfall that can be heard from a considerable distance [42].

3.6 Tintinnabulation

Is a “tinkling sound, as of a bell or of breaking glass” or the “ringing of bells”[43].

3.7 Summary of Candidates

In table 1 as three candidates for use to represent positive sound, with comments as to their strengths and limitations.

Candidate Word for sound of value	Comments	Opposite words
Euphony	This meaning focuses on the quality of sound could apply broadly where it is pleasing to the listener, whether vocal, musical or natural	Cacophony, Noise
Mellifluous	The word means a flowing quality, quiet and gentle to the ears, but this provided too much expectation of the character of the sound, rather than a quality that could be apply to all sound.	Deafening, loud, blaring, discordant, tumult, harsh
Susurration	Specific to a quiet or gentle murmuring or calming and indistinct sound which would be suited to association with tranquillity	Catastrophe, effervescent, roar
Canorous	Meaning a melodious vocal sound, which is quite and focussed on voice	Dissonant, discordant, tuneless
Sonorous	A deep ringing full-bodied sound of high level, caused by the source, usually a voice but not always	Thin, gentle, low, soft
Tintinnabulation	Tinkling sound, jingle or chime, generally restricted to the sound of bells, but can be used to describe similar type of sound characteristics	Calm, order, peace, quiet, harmonious, mellifluousness

Table 1: Summary of candidate words and comments

It is from this selection that Euphony emerges as a good fit with the requirement of being broadly applicable, beyond speech, to a quality of value of a sound in general.

Its historical link to Greek also provides a good connection with the word acoustics, and this is the candidate that is recommended for adoption into common use. The other candidates are rarely used, but can offer a further palate to expand the subjective language around describing the quality of a sound without it simply described as being pleasant.

4 CONCLUSION

The language used to describe acoustics is incomplete and evolving, and there has been no single word for sound that has value adopted within technical and common language in English. The tendency for acousticians to control sound, for the purpose of reducing noise, has been a key driver since the industrial revolution. However, the emergence of soundscaping has prompted a need to consider in closer detail how we now describe sound that has value.

This paper explores how the language of sound began appearing in written reports over 2600 years ago, where describing the unwanted effects were plentiful. Also the effect of spaces on sound, in what we now call acoustics, also developed. The Greek word "*Euphony*" has emerged as a suitable word for that purpose of describing sound that is pleasing to the ear. It is concluded that this is an appropriate word to apply to all sounds, including music, manmade and natural sound, as perceived by the listener.

Euphony is recommended for wider adoption and it is hoped that application of it will provide a suitable descriptor on which the field of soundscaping can evolve to balance and act to some degree as an antidote to concept of noise, and encourage a shift of focus to design that includes Euphonic sound.

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