

Article

# How Did 19th-Century Alphorns Sound? A Reconstruction Based on Written Accounts of Its Musical Timbre

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**Abstract:** This paper reconstructs the sound of 19th-century alphorns based on contemporary written descriptions, which allows for a better understanding of literature and compositions that quoted and imitated the alphorn throughout the 19th century. In the absence of sound recordings, historical documents and literary sources provide valuable insights into the timbre of these traditional Alpine instruments. The research examines descriptions from 19th-century texts, comparing them with modern understandings of musical timbre. By analyzing the language used to describe the alphorn's sound, the study identifies recurring descriptors and contextualizes them within the broader acoustic environment, including the influence of natural sounds like waterfalls and echoes. Historical sources reveal a complex perception of the alphorn's timbre, described in terms of its resemblance to muted trumpets and a blend of brass and woodwind qualities. Authors such as Hermann Alexander von Berlepsch and François-Joseph Fétis provided detailed accounts, noting contrasting characteristics like "rough", "soft", "sharp", and "melodious", which varied with the listener's distance from the instrument. These descriptions highlight the alphorn's unique sound profile, distinct from modern perceptions that emphasize a warmer, fuller timbre. The findings underscore the importance of considering ecological and psychoacoustic contexts in the study of historical musical instruments.

**Keywords:** alphorn; literature; music



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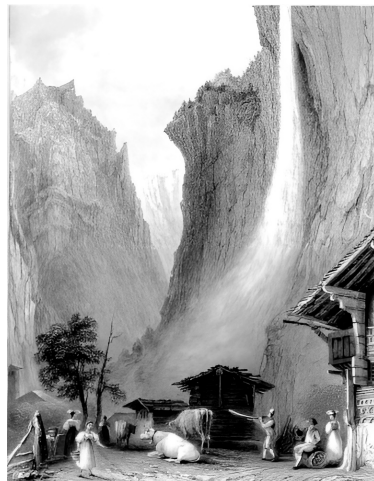
## 1. Introduction

Can we reconstruct a picture of how a historical musical instrument sounded from the descriptions of contemporary observers? If successful, such a reconstruction may not only inform historical musical practice but also our understanding of literature and compositions that quoted and imitated the alphorn (Figure 1) throughout the 19th century.

Historical developments in musical tradition have been at the center of various research initiatives (McCollum and Hebert 2014; Ziegler et al. 2017; Ziegler 2010). Exploring musical change necessitates analyzing its causes, characteristics, and extent across different levels. This involves studying alterations in specific pieces or broader musical collections, tracking a single song's variations, evaluating changes in cultural or structural contexts, and quantifying the pace of these shifts within whole repertoires (Nettl 1958). Within this field, the reconstruction of instruments from historical sources is an area that has been the subject of lively research in recent years (Fang 2023; Rodà et al. 2021; Serafin and De Götzen 2009; Bellia 2019). In addition, the evaluation of the timbre of instruments by means of test playing them and measurements of audio recordings have gained attention (Haverkamp 2022a, 2022b; Kouroupetroglou et al. 2021).

Timbre is still today one of the less studied components of music (Dolan and Rehding 2018). There is no direct single measure for timbre; instead, timbre research relies on the psychoacoustic impression that is verbalized (Saitis and Weinzierl 2019). The challenge in studying timbre is further compounded by its dynamic nature; the timbre of an instrument or voice can change significantly with variations in playing technique, making it a

moving target for analysis. In the present case of the alphorn, the question of how musical instruments sounded in a period before sound recording technology is driven by several motivations. It contributes to the understanding of the musical tradition itself. Timbre can be characteristic of a single instrument or sound source, as well as of a group, such as a band, ensemble, or orchestra. It may also define the distinctive quality of a specific song or an entire musical genre (Chong and Sourin 2023, p. 193). Secondly, it provides an understanding of what authors meant when they mentioned the sound of the alphorn in their compositions, literary works, and travelogues. Beyond these aims, the present study aims to provide tools for the further examination of musical developments based on written ethnographic sources.



**Figure 1.** Alphorn player below the Staubbach waterfall in the Lauterbrunnen Valley, the canton of Bern, Switzerland (anonymous etching, 1834). What did travelers hear when they encountered such scenery?

The reconstruction of the sound of historical instruments poses various challenges. Even given access to exceptionally well conserved instruments, it remains unknown how the instrument was played, which techniques were used, and what musical aesthetic ideals defined the performance. In some cases, we find that a core material part of the instrument can be reliably reconstructed based on the source material, but information on important details of sound production is missing, such as drumsticks in the case of percussion, tools used to pluck strings, or in the present case, the mouthpieces, which influence the timbre significantly. For these reasons, it is worth examining the question of sound not exclusively on the basis of surviving artifacts but using alternative approaches, which, in the present case, involves the evaluation of written sources.

## 2. Framework for the Study of the Alphorn in the 19th Century

Various composers from this era incorporated an alphorn motif into their compositions, expecting it to be recognizable to their listeners. This suggests that, at the time, audiences were familiar with the sound of the alphorn, or rather the idea thereof. Over time, this familiarity has evolved. For example, Jones (2020, p. 353) assumes that while 18th-century audiences might have recognized the alphorn's sound from its use by local herdsmen, 19th-century listeners might have learned about the instrument from literary sources. The interest of the educated public and artists of the 19th century in the alphorn marks one motivation for a focus on this period. Starting in 1910, an organized promotion of the instrument took hold in Switzerland, leading to more information on how the alphorn was supposed to sound, although the emerging recording technology was only used to record alphorn music from the 1930s onwards. Relatively soon thereafter, today's type of the instrument was constructed by one of the few semi-professional alphorn makers, Adolph Oberli (1879–1972). We can therefore limit the timeframe of the study to the period

between the emergence of written observations about the sound of alphorns in the early 19th century and the standardization that has its roots in the year 1910.

As the alphorn inspired numerous compositions in the 19th century, it raises the question of the sounding reality and experience that influenced this trend. Surviving instruments from this period provide insights into the horn's size and scale. However, dating historical alphorns is challenging, and sounding them is often not possible due to potential minor damage or cracks that can significantly alter the sound. Additionally, there is limited knowledge about how they were played by their original owners. In romantic works, composers often sought pastoral, arcadian melodies expressed through the alphorn, drawing on rare transcriptions and recordings from the Alpine region, mainly found in travelogues. The educated bourgeoisie's growing awareness and demand for detailed knowledge about musical traditions in the Alps spurred an interest in more comprehensive texts about the alphorn, notably, François-Joseph Fétis' (1784–1871) treatise published in 1827.

There are plenty of myths surrounding the alphorn, and we know little about its music in history before the popularization of the instrument in the 20th century. The few transcriptions that have been made of alphorn music in the past have been analyzed in depth by researchers in recent years (Ammann et al. 2023; Sommer 2013; Jones 2020, 2023). However, the musical scores provide only a narrow slice of information on actual performances, and conventional musical notation focuses on the representation of pitch and rhythm, not on timbre. Yet timbre, next to the intonation of the harmonic overtones, appears as the characteristic feature of the alphorn in the ears of the listener. Today's alphorn timbre contributes to the popularity of the instrument, as performers describe a familiar phenomenon: the sound of the alphorn pleases the ears of listeners who before had no interest in traditional Alpine music. Before the 19th century, the sources for the sound of alphorns are too scarce to paint a comprehensive picture. They account for interesting aspects such as the build of the instrument and its uses in very different functions, but we lack detailed descriptions of its timbre, which will follow in the 19th-century treatises discussed below.

A precise organological definition of the alphorn is all but impossible, as there were no standards for alphorn construction before the 20th century. There are, however, defining elements that shape the organological boundaries. The horns were made individually and generally without any claim to comparability or even the same tuning or similar sound. This means that we find a variety of alphorn types and cannot assume a single acoustic characteristic. The term "alphorn" has been used differently and with varying scopes by different authors of past studies on its history and ethnography (Sommer 2013; Vignau 2013; Böhringer 2015). I refer to the description used in recent ethnomusicological research on the alphorn by Ammann et al. (2023, p. 21), which "subsumes under the term alphorn wooden natural trumpets without valves or slides, whose cultural background lies in the Alpine region. [...] Natural trumpets of urban or courtly origin are not included". Alphorns are related to but distinguished from horns made from animals, the Gemshorn (for a reconstruction, see Fitzpatrick 1972), oxborns, as well as oliphants, short, curved signaling instruments (Ammann et al. 2023). The main difference to these lies in the length of the air column. The short animal horns are suitable for producing a single pitch, but they are too short for overblowing into the octave. On the longer wooden trumpets—in the 19th century, these instruments tended to be circa two meters long—melodies up to the 12th note of the harmonic series were possible (Ammann et al. 2023). This means that short horns were more likely to be used as signal instruments, while the long shepherd's horns were likely intended for melodic music (otherwise, the large build would not serve any obvious use).

Based on the empirical study of alphorn iconographies (Wey and Kammermann 2020) and the measurements of alphorns in museums that likely date to the 19th century (Ammann et al. 2023), the alphorns of the 19th century were shorter and thinner than the later, standardized form. The likely outcome of this is a sound perceived as narrower, sharper, and softer in comparison with today's instruments. This, however, represents the general tendency

and not the variety of individually crafted specimens. The alphorns measured by [Wey and Kammermann \(2020\)](#) range in length from under one meter to over four meters, illustrating the diversity in the construction methods during a period without standardized designs or norms. In future research, it would be valuable to explore instruments preserved in museums that most closely replicate the sound of 19th-century alphorns. While identifying the age of instruments may present challenges, this endeavor could provide important insights into the acoustic properties of alphorns from this period. These findings could then be compared to the present analysis of textual sources.

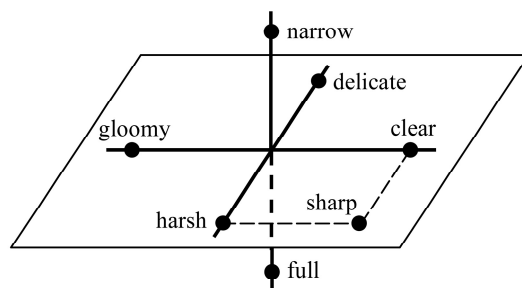
### 3. Verbal Description of Musical Timbre

The sound of an instrument changes due to various factors, which can be categorized into material influences and the methods of playing them. Material factors include the raw materials from which the instrument is made, its shape, and the craftsmanship involved. Components that come into direct contact with the player, such as mouthpieces in the case of labrosones, have a particularly strong influence. Notably, there are no known 19th-century alphorns with original mouthpieces, making it impractical to recreate the sounds of preserved artifacts accurately. The way an instrument is played also affects its sound, influenced by the player's intention and musical aesthetic ideals. These performative factors are especially challenging to analyze in the historical context of orally transmitted music, as there is no written information from the players themselves.

When approaching the phenomenon of timbre through language, researchers use terms referred to as verbal descriptors of timbre ([Štěpánek 2006](#); [Abeles 1979](#)). Verbal descriptors for musical timbre are words or phrases used to describe the tone quality or color of a musical sound. Timbral qualities of sounds are often not only conceptualized and communicated through sensory attributes from different modalities (such as bright, warm, sweet) but also using onomatopoeic attributes (ringing, buzzing, shrill) or attributes related to abstract constructs (rich, complex, harsh) ([Saitis and Weinzierl 2019](#), p. 119). In music psychology studies, sample groups of test listeners are asked to rate or describe prerecorded sounds. In the historical context, we cannot ask the listeners directly but can analyze existing written statements for their descriptions of the sound.

The evaluation of written historical sources for the description of timbre has been applied in a few relatively recent studies, not in the field of traditional music, but in the history of orchestration. Such an approach, used by [Wallmark \(2019\)](#), applies corpus linguistics to analyze 11 orchestration treatises, uncovering a limited but systematic vocabulary for describing musical timbre. [Noble et al. \(2020\)](#) conducted a statistical analysis of semantics used to describe timbre in six orchestration treatises. These corpus studies are based on Western art music. A challenge for the description of instruments from orally transmitted musical traditions is the fact that the written evidence for them is much rarer, and that a large amount of data cannot be collected and the few sources at hand must be read and interpreted more closely. We therefore attempt to reconcile the few descriptive sources with the interpretations of the observers by evaluating not only the verbal descriptions of timbre themselves but also the context in which they are used and the comparisons that are made with them.

A meta-analysis of verbal descriptors in the study of timbre by [Carron et al. \(2017\)](#) will be used for comparison with the descriptions found in reports about the sound of alphorns. Carron et al. conducted a quantitative survey of the occurrence of timbral descriptors in 54 studies, and they selected words with more than five occurrences for inclusion in the inventory, resulting in a list of 59 words ([Carron et al. 2017](#), p. 95). The collection of descriptions should then be organized thoughtfully, for which there are several models. Based on listening tests, [Štěpánek \(2006](#), p. 124) identified a three-dimensional common perceptual space as the optimal model for a nearly orthogonal system of verbal attributes with the three dimensions: gloomy/dark–clear/bright; harsh/rough–delicate; and full/wide–narrow (Figure 2).



**Figure 2.** Three-dimensional perceptual space for verbal attributes of timbre by Štěpánek (2006, p. 125). Axes: gloomy/dark–clear/bright; harsh/rough–delicate; full/wide–narrow. The common verbal descriptor “sharp” is localized in the space.

#### 4. Evaluation of Descriptions for Alphorn Timbre in 19-Century Sources

The ensuing survey and discussion draw upon 19th century writings that document and analyze the alphorn’s sounding characteristics. Among the sources that report on the alphorn, there are relatively few that contain evaluable descriptions of the sound. A total of 45 texts were analyzed, 7 of which provide such content.

Various writings from the late 19th century refer mainly to Szadrowsky and Berlepsch and reiterate their descriptions. These derivations either become clear from the wording or are explicitly stated by the authors, like in the case of Senn-Barbieux (1870). For this reason, it is not necessary to list the duplicating descriptions in all the treatises available, and duplications are omitted in Table 1, which lists only the original authors. The extensive descriptions of the first two authors mentioned are revealing because they are probably largely first-hand information and impressions. The descriptions of the sound by Berlepsch and Szadrowsky do not appear in older treatises, apart from the passages in which they refer to the Bernese professor of philosophy Johann Rudolf Wyss (1781–1830), who wrote a passage on the alphorn for the introduction of a collection of folk songs in 1818.

**Table 1.** Verbal descriptors for the sound of alphorns in 19th-century publications. An asterisk (\*) marks descriptors mentioned in more than one text on the alphorn; a cross (†) stands for coincidences with Carron et al.’s (2017, p. 97) list of frequently used descriptors in timbre studies.

German	English	Publication
Sehnsuchtsvoll	Longingly	(Berlepsch 1861)
Mächtig ausbreitend	Powerfully spreading	(Berlepsch 1861)
Schmerzlich	Painful	(Berlepsch 1861)
Heiseres Gestöhn	Hoarse moaning	(Berlepsch 1861)
Glänzend/glanzvoll/brilliant *	Brilliant *,†	(Berlepsch 1861; Weber 1881; Szadrowsky 1868)
Klangvoll	Sonorous	(Berlepsch 1861)
Hell	Bright	(Berlepsch 1861)
Vibrierend	Vibrating	(Berlepsch 1861)
Berauscht/berauschend	Ecstatic *	(Berlepsch 1861; Weber 1881)
Entzückt	Enraptured	(Berlepsch 1861)
Rauh †,*	Rough †,*	(Berlepsch 1861; Fétis 1827)
Unangenehm	Unpleasant	(Berlepsch 1861)
Weich *,†	Soft *,†	(Berlepsch 1861; Fétis 1827)
Gedämpft *	Muted *	(Berlepsch 1861; Wyss 1818)
Markiert	Marked	(Berlepsch 1861)
Zart	Tender	(Berlepsch 1861; Weber 1881, p. 181)
Eigentümlich *	Peculiar *	(Berlepsch 1861; Szadrowsky 1868, p. 301)
Scharf *,†	Sharp *,†	(Berlepsch 1861; Wyss 1818)
Gewaltig *	Powerful *,†	(Berlepsch 1861; Szadrowsky 1868)
fein	Subtle	(Berlepsch 1861)

Table 1. Cont.

German	English	Publication
Melancholisch–düster	Melancholic–dark	(Berlepsch 1861)
Bedeckt	Covered	(Berlepsch 1861)
Umflort	Enflowered	(Berlepsch 1861)
Wunderbar-eigentümlich	Wonderful–uniquely plaintive	(Berlepsch 1861)
Klagend		
Spitzig	Pointy	(Wyss 1818, p. XV)
Rund	Round †	(Wyss 1818, p. XV)
Angenehm *	Pleasant *	(Wyss 1818, p. XV; Fétis 1827)
Hart	Hard	(Fétis 1827)
Berauschend	Heady	(Weber 1881)
Unvergleichlich schön	Beautiful beyond comparison	(Szadrowsky 1868)

The most detailed description of alphorn music in the 19th century was written by the bookseller and publisher Hermann Alexander von Berlepsch (1814–1883). Berlepsch fled from Erfurt in Germany to Switzerland after the revolution of 1848 and found employment in Zurich, where he wrote and published on Alpine ethnography and culture in the following years. In his monograph *Die Alpen in Natur- und Lebensbildern* (*The Alps in Pictures of Nature and Life*), he dedicates a full chapter to the alphorn. This occupies an interesting position in the literature on the instrument primarily because the sound is described in unprecedented detail. Berlepsch (1861, p. 354) first categorizes the sound as follows: “The general character of the alphorn sound comes closest to that of a somewhat muted, large trumpet, but does not allow any specific comparison with the existing instruments”. The comparison with a muted trumpet is a very concrete statement, but it needs to be contextualized historically. Trumpets and their mutes were very diverse in the 19th century. The development of brass instruments at that time was often rapid and ramified, and new inventions such as mutes were not unusual, quickly came into fashion, and were forgotten again (Ahrens 2007; Weiner 2016). What did the authors in the 1860s and 1870s mean by this term, and what sound did they have in mind?

Based on the year of publication, 1861, which was probably not planned much earlier due to Berlepsch’s forced migration, it was already a valve trumpet. These instruments, which are organologically less similar to the alphorn than the natural trumpet, were constructed and patented in the 1820s and were widely used in the 1840s and 1850s, whether in opera orchestras, military music, or civilian brass bands. However, these trumpets existed in different tunings and therefore in different sizes. The “large” ones were most likely valve trumpets in F or E flat. These were around one and a half times larger than the equally common trumpets in Bb, C, or A. Due to their cumbersome nature and the high demands placed on the players, they were hardly ever produced in the 20th century and have now disappeared from the musical landscape, except for a few historical performances. Compared to the valve trumpet used today, they sound duller, the sound is not as straightforward, and they are prone to false notes, as the natural tones are close together—just like those of the alphorn. The length of the tubes of these “large trumpets” was approximately 1.8 m, half as long as that of the alphorn in common use today and corresponding to the lengths of many alphorns depicted on illustrations from the early 19th century (Wey and Kammermann 2020). Berlepsch further specifies that the sound is similar to that of the “muted” trumpet. We can understand this to mean that it was duller and softer than without mute—acoustically speaking, this means that the high formant range is less strong than that of a (unmuted) trumpet. The typically radiant sound of the trumpet therefore does not emerge. The comparison is qualified by the addition that the sound of the alphorn cannot be equated with any other existing instrument, with Berlepsch subsequently describing it as having the “metallic tone” of the trumpet and the “softness and fullness” of a “good clarinet”.

The special timbres of muted brass were increasingly exploited by later nineteenth-century composers (Herbert et al. 2019, p. 289); therefore, the timbre of the kind of mutes in use became known to a broader public. Mutes were used in funeral contexts, and according to Wallace and McGrattan (2012, p. 52), composers increasingly embedded the sonority of muted trumpets in their orchestral writing. Mutes for horns often found use in the romantic depiction of the natural environment by imitating an echo (Scott 2018). In orchestral and opera music, mutes functioned to mask and distort sounds in order to appear afar or uncanny (Hentschel 2019, p. 47). Only a few years after Berlepsch' account, Heinrich Szadowsky (1828–1878) published a long article on the alphorn and described the sound in a short paragraph, situating it between that of brass and woodwind instruments: “The sharp, piercing, blaring trumpet sound is softened by the body of the instrument—by the vibrations of the wood fibers; the fullness and brilliance of the sound is given a certain softness” (Szadowsky 1868, p. 301). Other writers have described the sound of the alphorn in less rich detail. Table 1 lists all the descriptors in various treatises from the 19th century that describe the alphorn in detail and contain presumably original accounts of its music.

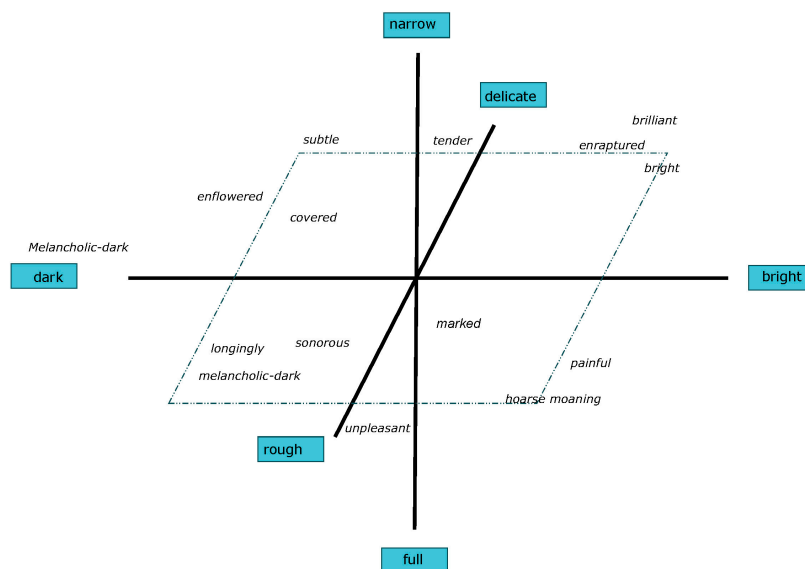
Reading the list in Table 1, it becomes apparent that the timbre of the alphorn was not perceived in a uniform way, and that many of the descriptors can be associated with positive or negative statements about the listening experience. Apparently well acquainted with the realities of playing practice, Berlepsch writes that the notes in the middle register are used above all, as these are the easiest to play, and that “the timbre is the most beautiful” (Berlepsch 1861, p. 355). This exalting description is harshly contrasted by other attributes with negative connotations: he sometimes speaks of a “rough” and “unpleasant” sound, a “painful” auditory impression, and even of “hoarse moaning”. Berlepsch is not alone in describing them in uncomfortable-sounding terms. Various observers have also made disparaging remarks about the sound of the alphorn or lamented the state of the time. From the turn of the 20th century, we have a description by Alfred Leonz Gassmann (1876–1962) (reproduced in Gassmann 1948, p. 293) that the few alphorn players active at the time could be heard “croaking and grunting”. At that time, “at sunrise on Rigikulm and Pilatus and during the day at the much-visited waterfalls of the Bernese Oberland, older wind players produced *dubious fragments* of traditional tunes” (Gassmann 1948, p. 293, emphasis added). The often rather astonished wondering and vivid descriptions of travelers in the Alps gives way to a critical view, with a pre-formed listening expectation.

## 5. Individuum est Ineffabile

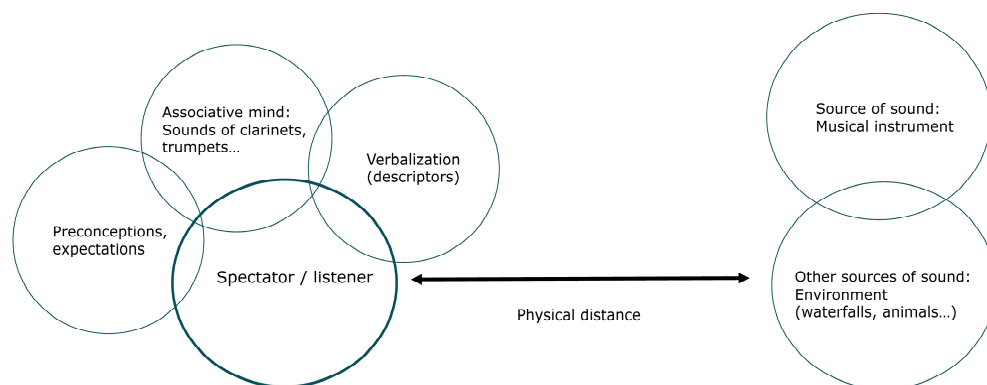
If we fit a sample of the timbral descriptors from Table 1 to the three-dimensional perceptual space for the verbal attributes of timbre by Štěpánek (2006), we find that they spread out over the various dimensions (Figure 3). This fitting is of course subject to individual perceptions and linguistic association, yet it conveys in an obvious way that the instrumental timbre is not perceived in one clear direction in this perceptual framework.

What does it mean that the sound from the same musical source is perceived in such different semantic terms? Interestingly, we find passages where the author describes the timbre of the alphorn with contrasting attributes. Fétis designates a different perception depending on the position of the listener: “The sound it produces sounds hard and rough when you hear it too close, but from a distance the same sound is soft and very pleasant” (Fétis 1827, p. 429, emphasis added).

The exploration of the sound experienced by observers therefore has to extend beyond the instrument merely as a source of sound. Music unfolds not in a sterile environment but within an ecosystem that includes the surroundings of both the player and the listener. The positioning and interplay of these elements is crucial. It has been found that the distance from the sound source significantly alters perception. From afar, the alphorn's notes may evoke feelings of longing, freedom, and vastness, yet, when heard up close, the same sounds can seem hoarse, unpleasant, and piercing. The situation of the spectator and the process of the perception of the sound forming the source of the verbalized description is shown in Figure 4.



**Figure 3.** Sample of timbral descriptors from 19th century literature fitted to the three-dimensional perceptual space for verbal attributes of timbre by Štěpánek (2006).



**Figure 4.** Setting for the perception of music in cases of alphorn encounters such as described by Berlepsch, Fétis, and others.

### 6. Embedded in Environmental Sounds

To capture the sonic scene, other objects that sounded together with the alphorn are considered in the corresponding passages from the same writers. A complementing sound, which appears in several historical reports, is that of water. The ethnographic literature suggests that local people did not conceive of water as a purely noisy murmur but as being underlaid with a musical harmony, the waterfalls emanating a spectral sound (Wey 2019, p. 82; Ammann 2021). In such a context, we must not think of harmony as a construct of several fixed pitches but as a field of timbre, a composition of overtones or vibrations. These were then transferred in various experiments into a pitch system with conventional musical transcription. From our perspective today, we tend to understand this metaphorically, as bodies of water per se do not produce acoustically measurable chords like vibrating strings or columns of air. At the same time, we must avoid treating the scientific reflections on the harmonic structures of waterfalls and other bodies of water in the Alpine region, particularly in the 19th century, as merely a curiosity of their time. The motivations behind these theories could only grow if there was already a traditional awareness of the sonority of water and an observable musical practice of the interplay between the musical instrument and the naturally existing sounding source of the waterfall or mountain stream, for example. The academic study of this question peaked with a scientific article by the geologist Albert Heim, geologist at the Federal Institute of Technology in Zurich, entitled



“sounds of the waterfalls” (Heim 1873). Alfred Leonz Gassmann, to whom we owe several valuable first-hand observations about alphorn playing in the late 19th century, was himself a firm believer in the idea that the sound of waterfalls interacted with instrumental and vocal music. However, he went even further and saw the sounds of waterfalls as the basis of the traditional tonal system in the Alpine region. Gassmann contemplates that the omnipresent noise became so ingrained in people’s hearing that they based their singing on it and constructed their instruments in such a way that they sounded in tonal harmony with the water. The idea of embedding music in environmental sounds, however, is a reference to the timbre of these sounds, not the pitches. Gassmann undertook excursions to determine the tonality of bodies of water. In 1937, he published his autobiography and list of works entitled “A 60-year-old as a successful, popular Swiss composer”. The cover picture shows him standing by a mountain river in an attentive pose with his head slightly tilted upwards, listening attentively to the waters. The caption reads, “On a search for folk songs in primeval Switzerland. Finding the water harmony of the Göschener Reuss”. Listening to the harmony of the water was therefore also part of the search for and collection of folk songs. We can assume that the sound of the river formed a tonality in the listener’s perception over time.

A second element indispensable for the analysis of the sonic environment of alphorn experiences is echo. The elements described—rushing water and echo—were already known to a learned audience. Many discovered their interest in the Alps through the poem “The Alps” by Albrecht von Haller (1708–1777) that remained a classic throughout the 19th century. Haller’s quote from “The Alps” calls both elements together: “But he sits down by a waterfall/And calls with his horn to the loud echo” (von Haller 1987). The drone-like noise and the reverberation of the echo from the wall together create a dome of sound that fills the room and leaves no gap. In the horizontal, temporal axis, they fill the room completely, pauses in playing are filled by echo and noise, and vertically, too, a complex layering is created, consisting of intoned pitches of the alphorn mixed with previous overtones. In a scene where both echo and waterfalls come into play, the latter will add a sort of bourdon drone to the harmonic chords and melodies. Regarding the interplay of the timbres, it makes no elementary difference whether this is identified as toneless noise or as an imagined three- or four-note chord because in the spectral space, noises have an effect in any case (the basis of the timbre is the overtone spectrum plus transient noises). In the case of the Alpine soundscape, the harmony with sources from the environment can be understood as a form of polyphony (Wey, forthcoming; touched upon already by Hoerbuerger 1964). Berlepsch (1861, p. 155) not only discusses the effect of echo but also, more broadly, the entire influence of the extensive mountain landscape, and he points out the lack of scientific understanding of this phenomenon: “A particular peculiarity in the high mountain environment regarding our instrument is that certain rock walls and underlying valleys or forested rock formations reproduce the sound of the alphorn in a very peculiar way. Unfortunately, physics has not yet brought the resonance of the mountain walls for the sound, the difference of the sound against this or that rock wall, or an echo-producing area enclosed by rock walls into the circle of its studies so precisely that laws could be established as in the field of musical instruments and their acoustic effects”.

## 7. Conclusions

A systematic approach to timbre description is explored through the eyes of contemporary observers, revealing a consistent yet limited set of descriptors that transcend simple sensory language to include affective and onomatopoeic attributes. Historical descriptions of the alphorn, notably by Fétis (1827), Szadrowsky (1868), and Berlepsch (1861), provide qualitative data that offer insights into the historical perception of its timbre. These descriptions, ranging from comparisons to other, commonly known instruments to the emotional impact of its sound, underscore the complexity of timbral perception and its verbal articulation.

The approach presented holds potential for future research on the timbres of historical instruments in their environments, broadening the scope of analysis from the sound produced directly by the instrument to its ecological and social surroundings. The evaluation of the scenes described in the literature places the instrument in its ecological context and the listeners in their respective subjective psychoacoustic contexts. A collection of verbal descriptors for timbre can thereby serve as a compass for different expressions and sensations. If we summarize the verbal descriptions, a broad spectrum of sound impressions emerges. However, tendencies can be discerned that differ from today's perception of the instrument: the sound is often described in terms of a narrow and sharp timbre, which contrasts the voluminous, warm sound that current-day alphorns are known for.

In addition to recording descriptors and recognizing their broad spectrum, the evaluated treatises also contain explanations that provide better insights through concrete comparisons and contextual information. A comparison with another musical instrument is the most concrete way to describe the sound. The specific association with a "muted trumpet" tells us that the sound apparently was darker, muffled, and less piercing than that of trumpets. This is also reflected in the localization between brass and woodwind instruments. The similarity to the known timbres of instruments is a factor in the perception of new, uncommon sounds (Siedenburg 2017, p. 385). The distance between the player and listener is a significant factor in the descriptions of encounters with the alphorn. The position too close to the bell of the instrument makes the sound too direct and penetrating. The sound from the same source is transformed by the acoustic environmental influences of long-distance transmission, reverberation, and damping by obstacles so that it is perceived as melodious from a distance. In the Alpine musical thought of the 19th century, sounds of the environment and those of built musical instruments were not necessarily categorically differentiated. The harmony between waterfall and alphorn is an example of how harmonies or melodies were also sought in works of nature. Of course, this topic requires further investigation of the sources. A comparison between perceptions in different settings and different epochs would require further analysis. From a change in perception in different epochs, we could conclude, on the one hand, that the style of playing and music has changed, and, on the other hand, that listening habits and assessments have changed for social reasons. In future research, it would be valuable to explore instruments preserved in museums that most closely replicate the sound of 19th-century alphorns. While identifying such instruments may present challenges, given that many museums prioritize other types of historical artifacts, this endeavor could provide important insights into the authentic timbre and acoustic properties of alphorns from this period. By analyzing and potentially testing museum-preserved instruments, researchers may be able to better understand the historical soundscape and performance practices associated with these traditional instruments.

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