Introduction

Between February and June of 1975 the World Soundscape Project, with assistance from The Canada Council, undertook to study the soundscape of northern Europe. Our immediate purpose was to obtain data to compare with our first field study *The Vancouver Soundscape*. We decided to concentrate our attention on a selection of villages rather than cities, for although numerous organizations and civic officials in larger centres offered to assist us, the prospect of arriving at intelligent conclusions regarding the complex soundscapes of cities in the brief time at our disposal would have been quite impossible. We were also aware of difficulties involved in even a modest survey of such an elementary soundscape as that of a village, for we would only be able to remain a week or ten days in each location, we had insufficient knowledge of the languages (including dialects) we expected to encounter, and we were only able to carry the minimum amount of equipment to measure our findings objectively. Given these conditions, the study which follows is certainly open to criticism on grounds of accuracy and methodology. No doubt soundscape studies will have to undergo many refinements before it becomes a reliable discipline, but the discoveries leading to improvements in research techniques and methodology will not be made in the laboratories, but only in field studies such as the one described here. Our purpose then, far from being a definitive analysis of the soundscape of northern Europe, is to enquire into the different types, quantities and rhythms of sounds heard in five villages in five countries, and to show the relationship of these sounds to the structure of each village and its life.

Our five villages were Skruv in southern Sweden, Bissingen in southern Germany, Cembra in northern Italy, Lesconil in western France and Dollar in the Lowlands of Scotland. Each village has a population of less than 3,000 inhabitants, and in each,

one social activity or institution is prominent. Thus, Skruv is a relatively modern factory village, Bissingen is an agricultural village, gradually being converted to industrial life, Cembra is an agricultural village with few signs of conversion to industrial life, Lesconil is a fishing village and Dollar is a village revolving about a celebrated school. We expected that by choosing villages with contrasting institutions and social life the differences between them would be more conspicuous.

How did we choose precisely these five villages? Actually, it was no easy matter and although we consulted libraries and talked to numerous natives of each country before and after our arrival there, we simply had no way of knowing for sure whether a particular village would be satisfactory until it had been visited. Thus, numerous places in Sweden were mentioned, all of which proved unsatisfactory, until, after several days of hunting, we happened accidentally to arrive in Skruv and in desperation decided to remain there. Again in Scotland, after two weeks of preliminary research in London libraries had provided us with a long list of what seemed on paper to be perfect sites, days of crisscrossing the country resulted in merely abbreviating the list. After a dozen sites had been rejected, Dollar proved to be suitable. What made a village suitable? First of all, we hoped it would be off a main road, that it would be self-contained and not contiguous with other settlements, that its buildings would be fairly closely grouped so that the soundmaking activities of the village would constitute the largest events in the quiet countryside beyond, that the village would have a strong and cohesive social life – but not so cohesive as to resist curious intruders like ourselves – that it would have a few acoustic signals of distinction, a few unusual vernacular sounds, some good ambiences to record, and a native speaker who knew both the regional dialect and spoke fluent English. These are not features likely to be found in tourist literature or governmental and social studies, hence our difficulties and the reason for so much reconnoitering.

We traveled by Volkswagen bus. At first there were four of us: Howard Broomfield, Peter Huse, Jean Reed and Murray Schafer; then in early March we were joined by Bruce Davis. Space limitations dictated the modest amount of equipment we could take: two tape recorders (a Nagra and a Uher, both stereo), an assortment of microphones, two sound level recorders (B&K) and about 100 reels of recording tape. We stayed about the same length of time in each village (a week to ten days), starting in Skruv in February, followed by Bissingen and Cembra in March, Lesconil in April and Dollar in May. Our findings are undoubtedly affected by the period of the year we visited each site and we returned to none except Skruv, which Bruce Davis visited for a few days in early June.

With limited time and equipment we had to organize our data collection in an efficient manner. The following is a brief list of the things we attempted to accomplish in each village:

- investigate local and regional history
- study local archives for references to sound (town crier, post horns, noise by laws etc.)
- create morphology charts of all significant changes in the soundscape
- record and measure the intensity of all village signals
- draw profile maps for prominent community signals
- record all antique sounds in the village (blacksmith, old tools or artifacts, etc.)
- make extended recordings of characteristic ambiences in each village
- take regular sound level recordings day and night both in and outside the village
- enumerate and measure the frequency of specific types of transportation sounds
- make lists of sounds heard throughout the village at different times of day
- run a Sound Preference Test in the village school(s) in which we ask children to list their favourite and most disliked sounds in the community
- conduct interviews with elderly people concerning the past soundscape of the village
- focus special attention on any unusual features of the soundscape.

As can be imagined, the collection of this type of information made us very conspicuous during our sojourn in each village.

We found the villagers generally much more approachable than we had first imagined, and we were able to get a good deal of information from personal interviews; but our biggest problem was language. Although some of us had fair competence in two or more languages, this was totally insufficient to extract the information we wanted from the villagers, much of which was technical or concerned social activities with which we were unfamiliar, usually delivered in broad dialect. We realized this in our first village, Skruv, but were saved by an accidental meeting with Yngve Wirkander, the church organist and a sensitive naturalist and historian. In the three other continental villages we were fortunate enough to find native speakers in advance, who had both a knowledge of the region and a sympathy for our work. Without Renata Braun in Bissingen, Albert and Birgid Mayr in Cembra and Anny Malroux in Lesconil, we would have been quite lost. We thank them by name. Nameless, but not unthanked, remain the countless citizens and officials who provided facts and information on which this study is based.

I The Five Villages

Skruv

The smallest and most northerly of our five villages is Skruv, situated in Kronoberg County, province of Småland in south-western Sweden. Founded in 1874, it is a relatively new village, having come into existence with the railway. Though not large, the station still seems to dominate the village for it sits at the intersection of the community's three principal roads. The country around Skruv is flat with some farming, although much of the land is covered with evergreen forests.

About seven kilometers to the west of Skruv lies the original community of Ljuder, now nothing more than the parish church and a few high wooden houses. Linked historically, the two locales continue to exchange greetings by means of bells and whistles, plainly heard across the vacant intervening fields.

Skruv is an industrial village, in the heart of Sweden's glass-blowing district, and after its establishment by the railroad, the glassworks became the first source of employment for its citizens, though by the early twentieth century it had also become the home of a brewery. Since that time a number of small industries have moved in: there is a small metal works and a sawmill, and in 1975 a cardboard factory was opened. There had always been a flour mill on the brook which divided the village, though the flour mill now in operation has moved to the edge of town and is no longer powered by water.

Including the community of Ljuder, the area population of Skruv (1975) is 1,422. The area has a surprising number of telephones: 472, compared with 78 for Cembra, 266 for Bissingen and 150 for Lesconil – though each of these has a larger population. It is 322 kilometers north to Stockholm and 220 kilometers west to Copenhagen. The nearest airport is 30 kilometers away at Växjö, but it is the railroad with its numerous commuter trains and fast nonstop expresses that provides the travel excitement for the community.

Leaving the station and proceeding down the main road about 300 meters, the traveller encounters on the left the town's only hotel. Its half dozen guest rooms and spacious, but rather sterile, dining room are managed by a friendly Jehovah-Witness couple. It was here that the World Soundscape crew stayed, ate Swedish meatballs and endless quantities of potatoes, seasoned with Ingrid's pickled plums, and passed the evenings, when we were not out collecting information, in dense religious conversations with the proprietress.

Skruv: looking down the main road from the station.

Bissingen

We should not have discovered Bissingen had it not been for Renata Braun, who lived there. She had attended one of Murray's lectures, in Stuttgart, where we met her. We drove from Stuttgart to Bissingen that night, arriving after dark and took rooms at the Gasthaus Adler, a smaller pension and butcher's combined. The next day we explored the countryside, visiting alpine and plateau villages and those nestled far below in storybook valleys; however, we resolved to stay in Bissingen, for the promise of Renata's sustained help meant that we should be able to approach the local inhabitants more easily.

Bissingen, with a population of 2,742, lies in a fertile farming area at the foot of the Swabian Alps. It is an old village with a continuous record of activity since the early 15th century. Two sides of the village are surrounded by high hills adorned by ruined castles; the other sides give out to flat countryside sprinkled with more towns and villages, which now are threatened by Stuttgart's sprawling scruburbia.

Fruit farming is the occupation of the farmers though dairy products and vegetables are also produced. The farmers all live in the village and go out to their fields during the day on tractors. The arrangement of their houses is interesting, for they combine barn, storehouse and living quarters. Occasionally the living quarters are above the barn, but the usual arrangement is for the cowstall to occupy the centre of the building with the storeroom on one side and the living quarters on the other. The front gardens of these houses are invariably manure piles and it is said that the wealth of a Swabian peasant was traditionally measured by the size of the urine tank beneath his manure pile.

But Bissingen is changing. Of the 40 remaining farmers, about 20 of them combine farming with other kinds of labour. The rest of the population either works outside of the village in Stuttgart, or in the newer parts of the village, which have witnessed an accumulation of industries throughout the 20th century. The oldest of these is a large textile works dating back to 1897, and a furniture factory of unknown

Bissingen: a typical farmhouse.

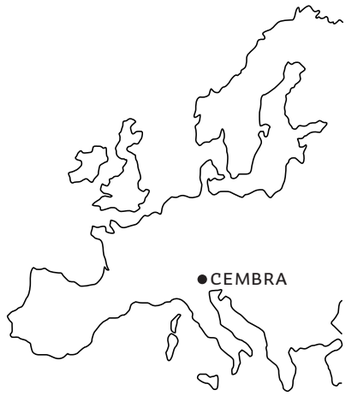
vintage. More recent industries are a hosiery factory (1964), a plastics factory (1964) and a thread factory (1962). Past this end of the village, traffic moves continuously along the arcades of the Autobahn in the distance, while the sky overhead is filled with the calisthenics of everyone's airforce.

There is one church in Bissingen, Lutheran. The nearest railway station is at

Bissingen: from the cherry orchards looking towards the village.

Dettingen, a few kilometers away, but the village is linked to the outside world by buses, which stop about every 20 minutes in front of the Rathaus (Town Hall), and take the villagers to Kirchheim, the nearest sizeable town.

It is from the direction of Kirchheim that small planes carry gliders aloft in one of the more interesting pastimes of the area. Originally the gliders were pushed off the slopes of the high hills above Bissingen, and Renata says the whistling sound they make as they nose in for landings is one of the most characteristic summer sounds in the fields around the village. But in March only a few went aloft and none landed around our heads.



Cembra

Cembra is the oldest and most traditional of our villages, for although the date of its actual founding is unknown, it was the site of a chapel as early as 946 A.D. It can be reached only by one road, a narrow ascent through an oblique latticework of vineyards, for the village lies high in a mountainous valley north of Trento.

The area of the town itself is less than a square kilometer, although its population is 1,431, facts which will suggest even to those who have never visited it, the tight network of its buildings and inhabitants. But such facts do not convey the extremely attractive quality of the village, for many of its passageways are no more than a few meters wide, and are often bridged by the upper stories of the houses. The streets are cobblestone and except for the newer parts of the village, the houses are situated directly on them.

Though built on a little plateau where the mountainside seems temporarily to fan out, the village also climbs the hill so that it makes an attractive picture when seen from across the valley, just as the villages on the other side appear along another mountain road to the inhabitants of Cembra. They can be no more than a few

kilometers away and seem close in the bright sunshine; acoustically, however, few sounds carry across the deep valley which is cut by a large river.

The new road moves through the outer edge of the village, adorned with new stucco buildings of cream and orange. The original road zigzags through the heart of the village, past two of the three Catholic churches and into a little square on which are situated shops, the Municipio (Town Hall) and the Albergo Cembra, where we stayed.

The only factory in Cembra is a small pewter works. The inhabitants live mostly off the vineyards and fruit farms, though the valley is too high to produce the best wine. Some of the villagers still take cattle up the mountain to pasture in the spring, remaining with them all summer. Tourism is a quite recent industry here.

Village life revolves around the new church (the older two are used today only for special festivals) and the Albergo Cembra, where the elders gather in the evenings to drink grappa and the adolescents gather in an adjoining room to play the jukebox and occasionally dance.

Here it was that we remained for a week in late March, working in the comfortable but unheated little rooms of the Albergo, visited daily by our guide and native speaker, the composer Albert Mayr and his wife, explaining our work around the dinner table to a growing company of sympathetic but incredulous Cembra citizens.

Cembra: looking towards the New Church.

Lesconil

We had made up our minds to study a fishing village in France and asked several friends in Paris to recommend one. The suggestions were numerous and confusing. Arbitrarily eliminating Normandy, we were left with Brittany. So together with Anny Malroux of UNESCO, who had kindly agreed to accompany us, we started out along the north coast. We eliminated all the recommended villages in one day as being too touristy, then cut across the peninsula and moved along the south shore, ears open, until we eventually entered Lesconil. We were immediately struck by the way in which the houses of the village were gathered in a bow about the harbour.

Lesconil at low tide.

With a population of 2,832, Lesconil was larger than Skruv and Cembra, about the same size as Bissingen. In 1800 Lesconil had been a hamlet of 80 persons centred around a flour mill. Its evolution since then is the story of a village twisting around on its axis from the land to the sea. At first the sea was fished only as a means of augmenting agricultural livelihood, but by the turn of the 20th century, fishing began to be its main source of income. In 1975 the daily catch of its 46 trawlers amounted to 13,000 kilos on the average. Lesconil is today the first port in France for shrimp.

Two languages are heard in the streets of Lesconil: French and Breton. The latter had suffered setbacks for many centuries (it was, for instanced only in 1960 that a French law prohibiting Breton parents from giving their children Breton names was repealed) but its revival has been swift, so that side by side with old fishermen who speak Breton as natives one also encounters young people who have studied the language and folk music at the University of Rennes.

But Lesconil seems like a village of elderly people; or perhaps it is just that they are conspicuous by the peculiarities of their dress, for most men still wear *sabots* (wooden clogs) and the women may be seen wearing dark coloured dirndl skirts and shawls and the traditional Breton *coiffe* (a bonnet that sits on top of the head). The ones of this region of Brittany are very tall – 18 inches high and always made of beautifully embroidered white muslin. To observe a woman with a *coiffe* getting into a small French car, her head thrown right back to find room for her headpiece, is one of the town's best entertainments.

The heart of Lesconil is, of course, the harbour. It is from here that the fishing boats depart each weekday morning at 5 a.m. to return only in the late afternoon. One by one the boats bob their way past the great bell at the harbour's mouth, pull up to the wharf, and unload their catch, which is immediately auctioned off and loaded into refrigerated trucks to be hauled to cities as distant as Paris (600 km.). Then the fishermen may be seen returning to their houses each with a basket of *fruits du mer* for supper, and save for the occasional strain of a Breton folk song, emerging from one of the waterfront taverns, the village closes down for the night.

Dollar

Visually, the most conspicuous thing about Dollar is the castle which stands behind the village. Indeed the oldest authenticated reference to the site of Dollar is the 1465 title deed of Castle Campbell, or as it was then known, Castle Glaume (Gloom) – an apt name, for the building gives a sombre note even to the bright green landscape of May, the month we visited the village.

Dollar itself is situated directly beneath the Castle on the southern slopes of the Ochil Hills overlooking Dunfermline and the Firth of Forth. It lies on a direct line between Stirling and Kinross, the distance to each town being 12 miles along the A91, which slices the village in half. To the south the river Devon meanders past, receiving in its course the many tributary streams of the hills. One of these is the Dollar burn, formed by the union of two streams beneath the castle, and flowing excitedly down past a golf course and playing fields until it reaches the village, dividing it in the opposite direction to the road and with a quite different acoustic effect.

Dollar revolves around one principal institution: its celebrated school. Founded in 1818, the Dollar Academy attracts young men (and now also young women) from well-to-do families around the world. There is a local saying: "The School is Dollar and Dollar is the School," suggesting the way the entire community organizes itself around the forms and rhythms of school life. Certainly the moments of greatest activity in the community are those when school is assembling or breaking up, just as the moment of greatest excitement was the time the school was damaged by fire in 1961.

Owing to the school, Dollar seems to be a community of young and old. What is missing is the 20 - 40 age group. Aside from a little farming, there is nothing else in Dollar to attract this generation. The coal mines that once gave employment are no longer operated, and the copper and silver mines have long since ceased to be profitable. Even the railway station closed down in 1963. But the community still appears prosperous and indeed the l8-hole golf course, the tennis courts and bowling green suggest that Dollar has not been shy of discovering the attractions of tourism.

The stone houses of the village are neat in appearance, each with its flower garden surrounded by stone walls. The inhabitants seem quiet and rather stern, at least towards outsiders. But with a population of 2280 (1971) the community possesses 803 telephones suggesting an active vocal life that is not heard in public.

Dollar: the main street (A91).

II Soundscape Character

So far, the impression we have given of each village is visual, for print is best suited to visual description. But in life, too, the impression we obtain of places is often largely visual. We must now seek to improve that impression by adding the aural dimension. A Parisian commentator wrote after receiving our previous work, *The Vancouver Soundscape*, that for the first time in his life he had formed an impression of an unknown city in aural rather than visual terms.

Each locale usually suggests its character to a visitor by means of an immediate initial sensory experience. We form an attitude about a new place right from the start. This attitude may be changed as we get to know a place better, but in this chapter we will be concerned with the initial character which each village evoked when we arrived and walked its streets for the first time. What was it that made it different? What made us decide to stay?

Skruv

Skruv in February is cold and bleak. We arrived before supper. After supper we took a long walk through the deserted streets, down across the railroad tracks to the glass works, over to the cardboard factory, back to the brewery and shopping plaza, around the metal works and past the Volkshuset with its library, then along the stream to the lake and finally back to our hotel. It was quiet. The snow screeched under our boots. But we also heard another sound: a pitched hum; and the pitch changed as we moved through the village. We resolved that the next night, when we were to take ambient sound level readings, we would also trace these hums and notate their pitches. The result was the map in Figure 1.

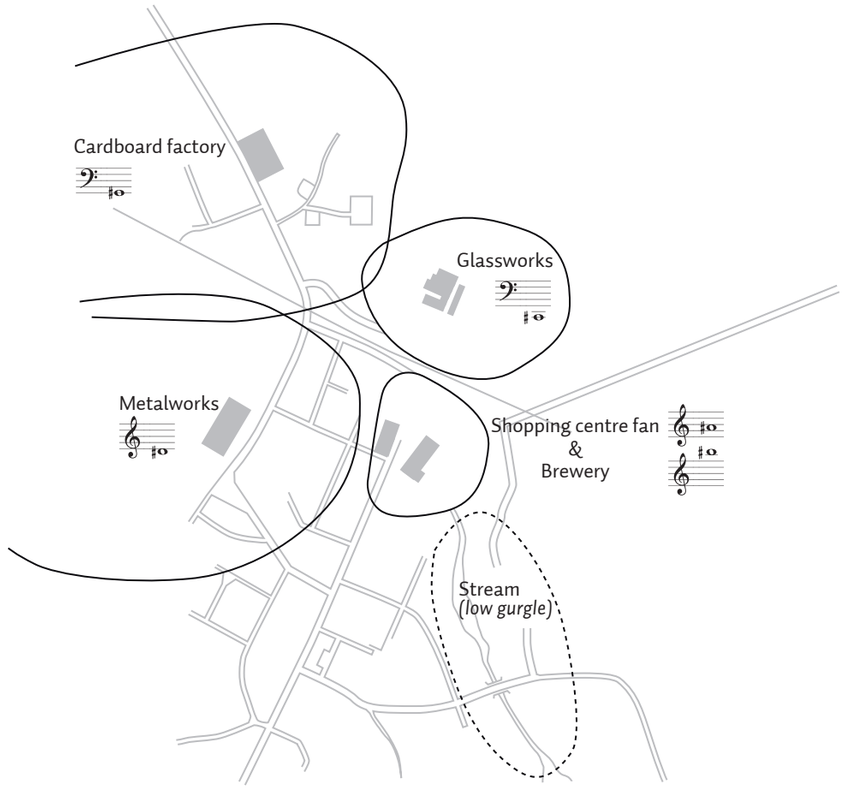
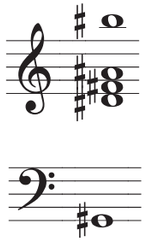


Figure 1. Pitches of predominant hums heard in Skruv, originating from the factories and the shopping centre.

Each of these steady-state sounds flooded out over an area of the village, as shown on the map. Two of them were non-pitched: the low rumble of the glassworks and the gurgling of the stream; the others were electrical hums of various pitches.

Pitched sounds result when pulses or oscillations are speeded up past 20 or 30 per second. A similar development has taken place among the sounds introduced by the Industrial and the Electric Revolutions. The hard-edged sound of electrical current is symbolic of this speeded energy and its strong presence in Skruv suggested a "progressive" village. In Europe the current is 50 Hertz giving a musical pitch of approximately G sharp. It is this fundamental that sounded from the cardboard factory. The other pitches resulted from the presence of strong harmonics. An additional feature of the Skruv soundscape was the piping F sharp of the train whistles. The resulting aggregate of pitched sounds was a dominant ninth chord, quite in tune.

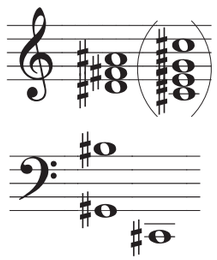


Brewery (east side)

Shopping Plaza refrigetration unit
Train whistle
Metal Works

Cardboard Factory

Further investigation of some malfunctioning street lamps gave us additional tones: C natural, C sharp and D; but the predominant character of the Skruv soundscape was that 9th chord. Returning to the glass factory we were surprised to detect that its low rumble was centred on C sharp, giving the whole chord a quite classical harmonic resolution, just as the glassworks itself gives the town its fundamental character.



Of course, one does not hear these things standing still. One has to move about. As one does the town plays melodies. It is the folk music of the Electric Revolution.

Bissingen

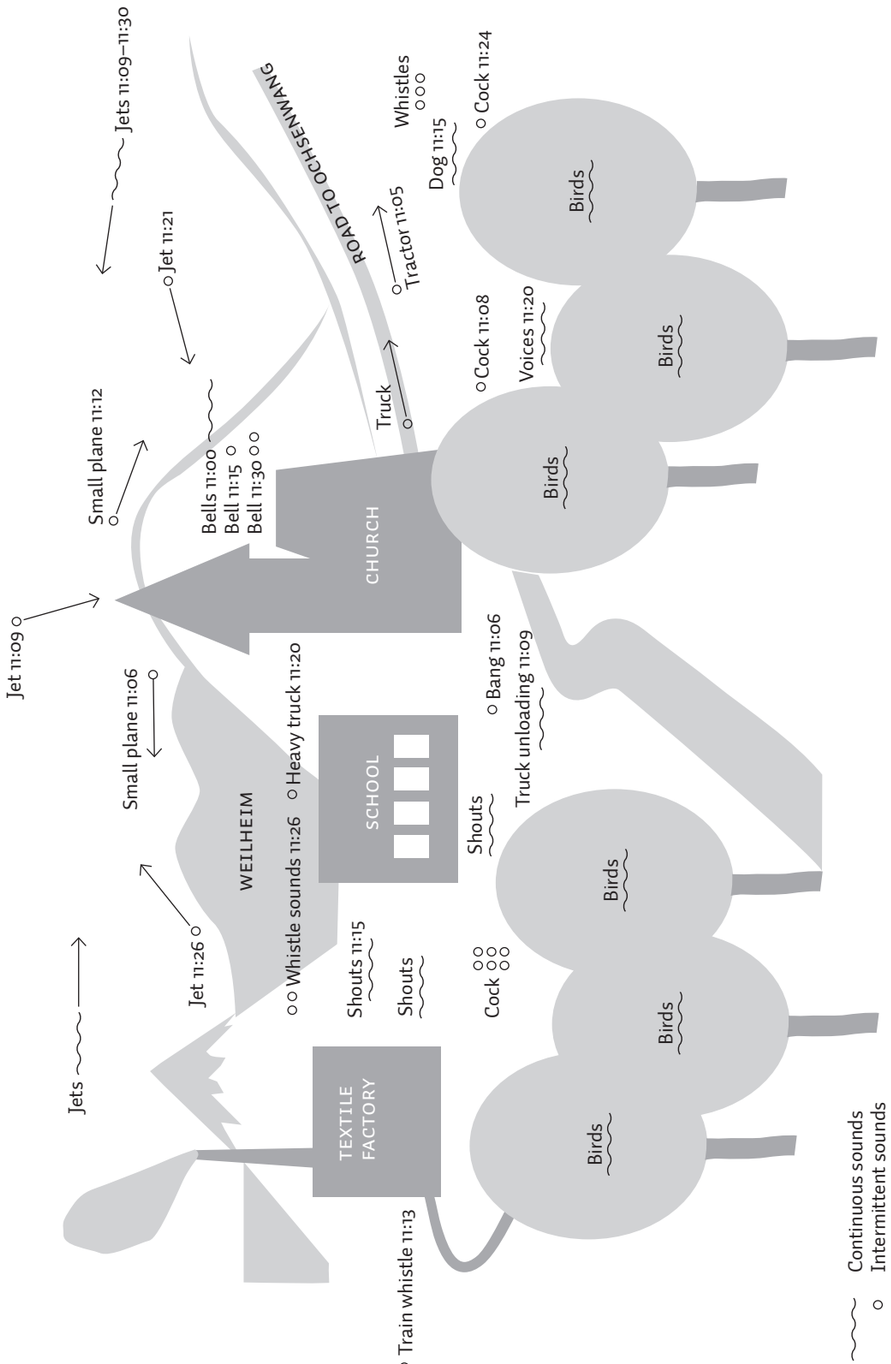
One can not be in Bissingen for more than 15 minutes before one hears its clock bell. Day and night it rings out from the church tower. There were church bells in all the villages we studied, but none rang as frequently or punctually as those of Bissingen. It was Oswald Spengler who said that the interminable bells of Germany gave the nation its sense of historic destiny.

There are four bells in Bissingen. The highest rings the quarter hours; the hours are sounded first as a set on a lower bell and are then repeated as a set on another bell, deeper still. The custom of sounding the hours twice is apparently common in this part of Germany, though we heard it nowhere else. The bells are also pealed at certain times every day, known as *Zeitläuten* (time ringing) a system of time keeping in use before the mechanical clock. *Zeitläuten* occur at the following times:

WINTER	SUMMER
6:00 a.m.	6:00 a.m.
11:00 a.m.	11:00 a.m.
3:00 p.m.	3:00 p.m.
6:00 p.m.	6:00 p.m. getting a little later each day so that at midsummer it is rung at 8:30.

The early bell is a *reveille* for the farmers, the 11:00 the signal to break for food, at 3:00 the peal is in memory of the hour of the crucifixion, and at 6:00 the Angelus ends work for the day. On Sundays the burghers of Bissingen are aroused to church by peals of bells rung for 3 minutes at 8:30 (one bell), again for 3 minutes at 9:00 (another bell); then at 9:20 all four bells are rung for 10 minutes, the service starting punctually at 9:30 a.m.

Bissingen church on the main street.



Prominent sounds heard between 11:00 a.m. and 11:30 a.m., March 6, 1975, from a hillside about 500 meters beyond the village of Bissingen.

The night after we booked into the Adler, which is just a few short steps down the street from the church, we shared dinner with an amplitudinous traveling salesman who claimed that the bells of Bissingen and the Adler's apple cider were his chief pleasures in Swabia. The Bissingen bells are also held in great affection by the local inhabitants. Curiously, the only person we met who showed no affection for them was the church's new pastor, but he did allow us to go through the church books. There we learned that in 1886, when the steeple was reconstructed, it was the wish of the congregation that the belfry be left open so that the bells could be seen as well as heard to ring. Pastor Burkhardt told us that experts had recently tried to persuade the people that angled shutters would distribute the sound of the bells over a greater distance, but they wouldn't hear of it for the same reason as in 1886. An interesting story is told of how in 1969 specialists informed the congregation that the sound of the bells was faulty and they would have to be recast. The congregation agreed, with the understanding that the new bells would be recast directly from the old. However, while the bells were down waiting to be collected by the foundry, the new bells arrived. The uproar that ensued made it necessary for the pastor to be replaced. Also, one of the old bells was taken away, presumably by a band of local citizens, and has never been seen since.

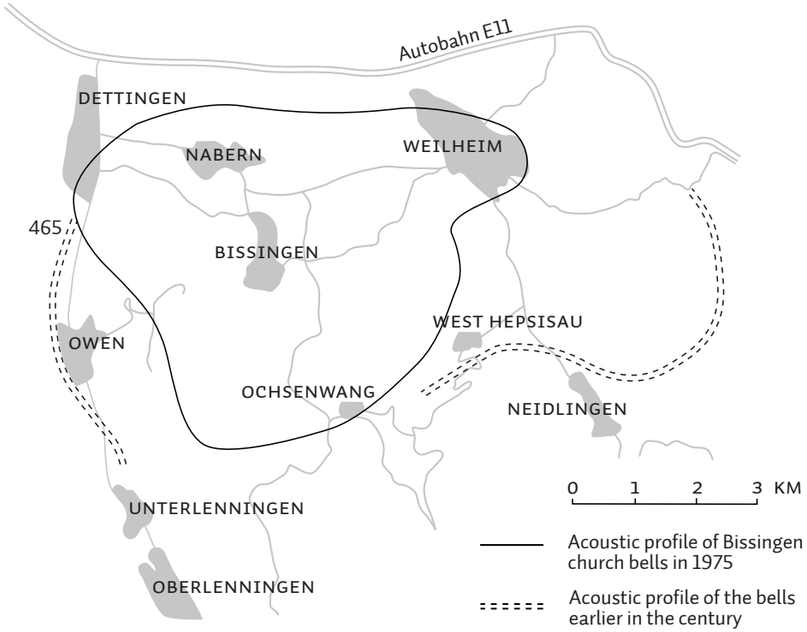


Figure 2. Acoustic profiles of the Bissingen church bells for two time periods.

We decided to attempt to construct a profile map of the Bissingen church bells and so on several evenings we drove out to surrounding villages, Weilheim, Dettingen, Owen, Unterlenningen, to ask villagers on the streets or in the pubs whether or not they could hear the Bissingen bells. From numerous interviews we were able to draw a fairly accurate profile, which naturally varies considerably with the weather. Incidentally many villagers mentioned bells as a weather beacon: when they could be heard from the west, the weather would be bad. See Figure 2.

But something more interesting emerged during these enquiries. We noticed that elderly people, even at great distances from Bissingen, heard the bells more regularly than youthful listeners. For instance, a middle-aged woman on the street in Weilheim was asked whether she heard the bells, and replied: "Yes, and best of all on the east side of that hill over there." But when we asked a youth on the same street, his reply was a flat: "never have." Later when we interviewed a marvelously lucid 94 year old woman in Bissingen, she told us that in old days the bells had been audible at an even greater distance. The shrinking of the bell profile may be explicable as a function of the rise of ambient noise. As the countryside becomes noisier (the Autobahn, for instance was built in 1936) sounds do not travel as far. In *The Vancouver Soundscape* we noted a parallel between the shrinking acoustic space of the Cathedral bells and its dwindling congregation. The same thing is apparent in Bissingen, where young people are no longer attending church. As they cease, they no longer hear the bells, or, as we were informed in several German cities, they begin to experience them as a source of irritation and noise. Bell casting has dropped quite remarkably in Germany in recent years. Church bells appear to be on the way out, although in Bissingen, where the last bell was purchased as recently as 1970, they may continue to be heard for some time to come.

Cembra

First impressions of a new environment are much affected by the environment just left. Italy would sound quite different to a visitor arriving from the south or east than to one arriving from the north. We arrived from the north and as we left Tyrol, we anticipated the same miracle that has thrilled northern Europeans for centuries: the sudden fluorescence of sunlight and warmth. Is it the light and heat that brings Italians outdoors to congregate on verandahs, in streets and plazas? Is it the light and heat that causes them to talk more enthusiastically and seemingly louder than their northern neighbours?

The soundscape of Italy is a vocal soundscape and Cembra is no exception, though after the deserted streets of Skruv and the taciturn ways of the Germans, it seemed exceptional to us. Voices came from all directions, from inside and outside, from men, women, children, birds and animals. It was Easter week; the Albergo was full of visitors and children were out of school: they milled about us as we sat on the steps

of the Albergo translating a sound preference test we had given in the local elementary school. Between hoots of laughter they called out to us. "Don't forget *chiamare del ferrone – Ei!*" "Remember *mormorio della gente*." "Look what someone mentioned! *Ehi sleffo!*" The day before they had patiently filled out our questionnaire under the supervision of their teachers. We had given our sound preference test in many places in many countries but nowhere had children mentioned calling out to each other, nicknames and the current insults used among themselves as significant sounds.

Children playing in the steep, narrow streets of Cembra.

Snow was still on the ground and the men had not yet gone to the fields. They stood on street corners and shop porches, in idle conversation, sometimes playing with the children, or else they gathered in one of the village's three bars to raise their voices over a glass of *grappa* or a cup of espresso. Two of the three bars had marble floors and stone walls, materials common in Italy, which produce a clear reflection of the voice, seeming to give it heightened amplitude and resonance. The narrow cobblestone streets and passages of Cembra also encouraged the voice and even quite late at night one might still hear youths or drunks testing out a good wall or tunnel with a shout or a song.

Voices in the streets are clear and present. Those from indoors are reverberant and hollow. There are no carpets on the floors of the houses in Cembra and the indoor voices bounce off hard bare surfaces: tile, stone, plaster and, less frequently, wood. If the voices of men and children predominate in the streets, the voices of women come from windows. The windows of an Italian village seem always to be open. They are like a radio, tuning in on the happenings of the world, eavesdropping in the literal sense. They are like telephones, for often one hears women talking

across the roofs of the town between airing bedding, shaking mops, and supervising children playing in the streets.

Outdoor speech tends to be louder than that indoors. If this is so, the Italians have more opportunity to practise. And having mastered the art they take big voices back indoors with them. Lydia, for instance, the waitress in the Albergo, when she announced the supper menu, proclaimed it like a biblical angel with tidings of great joy. When we explained our project to her as well as our impoverished Italian and diffident vocal style could suggest, she proclaimed "*silenzio*" to the dining room with a voice like a bronze trumpet. Another evening a group of men came over to our table to give us a demonstration of the game of *Morra*, banned in Italy because of the excitement and violence it creates. The *patrone* of the Albergo said the game created "too much noise." Two men sit across the table throwing out a fistful of fingers at each other and shouting out the sum of both sharply: "*Sette, Otto, Uno, Due, Quattro, Tre, Cinque.*" The crowd of men around them is hushed; it is possibly the only time a crowd of Italian men is hushed, except perhaps in church. But even in church, which we attended at Easter, there were also grand opportunities for soundmaking as the congregation spontaneously broke into harmony, singing hymns in the Lydian mode.

Italian voices dialogue with extensive overlapping. Having noticed how frequently two or more people would be speaking to each other at the same time in Cembra, we listened especially for dialogue "cross-fades" in Lesconil and found that they occurred much less frequently. In any case, dialoguing voices in the Albergo Cembra between 5 p.m. and 8 p.m. could raise the ambient sound level from 40 to 80 decibels.

If Italians are egotistical, it takes the form of sheer vocal exuberance, regardless of subject matter. When Albert Mayr would come with us to interview local inhabitants we always spent more time with them than in any other village extracting the information we wanted, not because they were unforthcoming, but rather because so many other matters had to be expressed along the way.

One intimately familiar with Italian life would probably criticize many of the observations of these paragraphs. We would do so ourselves as our experience increased. But these were our first impressions in Cembra. There were other memorable sounds there – the church bells, some of which were still rung by hand; motorcycles in the village square; the mountain buses with their aggressive two-tone horn, and others we will mention later. But our first impression was that Cembra, unlike Bissingen and Skruv, was first and foremost a human soundscape. As such we thought it sounded medieval. Certainly the village looks more medieval than any other we studied. But with the soundscape one can only reach back to ancient times with the imagination.

Lesconil

Chateaubriand, a Breton and born by the sea, knew the sound of the waves from birth: "The roar of the waves whipped up by a squall heralding the autumnal equinox drowned my cries." When women sang to the child, "the music of their canticles mingled with the roaring of the waves."

Lesconil is surrounded by the sea on three sides and the modulations of its voice never leave the village. It is a strange, even oppressive experience for newcomers to the sea, for it sounds in the distance much like the roaring of a busy expressway. Above the waves at Lesconil one hears the buoys which are a type known in English as "puffers." They make a mooing or groaning sound when tipped by the waves, forcing air out of a compressed chamber and through a reed whistle. In choppy seas they repeat every 2 or 3 seconds. It is these buoys that give the first clue to the secret of Lesconil's acoustic character, for one cannot remain in the village long before noticing that the sound of the puffers comes from different places at different times of the day. Then one talks to the old sea captains and the mystery unfolds as a complex soundscape rhythm.

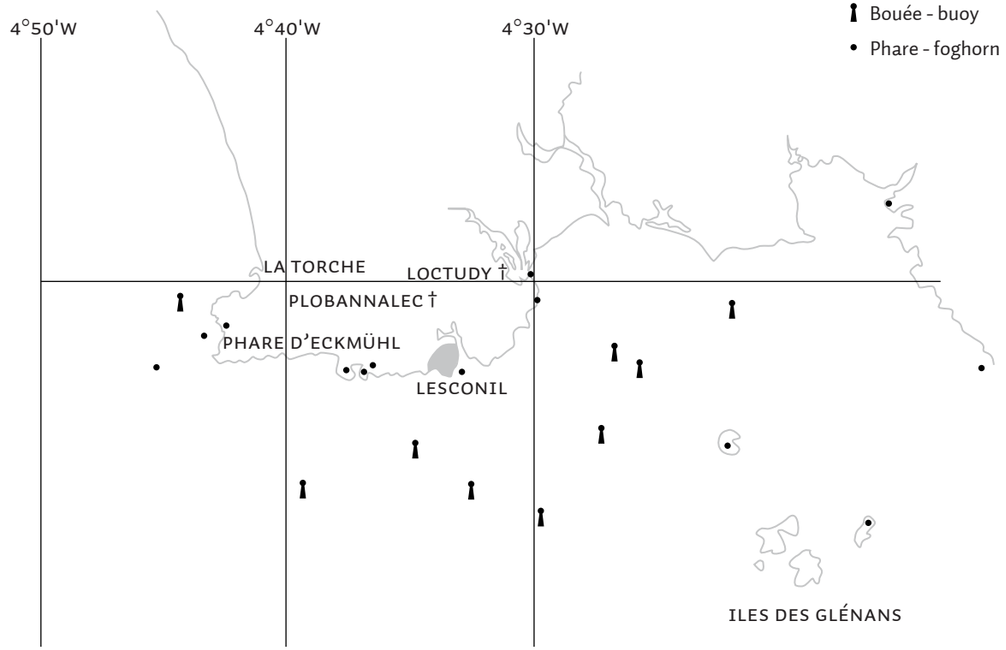


Figure 3. Marine map of Lesconil from information provided by a local sea captain. All the marine signals can at one time or another be heard in Lesconil, depending on weather conditions. The radius from Lesconil would be approximately 15 kilometers to the more distant signals.

The village is subject to an onshore-offshore wind cycle known as *les vents solaires*. These winds affect the acoustic horizon of the community and bring villagers vital information about the environment beyond. Distant sounds are carried to the village in a clockwise sequence, beginning from the north at night, moving to the east and south during the day, and finally the west in the evening. (See Figure 24.) In the early morning when the fishermen put out to sea, the Plobannalec church bells and nearby farming noises are clearly heard. By 9 a.m. it is the bells of Loctudy to the northeast; by 11 a.m. the buoys off the east coast, then by noon the motors of the trawlers out to sea at the south. By 2 p.m. the western buoys are audible and by 4 p.m. it is often possible to hear the blowhole at Point de la Torche, 12 km. away to the west. When the sea is heavy, the sound of water being sucked up and squeezed out of this giant blowhole has been heard up to 30 kilometers away. If the weather is foggy, the afternoon will bring the sound of the great foghorn at Eckmühl, on the same coast. By evening, the farm sounds return and with them the bells of the church at Treffiagat to the northwest.

This pattern is characteristic mainly of the summer months, when the weather is clear. Variations in it indicate weather changes: thus when the surf is strong in the west, villagers know that good weather will follow or when certain buoys are heard out of sequence, there will be a squall, etc. Every fisherman and every housewife knows how to read these sound nuances, and the activities of their lives are regulated by them in a manner that is as old as fishing itself, though the contemporary urbanist (and soundscaper) can only discover the pattern by patient investigation.

Dollar

Our arrival in Dollar was the result of a somewhat different selection process from that used for the other four villages: we tried to research this one in advance using library facilities in London. From our experience in the other places, certain criteria were clearer to us, and we hoped they could be tested by applying them to available data on certain villages in Great Britain. There was some preference for a mining village in Scotland and after a week's work we set off with a list of possibilities in order of priority.

Very quickly, the various mining villages were visited and eliminated from the list. They were usually mined out, or were too close to larger towns or city suburbs. After three days and several hundred miles of traveling (as far as Portree on the Isle of Skye), we returned to Edinburgh to start afresh. By chance we roomed that night not far from the Bartholomew & Sons publishing office (cartographers and geographical publishers) and with their assistance, found three other possible towns, with Dollar at the head of the list.

Dollar had the attractive feature of being a significantly different community on the basis of class alone: basically it is inhabited by professionals and executives who

XXXX kuvateksti puuttuu?

often live there for relatively short periods as their children attend the Academy, the institution which gives Dollar its identity and reputation. Upon arrival, we stopped at the village chamberlain's office, and on the basis of this talk, decided to stay. Here, for the first time we could talk to – and more important, be understood by – the people of the village. More than this, we could get a critical reaction to some of our questions and thus develop an interview to some depth and to a certain level of abstraction. We have always emphasized the idea that the soundscape is the interface between the objective reality and the perceived and understood image of reality. How would our objective measurements tally with the subjective experience of the inhabitants? We hoped that Dollar would be a good place to develop this theme.

Although it played no part in our decision to stay, we were soon to find the most characteristic sound of Dollar: the cadet Pipe Band. But because it was a musical event with established associations which were national as well as parochial, we were undecided how to regard it. It soon became clear that pipe music is very environmental: it is always performed outdoors, and has always been associated with the military, rather than the musical wing of the school. Pipes, of course, were used traditionally to lead soldiers into battle, and therefore the sound was functional, not artistic or aesthetic. It belongs outside and the sound carries all over the village and up over the Ochil hills to the north. Virtually all of the villagers we talked with mentioned the band proudly, adding that you will hear single pipers too, practising alone in backyards or on the school grounds. (See Figure 4.)

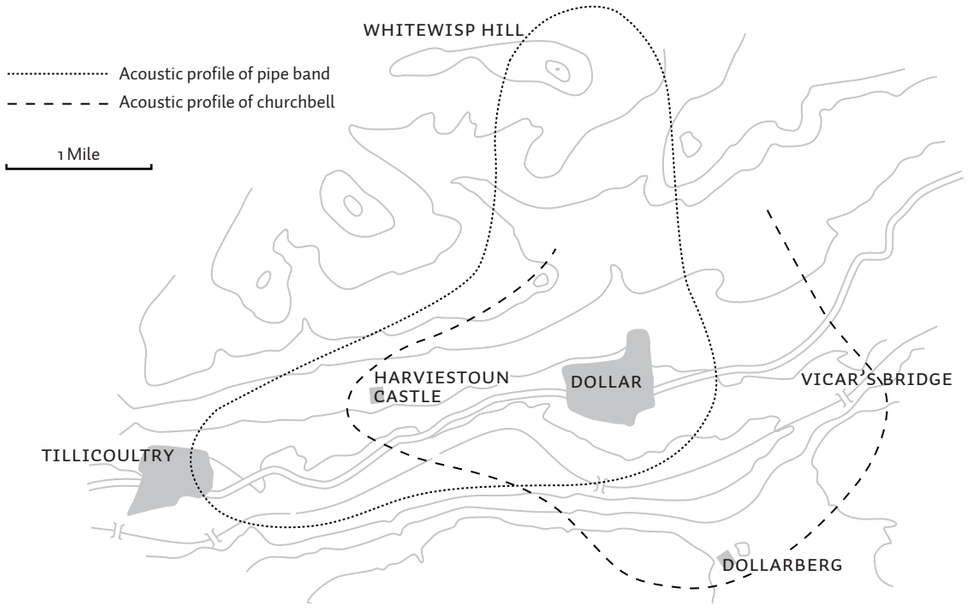


Figure 4 Acoustic profiles of two Dollar soundmarks, the pipe band and the church bells. The profile is largely determined by the geographic contours of the land, in particular the hills to the north-east and north-west.

But another sound challenges that of the Academy pipe band as the most conspicuous in Dollar. This is the A91 highway that strikes through the centre of the town. Heavy trucks are almost as common as automobiles, and the vehicular traffic often masks human sounds in the area, suggesting an environment dominated not by the spirit of learning and study, but rather by commerce and industry, even if these sounds were "just passing through."

This discrepancy between the ideal and the real became more interesting as we investigated it further. It was most apparent in the difference between descriptions of sounds given by the local minister and the town clerk. The minister spoke only of those sounds directly associated with the Academy, referring to the "cloud" of students' voices, footsteps and games from the playing field. On the other hand, Mr. Graham, the Town Clerk, whose account of the Dollar soundscape can be read in full at the conclusion of this document, was well aware of the change in Dollar's predominant sound since the increase of traffic on the A91, which he stated was by no means as recent as was claimed by other residents but had been building steadily since the end of World War II. This contradiction was further accentuated in interviews with two businessmen, the one living directly on the highway and the other well away from it. The former expressed a concern for the decline in the quality of life. At first he did not relate this directly to the increase in traffic outside his house, but when this was suggested, he was quick to agree.

If the traditional soundscape in Bissingen is being threatened by the encroaching suburbs of Stuttgart and the intrusions of aircraft noise, that of Dollar is being transformed by truck noise on the A91. In Dollar we were able to register the extent to which this change is perceived as threatening. Whether such a change in the acoustic life of a community can be subtracted from the social benefits or ills it represents is difficult to determine, but the passage of one predominant acoustic feature which is universally regarded as valuable and attractive towards another which produces ambivalent reactions is an important subject for further soundscape research.

III Acoustic Rhythms And Densities

The daily rhythms of a community reflect its social and economic structure. These rhythms may be defined by such activities as vehicle movements, work, school and transportation schedules, or, as we suggest here, they may also be defined acoustically. In this chapter, we will pursue the notion that the structure of community life is closely linked to and reflected by the acoustic patterns found there. These patterns seemed to be controlled by only a few social and economic determinants, usually those of the greatest importance to the village's survival. To a large extent, the soundscape and economy of these communities are controlled by the same factors.

The information we will use is of the following types:

1. the daily patterns of time signals; business, school and factory hours; major transportation schedules;
2. the flow of pedestrian and vehicular traffic at a central location of the village. This data is based on the number of cars, trucks, tractors. motorbikes, bicycles, pedestrians and other traffic passing the spot during the first ten minutes of each hour from 5 a.m. to 12 midnight. During peak hours, data from other 10 minute periods per hour were also collected;
3. sound catalogues of all acoustic events heard by listeners in *all* areas of the village during half hour periods at five times between 7 a.m. and 7 p.m. To compile this the village was divided in sections and project field workers moved continuously through the streets listing every sound heard. (This information was not collected in Bissingen.)

The data is summarized for the daily patterns of each village in accompanying figures (Figures 5, 6, 7, 8, 9).

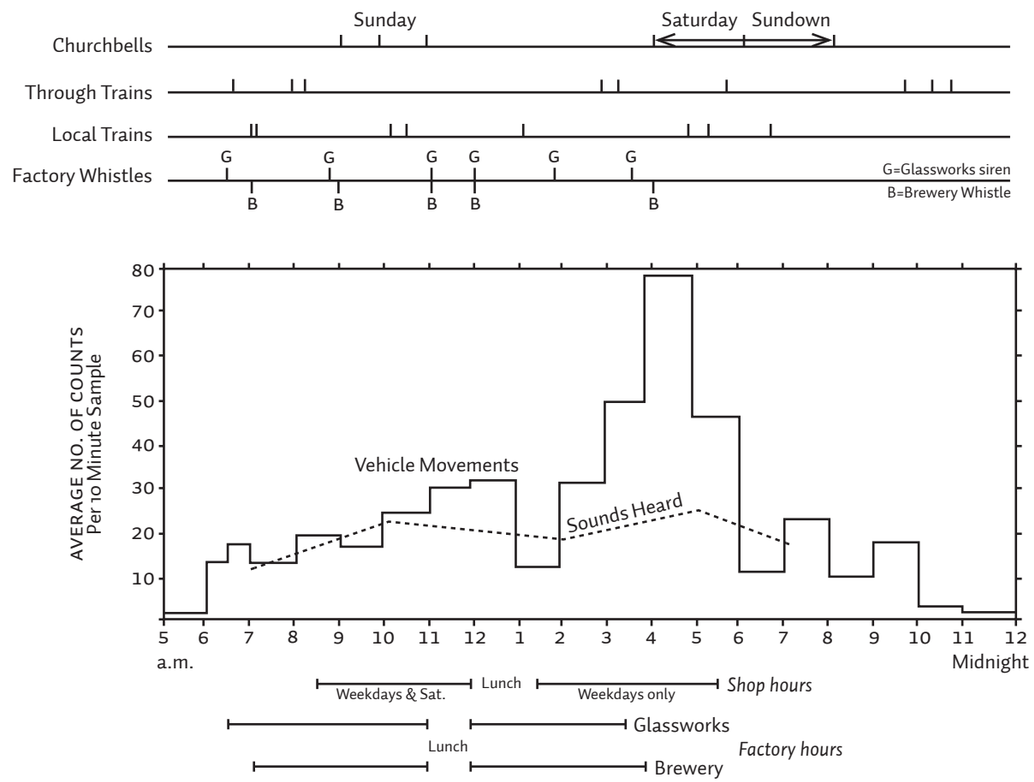


Figure 5. Skruv: Daily rhythms of signals, shop and factory hours. Traffic counted at the village centre is compared with the number of sounds heard throughout the community.

Bus arrivals every 20 minutes 5:30 am – 9:30 p.m.
Churchbells every 15 minutes (*Clock chime*)

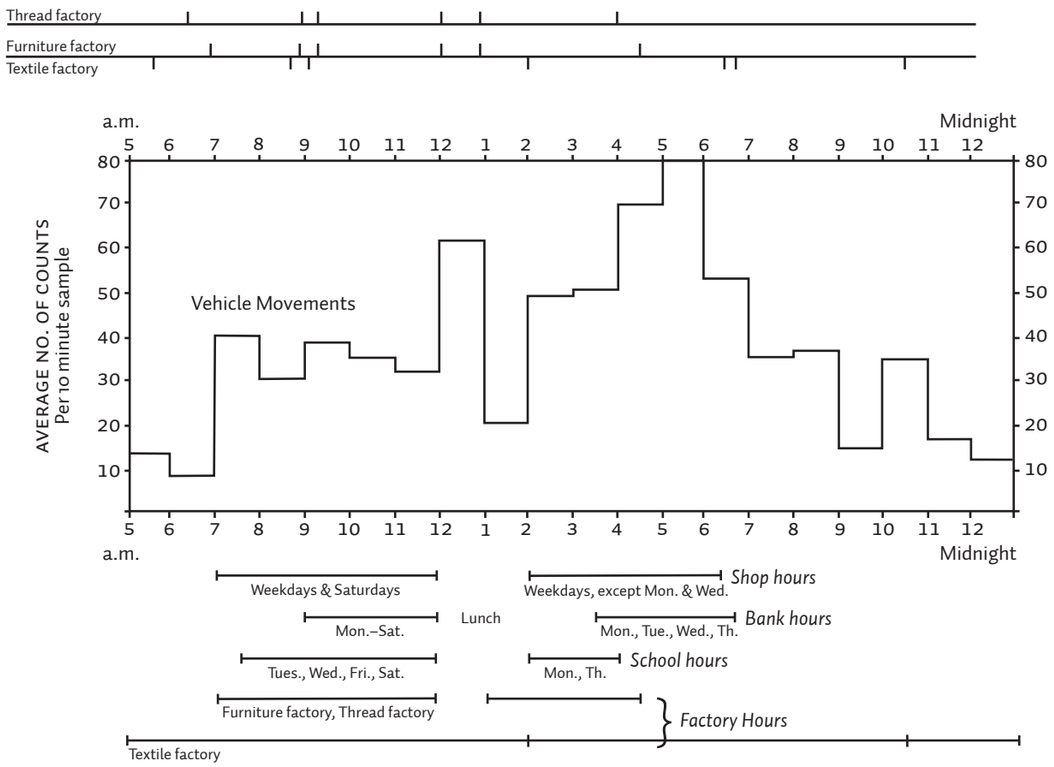


Figure 6. Bissingen: Daily rhythms of signals, business, school and factory hours. Traffic counted at the village centre is also shown.

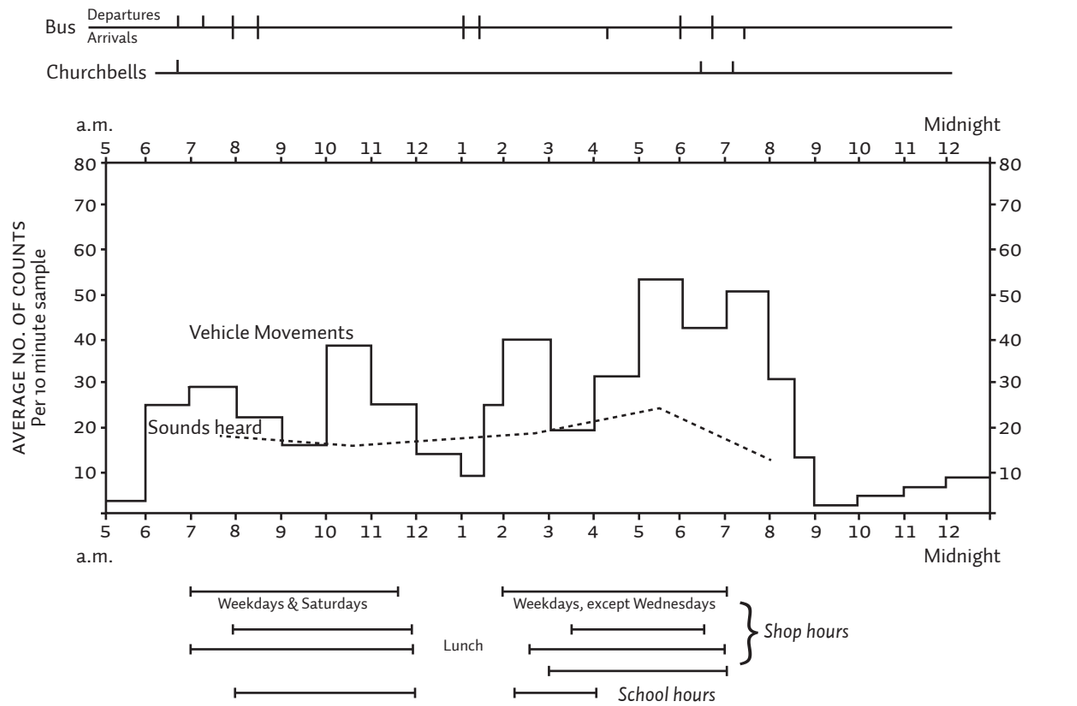


Figure 7. Cembra: Daily rhythm of church bells, bus arrivals, shop and school hours. Traffic counted at the village centre is compared with the number of sounds heard throughout the community.

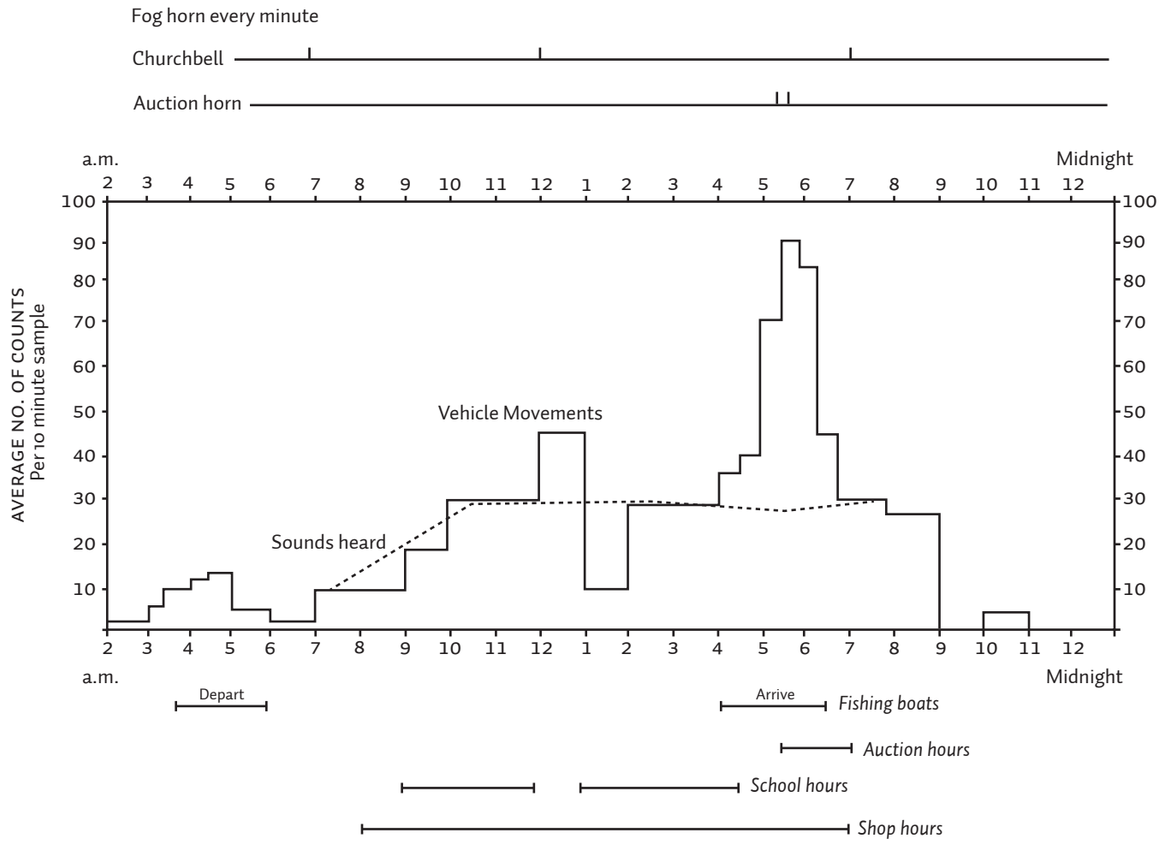


Figure 8. Lesconil: Daily rhythm of community signals, fishing fleet, school and store hours. Traffic counted at the village centre is compared with the number of sounds heard throughout the community.

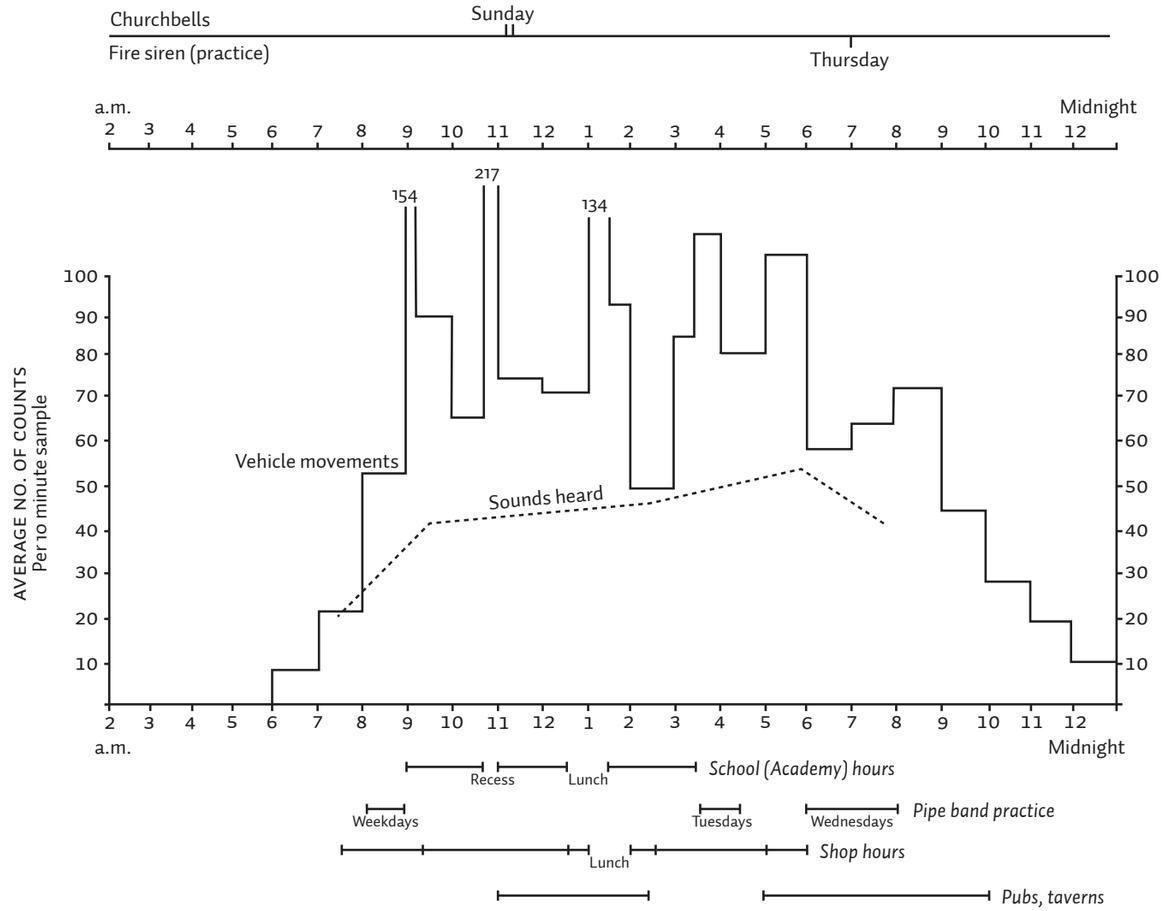


Figure 9. Dollar: Daily rhythm of community signals, pipe band practice, school and business hours. Traffic counted at the village centre is compared with the number of sounds heard throughout the community.

At first glance, the pattern of vehicle movements in each town follows a similar contour of increasing activity during the morning, a lull around noon, increasing activity again through the afternoon, reaching an overall peak in the late afternoon, then tapering off in the evening. However, many subtle differences emerge on a closer examination of these movements in connection with the hours of business and commerce, the rhythm of acoustic signals, and the breakdown of the traffic into various types. The total number of sounds heard throughout the village follows the same contour of activity, though because of the fewer number of samples, there is less definition of peaks. However, it is quite likely that there are fewer dramatic changes in acoustic activity throughout the village than there are in traffic flow near the centre at peak hours.

Skruv has perhaps the simplest daily pattern of movement, since a large number of its inhabitants work in the village's major factories. The largest two, the glassworks and brewery, have similar shifts announced by a siren and whistle, respectively. Therefore, these signals are closely correlated both with vehicle movements, as workers come and go from the factory, and by implication, with the ambient sound level as well. The heavier traffic movements in the afternoon suggest that not only are the workers the main contributors, but also that others are shopping more heavily during that period as well.

The secondary dependence of vehicle traffic on the local train schedule is striking, particularly when one remembers that Skruv was founded in 1874 when the railway was put through this region. Now, although train arrivals are prominent acoustic events in Skruv, it is the factories that not only establish the keynote humming sounds

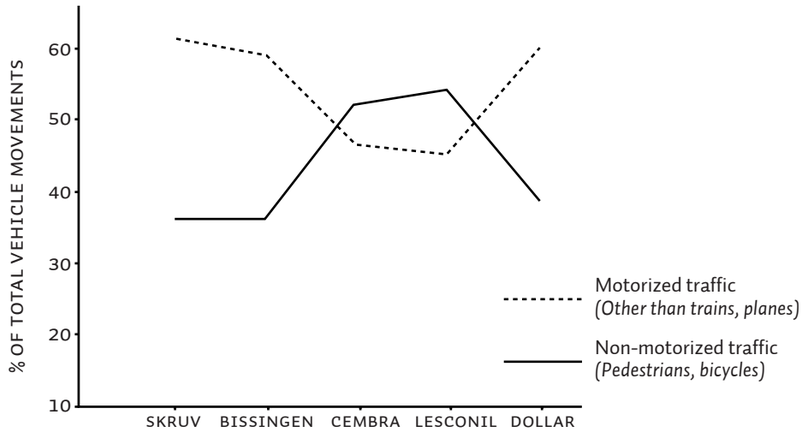


Figure 10. Percentages of motorized and non-motorized traffic counted at the centre of each village, 6 a.m. to 12 midnight.

(see Figure 1), but also the major traffic and ambience patterns. Many housewives, however, use the local train service to shop in larger nearby centres. The church bells, reduced to Sunday ringing, play even less of a role in daily village life.

Table 1

Percentage Breakdown of Traffic Measured at Centre of Village

	SKRUV	BISSINGEN	CEMBRA	LESCONIL	DOLLAR
Cars	50.4	49.1	34.1	32.4	48.2
Trucks	6.0	3.1	6.0	7.0	10.2
Bikes	19.2	9.1	5.1	5.9	1.6
Motor-bikes	3.4	5.4	5.0	5.2	0.9
Tractors	1.0	1.0	1.3	0.	0.2
Pedestrians	16.6	26.3	46.3	47.6	37.0
Other	3.1	6.0	2.4	1.7	1.9

As can be seen from Figure 10 and Table 1, Skruv is one of the three villages where motorized traffic outweighs pedestrian activity. In fact, Skruv has as high a percentage of car traffic as does Dollar where the major A91 highway bisects the town. This indicates that it is not only the local inhabitants, but also the equally large number of people living in the surrounding rural area, that participate in Skruv's high traffic density.

Skruv also has the highest percentage of bicycle traffic, and the lowest percentage of pedestrians of any of the villages studied (19.2% and 16.6% respectively). The lack of pedestrians may be due to the severity of the winter climate, but it may also occur for the same reason that the per capita telephone ownership (1 out of every 3 people) is high. Skruv is a small village with many essential services outside its boundary, and therefore communication over a distance is necessary. In view of the relatively high standard of living enjoyed by these people, the high density of traffic is not at all surprising, compared with the lower living standard in the relatively self-contained village of Cembra.

Cembra and Lesconil are the only pedestrian-oriented villages of the five, and these also show the most unusual rhythmic patterns. Cembra, on the one hand, shows the least amount of variation in traffic throughout the day, possibly because the measurements were taken near Easter when school children were on holiday and

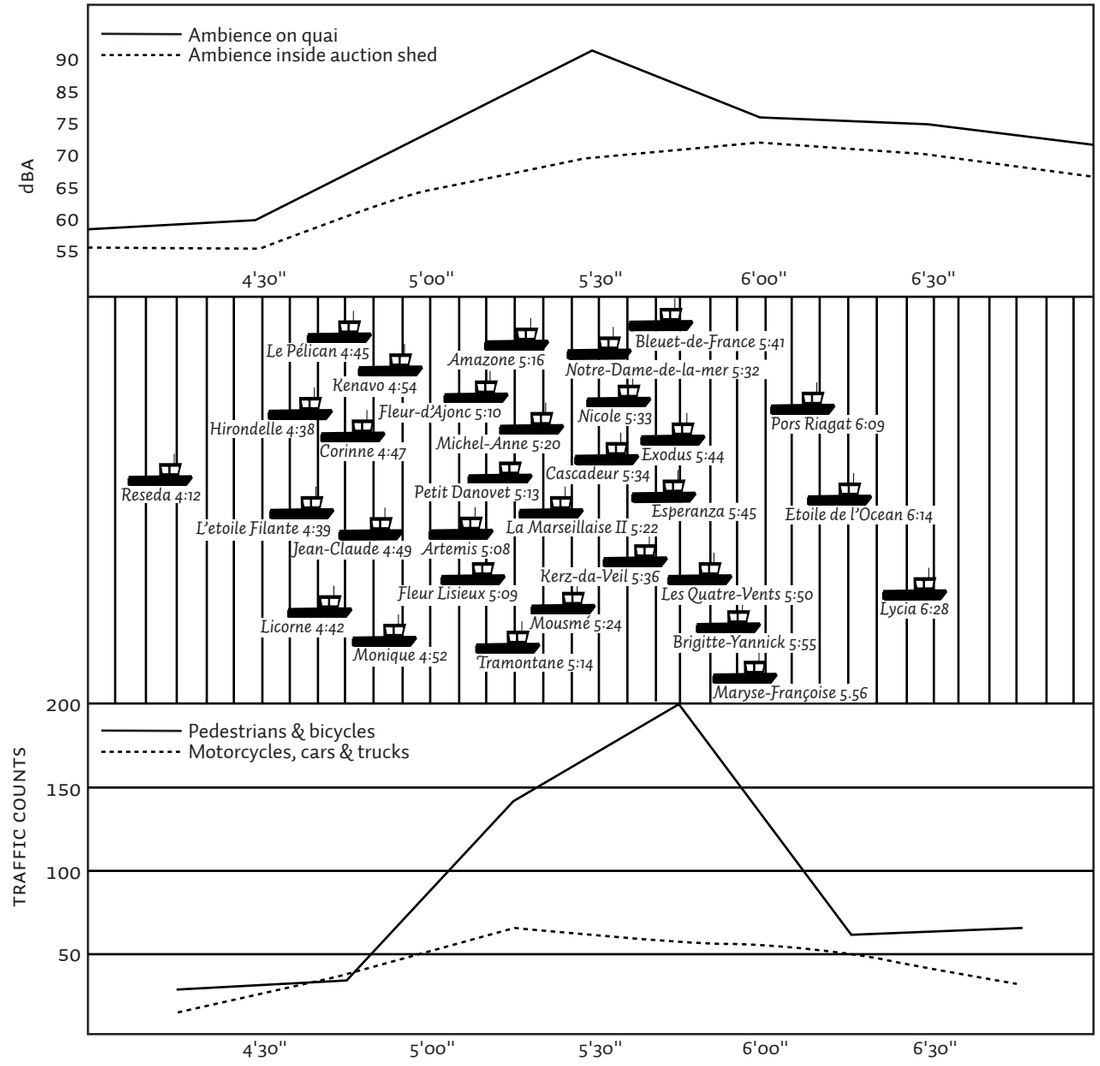
the workers had not left for the fields. Lesconil, on the other, follows the typical daily pattern that repeats itself throughout the year. This is the pattern established by the fishing fleet, leaving between 4 and 6 a.m. and returning from 4 to 6:30 p.m.

Landing the shrimp catch at Lesconil.

In between, the village is in a lull, except around noon when much of the shopping is done. The peak of the day's activity comes dramatically when the fleet returns to port to unload its catch for immediate auction sale. During this period, hundreds of people and vehicles flock to the pier where the acoustic event of the day, two long blasts of an air horn, announce the beginning of the auction. Once over, the villagers go home, and little evening activity occurs. Whereas the people of Cembra and Dollar participate in evening activities almost as much as in daytime ones, the hard-working townspeople of Lesconil concentrate their activity at fixed times, between 4 a.m. and 8 p.m.; otherwise little happens.

In Dollar, the peak pedestrian hours associated with the rhythm of the school day at Dollar Academy would seem to the casual visitor to define the pattern of activity of this village. However, the statistics compiled in Table 1 show that nearly 60% of all traffic movement is that of motorized vehicles, including 10% caused by trucks. Because their flow is steadier, they may seem less obvious to the observer than the visually striking throngs of school children that fill the streets briefly at certain points of the day. However, the pattern of motorized traffic provides the real acoustic basis of the town.

Since the five villages vary considerably in their populations, the total number



Correspondence between marine and land traffic in Lesconil on April 25, 1975. As the fishing boats return and unload their catch for auction, the number of land movements at the waterfront climbs sharply. At the top is the variation in ambient sound level on the pier.

of vehicle movements noted in each place is presumably dependent on population. Table 2 shows the estimated hourly number of vehicle and pedestrian movements normalized for population.

Table 2

No. traffic movements
(per hour per thousand population; 18 samples per village)

	SKRUV	BISSINGEN	CEMBRA	LESCONIL	DOLLAR
Motorized traffic	63.3	52.6	52.4	24.9	91.0
Non-motorized traffic	38.3	30.0	55.2	29.4	58.4
Total	101.6	82.6	107.6	54.3	149.4

The time period in the case of the traffic is an 18 hour period, usually from 6 a.m. to 12 midnight, except in Lesconil where the daily pattern lies mainly between 3 a.m. and 9 p.m. These figures vary over a 3-to-1 range with Dollar showing the highest level and Lesconil the lowest. With no train or major highway in the area, and an economy centred on fishing, Lesconil shows the least amount of daily activity, and similarly the fewest number of regular signals or acoustic events. The high levels in Dollar and Skruv indicate that much of the traffic may come from outside. Indeed the Skruv data is calculated from the population of the area, not simply the village, and both villages are on or near major transportation routes.

Cembra's isolation contributes to its slightly lower amount of traffic movement.

Table 3

No. of Sounds Heard Throughout Village
(per hour per thousand population; 5 samples per village)

	SKRUV	CEMBRA	LESCONIL	DOLLAR
Motor Traffic	30.6	21.8	21.8	37.4
Human Traffic	6.9	9.9	6.3	8.6
Voices	10.5	18.8	8.9	14.4
Indoor Human Activity	2.7	3.5	1.6	2.3
Outdoor Human Activity	8.7	7.6	4.9	3.5
Domestic Animals	2.4	5.7	2.7	3.6
Electro-Acoustic	1.2	1.7	0.7	1.6
Total	71.4	74.5	48.9	76.6

Here, as in Lesconil, motorized traffic has not yet surpassed pedestrian and other non-motorized activity. Despite the differences in population, the ratio of motorized to non-motorized traffic, as shown in Table 5, is about 1.6 for both Skruv and Dollar, and climbs to 1.75 in Bissingen which is near Stuttgart and a major Autobahn.

We turn now to the data for the types of sounds heard during the day throughout four of the villages. This is tabulated in Table 3 as hourly averages, normalized per thousand population, and in Table 4 as percentage contributions to the total number of sounds heard. The sounds tabulated are limited to those reflecting community life, and do not include those of natural sounds (e.g. water, wind, birds), one or more of which were so numerous in each village as to constitute what we call a *keynote* sound, that is, a prevalent sound heard as background to all other signals in the environment. (In the next chapter, for instance, we will discuss the prevalence of water sounds in the villages.) This predominance of certain natural sounds is in strong contrast to most urban areas where traffic is the main keynote sound.

Table 4

Percentage Breakdown of Sounds Heard Throughout Village

	SKRUV	CEMBRA	LESCONIL	DOLLAR
Motor Traffic	42.8	29.2	44.6	48.9
Human Traffic *(footsteps, bikes)*	9.7	13.3	12.9	11.2
Voices	14.7	25.2	18.1	18.8
Indoor Human Activity	3.8	4.7	3.2	2.9
Outdoor Human Activity	12.2	10.3	9.9	4.6
Domestic Animals	3.4	7.7	5.4	4.7
Electro-Acoustic Sounds	1.7	2.3	1.3	2.0
Signals *(Non-regular)*	2.5	2.8	2.5	5.0
Other Transportation Sounds *(breaks, doors, ignition, etc.)*	5.9	2.8	2.5	5.0
Planes	3.4	0.4	1.0	0.7

The data for some of the major types of sounds is shown in Figure 11 where it can be seen that, with the exception again of Cembra, the sounds of motorized traffic predominate throughout each village. In Cembra, as can be seen in Table 5, footsteps

and voices dominate the soundscape even more (ratio 0.76) than pedestrians did in the traffic count (ratio 0.95), indicating that traffic tends to be somewhat isolated at the centre of the village. This is because of the narrow, winding streets which damp traffic sound and confine its spread to the immediate area. The aural impression is that a car or bike emerges suddenly (both acoustically and visually), and almost as suddenly disappears again.

Lesconil was the other village where we noted a slight predominance of non-motorized traffic in its centre, but here the situation completely reverses itself in the residential area where traffic sounds lead. This reversal can be clearly seen in Table 5 which gives the ratio of motorized to non-motorized traffic sounds. Lesconil reverses from 0.84 to 1.43. Clearly, the reason is that traffic from outside the village is heard, though it doesn't necessarily penetrate to the village centre, i.e. the port area. This same effect is probably also present in Skruv where a slightly greater ratio of motorized traffic sound was observed throughout the village than was counted at the centre. The figures for Dollar are about equal, indicating that traffic is heard throughout the village.

Table 5

Ratio of Motorized to Non-Motorized Traffic
(1.0 denotes equality)

	SKRUV	BISSINGEN	CEMBRA	LESCONIL	DOLLAR
Traffic counts (village centre)	1.65	1.75	0.95	0.84	1.56
Sound counts (throughout village)	1.76	-	0.76	1.43	1.63

Lesconil is also different from the other villages in the amount of other types of sounds heard, as can be seen in Figure 11. It scores lowest in sounds per capita of indoor and outdoor human activity (a general category including all work and play sounds other than voices and footsteps), domestic animals and electroacoustic sounds. This is not surprising since, on the one hand, most of the men are away fishing during the day, and on the other, Lesconil has generally been the slowest of the five villages to bring in 20th century technology, as can be seen from the historical charts at the end of this chapter (Figures 18-20).

Skruv and Cembra, the smallest villages, show the greatest numbers of these other prominent sounds, though perhaps for different reasons. In Cembra, the predominance of voices and general social activity in the streets is closely followed by other human and domestic sounds, whereas in the quieter northern village of Skruv, there are fewer domestic animals and pets, but a fair number of other sounds of human activity reflective of the higher standard of living (e.g. power lawnmowers).

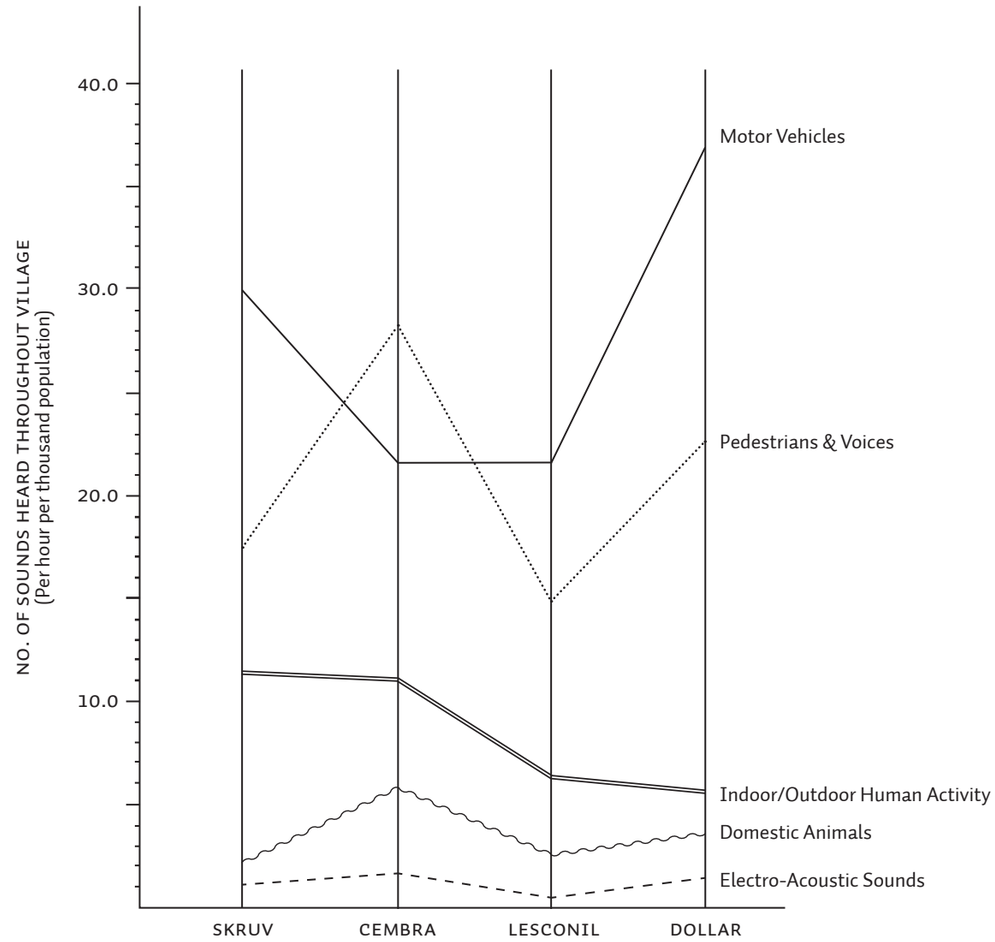


Figure 11. Breakdown of sounds heard in residential areas of each village according to source type. The counts shown are hourly average, normalized for population.

Dollar, on the other hand, with its extremely high traffic flow, records the least number of sounds of indoor-outdoor human activity, and a high per capita number of electroacoustic sounds. Domestic animal sounds are also fairly high, but unlike Cembra's farm animals, Dollar's sounds are mostly from pet dogs. Again, from the historical charts, it can be seen that Dollar was always the first with technological change, and therefore its urban tendencies are not surprising.

One of the most revealing breakdowns of the daily pattern of sounds heard throughout the villages is that of the different kinds of voices heard. In Figures 12

and 13 we show the comparison between two types at different times of day by plotting the number by which one type exceeds the other, women compared with men in Figure 12 and children compared with adults in Figure 13. In general, the pattern shifts from men to women during the day, and back to men again in the evening, except that in Lesconil the men are away fishing during the day, and in Cembra they were still in town when we visited, waiting to go out to the fields.

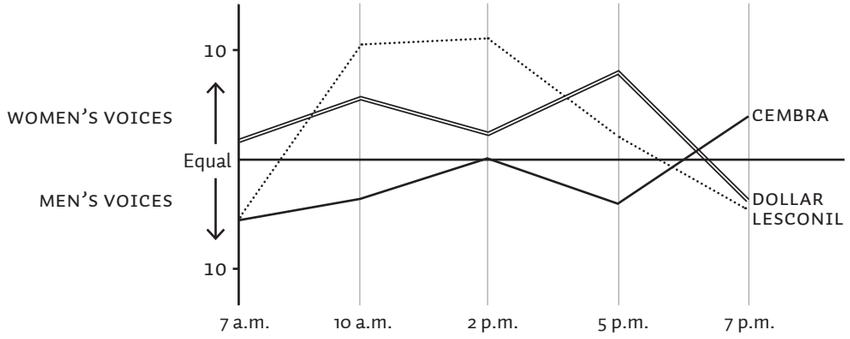


Figure 12. Comparison of the number of women's and men's voices heard in the streets of three villages during the day. Points above the line indicate women's voices predominating, those below the line, men's.

With children's voices, the patterns range from near absence in Lesconil (where most of the older children go away to school), to equal numbers throughout the day (except at 7 a.m.) in Cembra where children play in the streets. Dollar, with its academy of over 1,000 students, naturally shows a high proportion of young voices, but only after school hours (5 p.m.) or during the brief periods before and between classes. Data for Skruv is not included because of the small numbers of voices heard, although the tendency was for about equal numbers of children and adults.

The most interesting aspect of the information collected is the pattern that emerges when we plot the traffic and acoustic data opposite each other. The hourly per capita totals of traffic movements and sounds heard, shown in Figure 14, exhibit the expected correlation of mutual increase. Because data is only available for four villages, the conclusions to be drawn from the graph are somewhat ambiguous. Although the tendency for the number of sounds heard to increase with traffic is clear, the rate of change, as interpreted from the slope of the possible curves or lines joining the points is not. A straight line approximation would result in a slope somewhere between 1:3 and 1:4, meaning that the number of community sounds increases about 1/3 to 1/4 as fast as traffic movements. An alternative interpretation, which puts more importance on the specific data, suggests that the normal growth

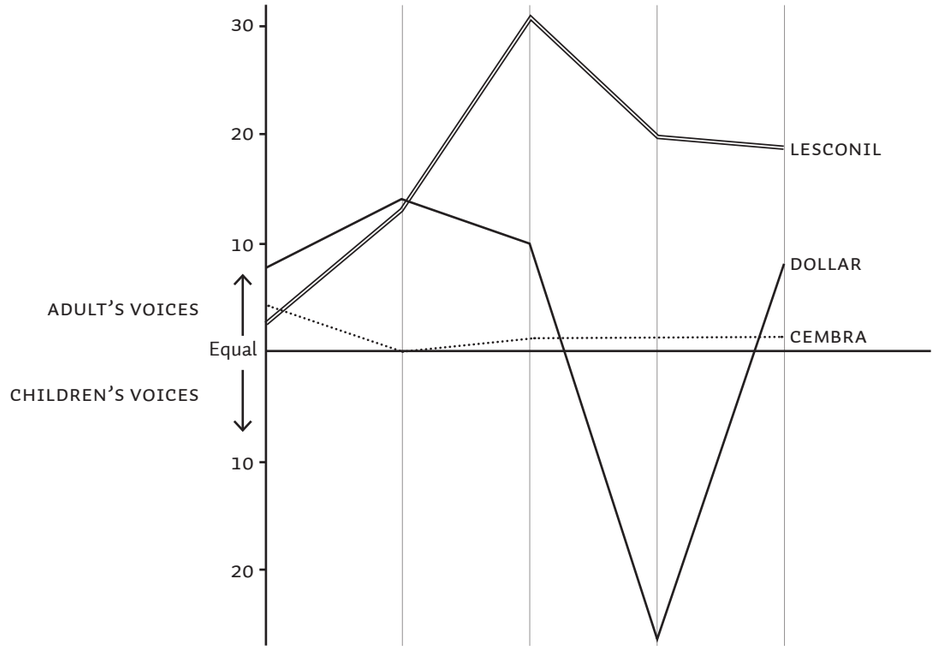


Figure 13. Comparison of the number of adults' and children's voices heard in the streets of three villages. Points above the line indicate adult voices predominating, those below the line, children's.

rate of sounds is between 1:2 and 1:3, but that it slows down as traffic movements increase, as suggested by the drop in voices and other sounds of human activity in Dollar, the most traffic-saturated of all the villages.

In other words, the simplest argument is that as a village prospers economically, there is increased traffic movement per capita and this is accompanied by a slow rise in ambient level (see Figure 15) and a slow growth in the sound density throughout the community. However, an extension to the argument is that the increase in motorized traffic creates a sound environment that in fact inhibits the growth of other types of sound, notably voices and such sounds of human activity as would be audible to a pedestrian in the community. Although the volume of sound increases, the actual rate of growth of numbers of sounds heard would be less rapid (as perhaps indicated by the flattening of the growth rate in Figure 14). The increased standard of living that accompanies a rise in economic activity and traffic movement produces fewer, but more powerful sounds which eliminate larger numbers of light-weight sounds such as voices. As well, the style of living moves necessarily toward more self-contained, isolated family environments, lessening the density of social, public

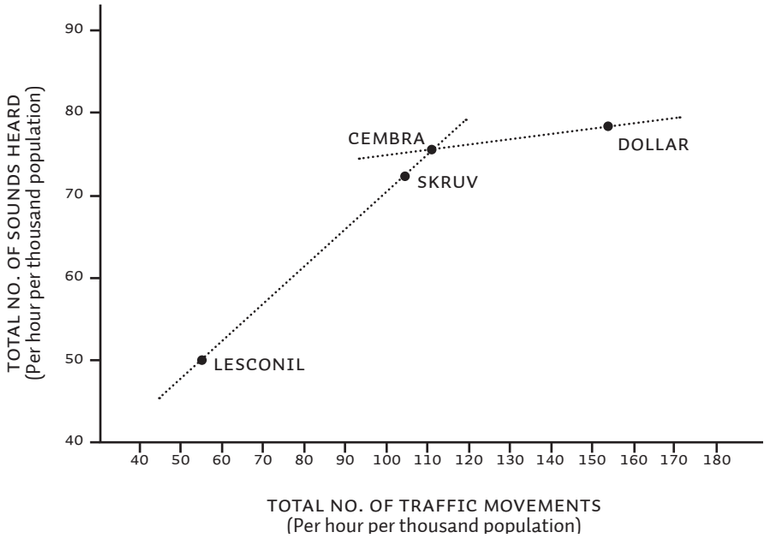


Figure 14. Total number of sounds heard in residential areas of each village throughout the day plotted against the total number of traffic movements recorded at the village centre. Both counts are hourly averages, normalized for populations.

sounds The data in Figure 14 suggests this trend, but further studies would be needed to establish it firmly.

Cembra, in this regard, stands out in an interesting manner, particularly in comparison to Dollar, in Figure 14. It is hard to imagine two more paradigmatic and contrasting villages to consider. Cembra supports a smaller, high-density population in a geographically isolated region with low traffic density, and a high degree of social activity, street sounds and general gregariousness. Its population and economy have been falling off since World War II (see Figure 16), and although many of the past traditions are gone, its social life remains on a distinctive, human scale. Dollar, on the other hand, is rapidly increasing in population and prosperity, and its soundscape is traffic-dominated. A great gulf of social development separates the two villages, suggesting that the rate of growth of the soundscape from one to the other is in the direction of the domination of heavy, technological sounds at the expense of the numerous small sounds that characterize a balanced social soundscape on a human scale.

The uniqueness of Cembra is also seen in Figure 17 which shows that the two most prominent sources of community sounds divide easily into the motorized traffic and pedestrian/voices categories, just as the traffic movement divides easily into motorized, non-motorized components. When plotted against each other, the two sound source types fall neatly along two nearly parallel lines, indicating that the rate of

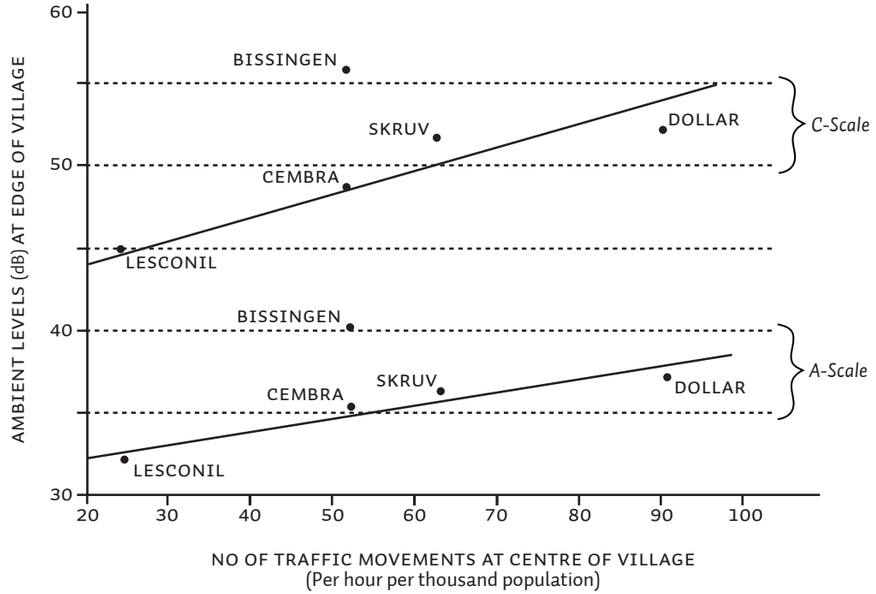


Figure 15. Ambient noise levels recorded at the periphery of each village (dBA and dBC) plotted against hourly traffic count at the village centre, normalized for population.

growth of these sounds is almost uniformly 1:4 (slope = 0.25). The remarkable anomaly, however, is that of all the villages, Cembra's predominant community sound type is that created by humans, whereas with the other three it is traffic. Similarly, traffic in Cembra falls among the secondary sound sources which in the other villages are the human sounds. Even through pedestrian traffic leads motorized traffic in both Lesconil and Cembra (as shown in Figure 17 by the fact that the point for pedestrian traffic is somewhat farther right than that for motorized traffic; note that the equivalent points for Skruv and Dollar fall far behind to the left), it is the sound of traffic from outside the village that predominates in Lesconil. Although the village has turned historically from the land to the sea for its livelihood, the prosperity this has brought has also been accompanied by a traffic invasion of the soundscape from the landward side, particularly by trucks carrying the fish to inland cities.

The choice of contrasting villages has worked to our advantage in this aspect of the study as it gives us examples of communities at different stages of economic progress with soundscapes suggesting different patterns related to that growth. The sound environments of these villages reflect the social and economic context not only in the more obvious aspects of daily rhythms and fluctuations, but also in the way that the types and numbers of sounds produced reveal the kind of adaptation made by the population to a changing social life.

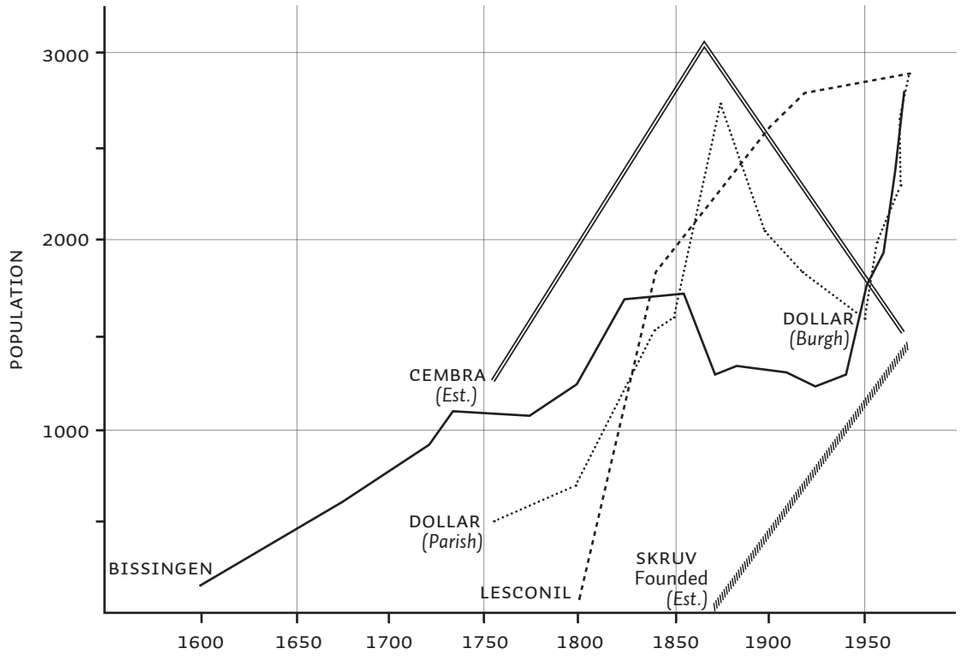


Figure 16. Pattern of population growth in each village. Note that the figures for Dollar represent the parish population up to 1950, and the burgh population thereafter.

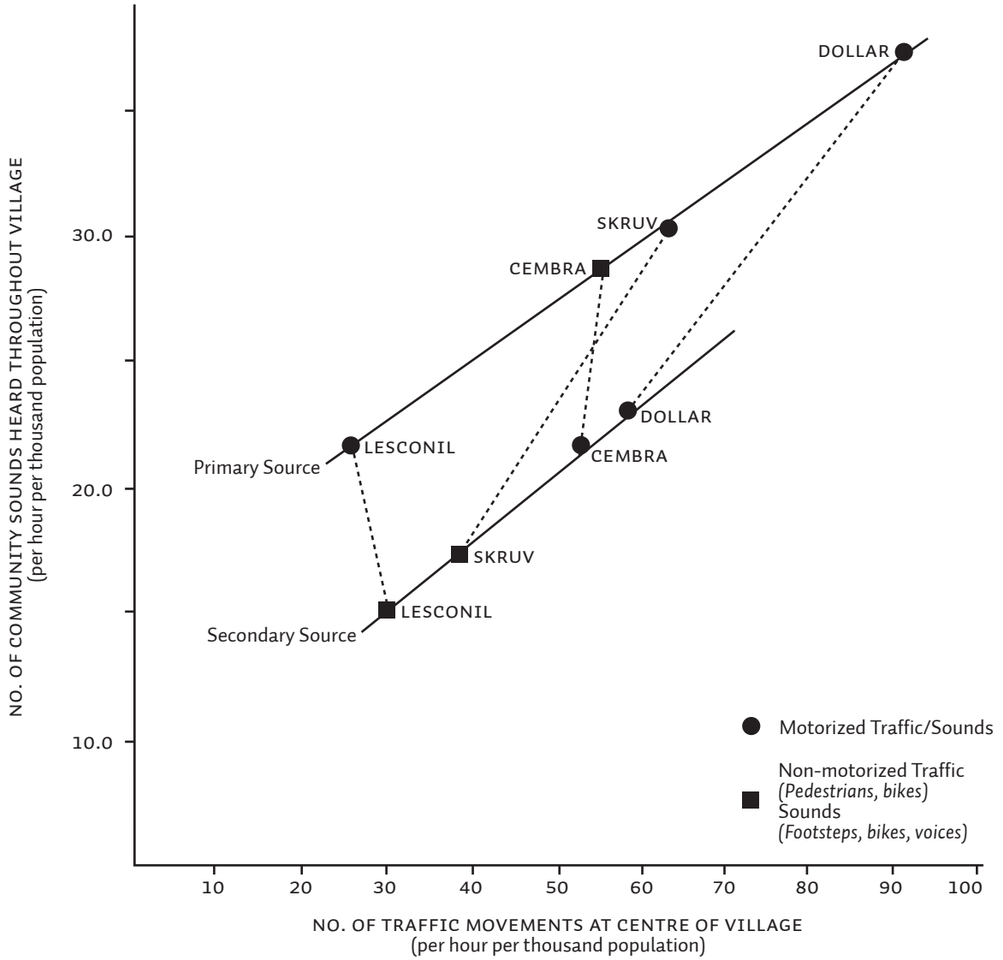


Figure 17. Hourly averages of primary and secondary community sound sources plotted against hourly traffic counts. Both counts are normalized for population. The dashed lines join the counts for the same village.

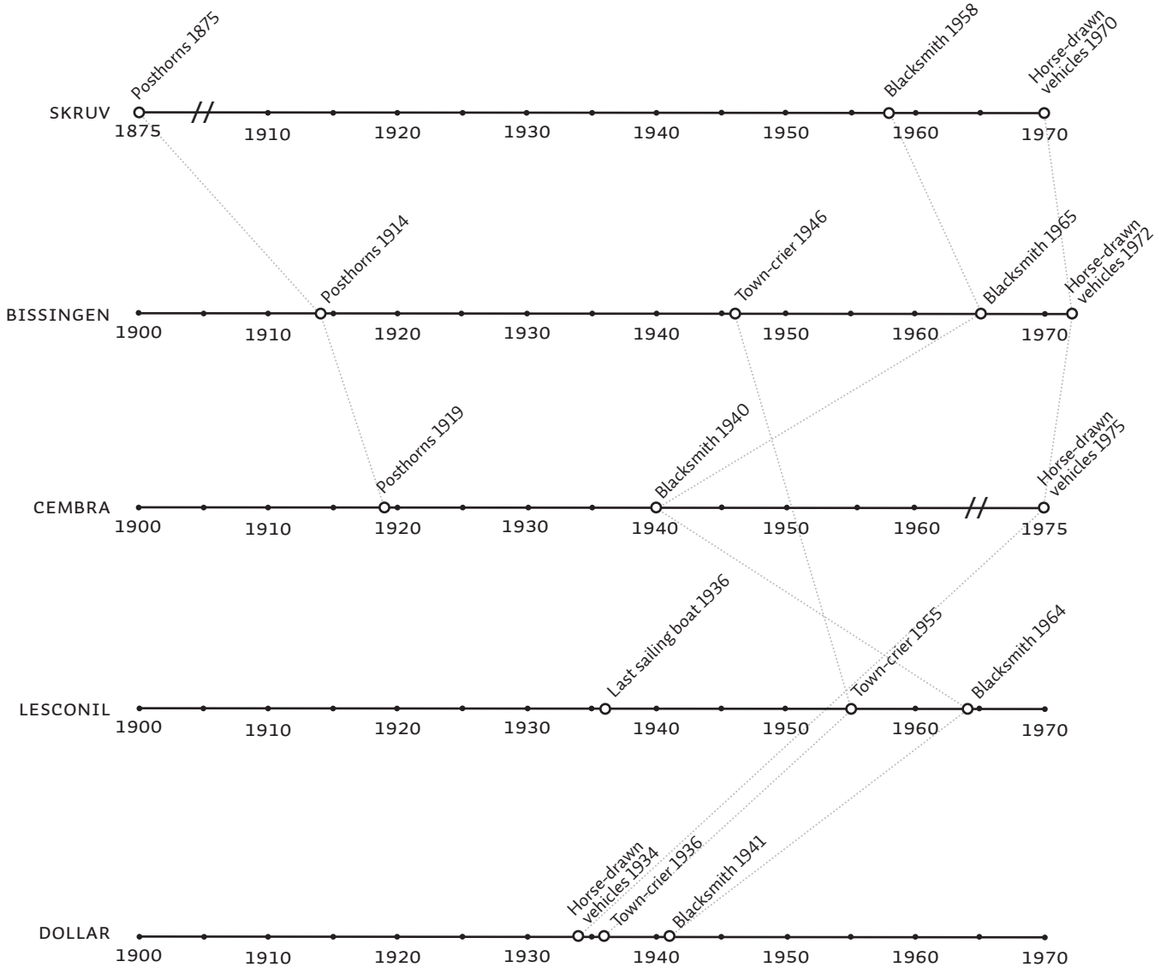


Figure 18. Chronology of disappearing sounds (posthorn, blacksmith, horse-drawn vehicle and town crier) showing when each was last heard in the different villages.

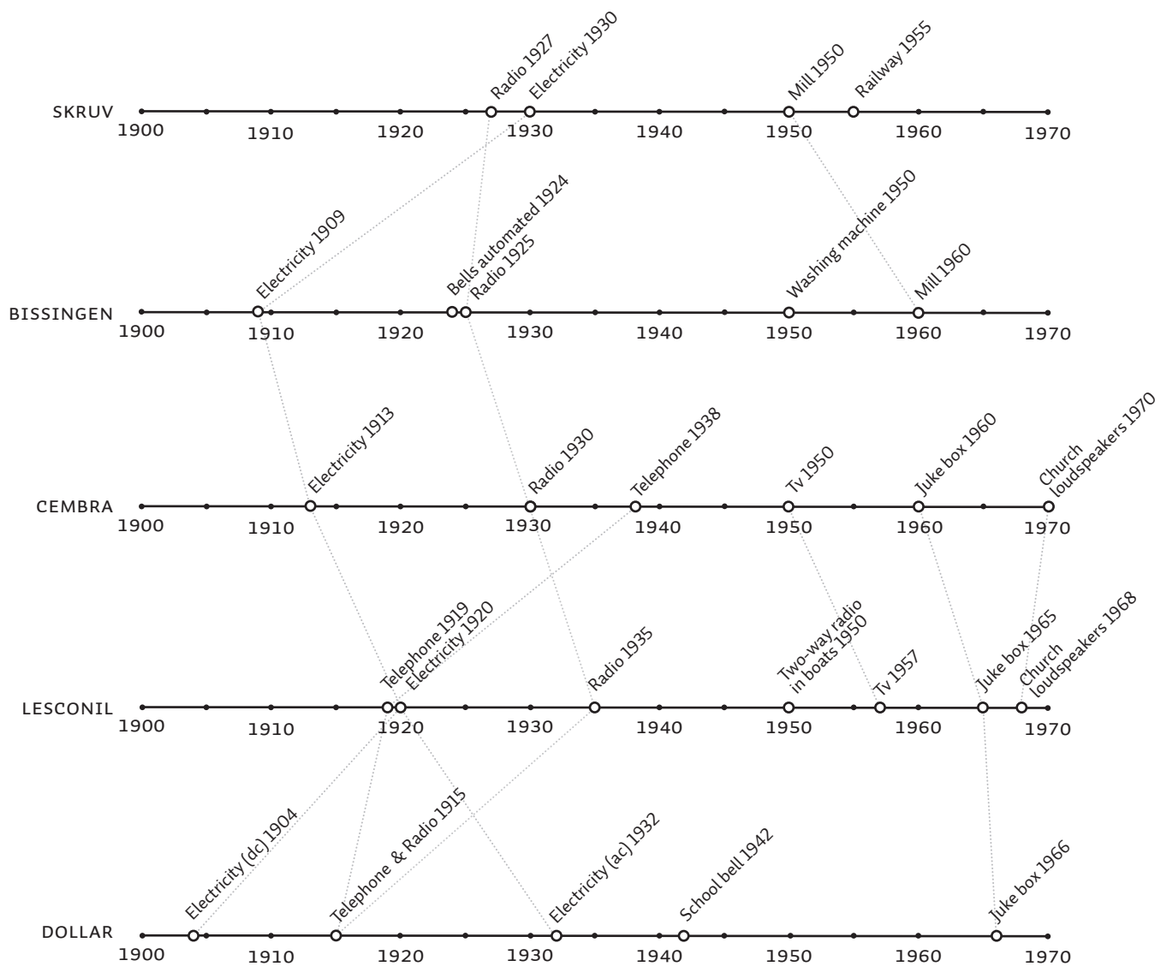


Figure 19. Chronology of electrification: electricity, telephone, radio, jukebox, church loudspeakers, and the electrification of other community sounds.

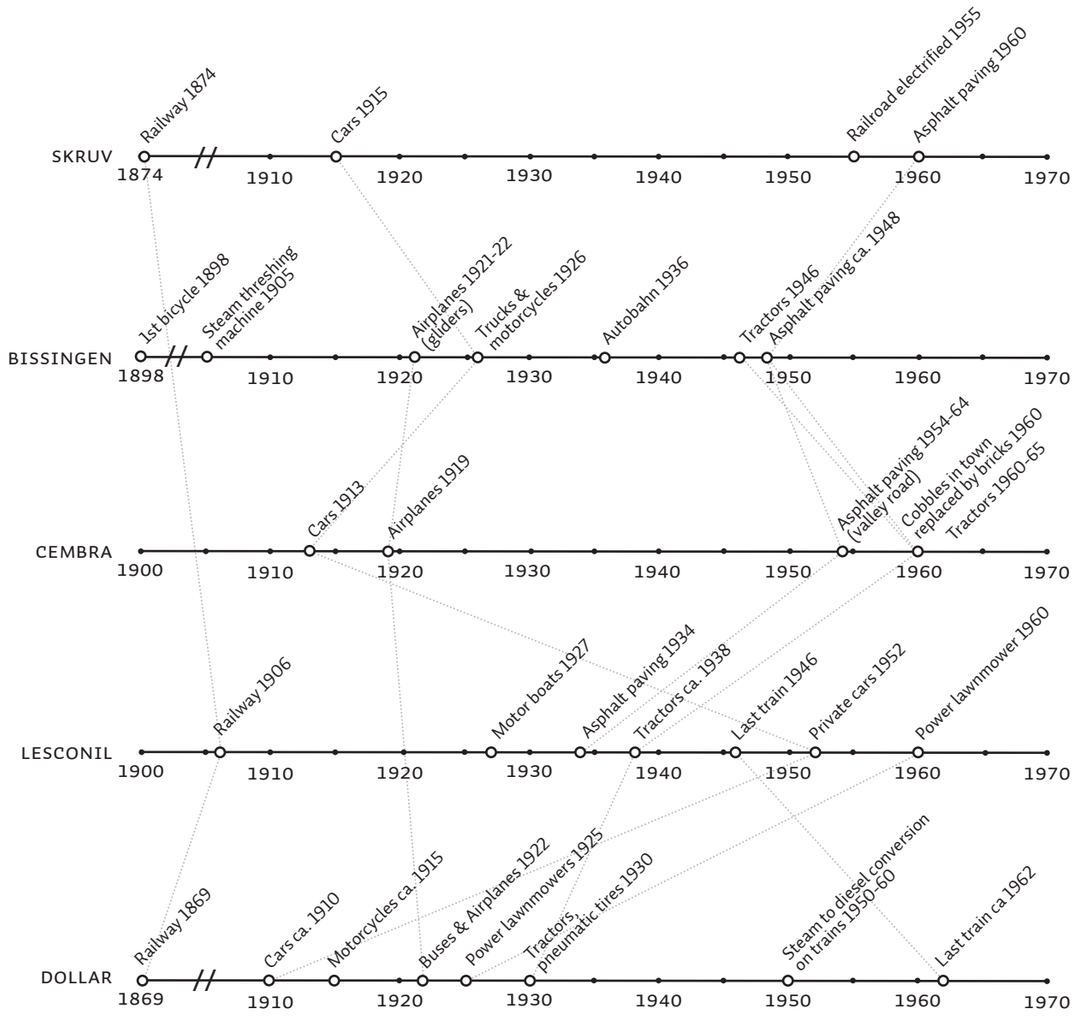


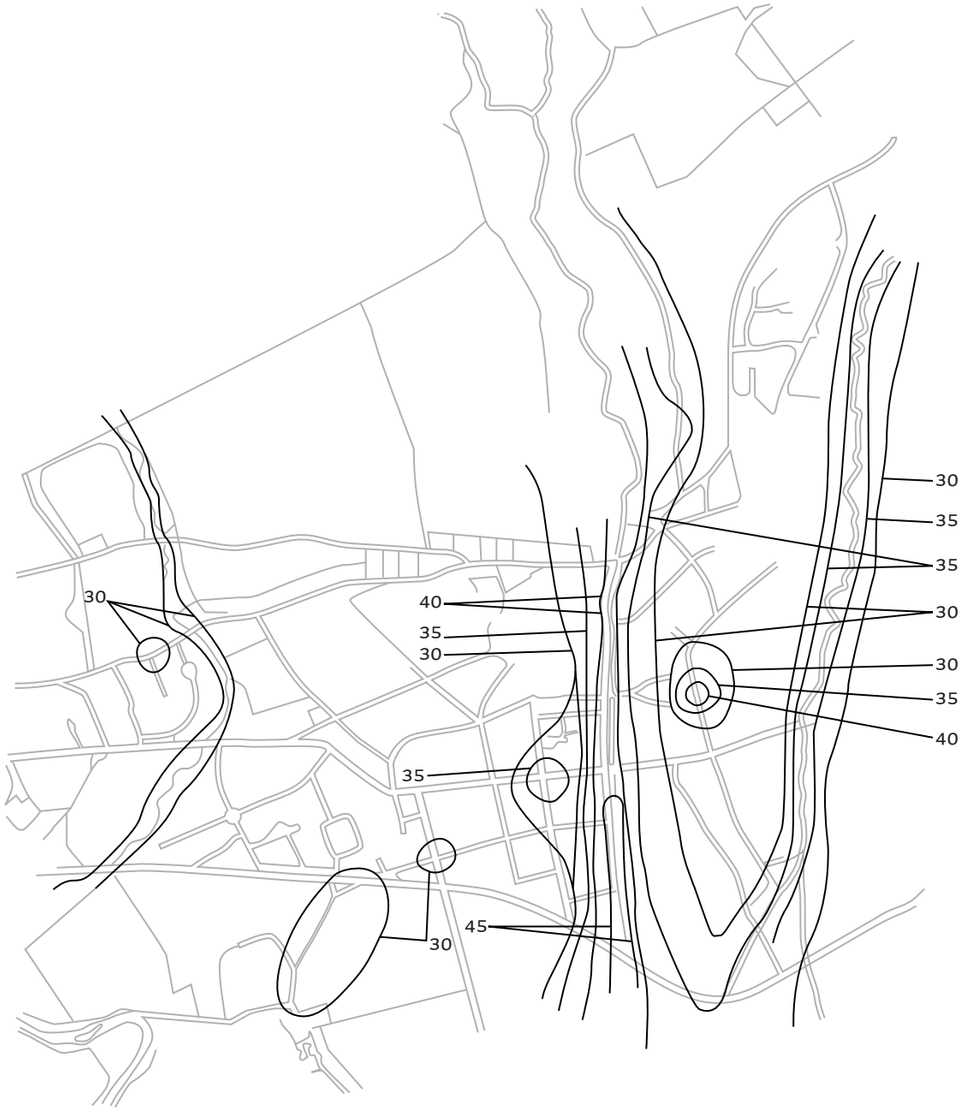
Figure 20. Chronology of developments in transportation in the different villages: railway, motor vehicles, airplanes, tractors, asphalt paving and other developments.

IV Acoustic Materials: (Water And Stone)

The materials of society each have their own special sounds. As we write about two of them in the life of our five villages, the reader will have to imagine their acoustic properties or verify impressions by listening to the recordings which complement this study.

No habitation is possible without an adequate supply of fresh water and so water becomes an important keynote for all ancient communities, both inland and

The Dollar Burn



Isobel map of Dollar, constructed from ambient sound level readings taken in the late evening. The sound of the burn accounts for the higher level down the centre of the map. Other prominent sounds, creating circles of higher intensity, were an electrical hum, voices and amplified music.

maritime. From the world's first civilizations, born on the deltas of the Nile, Tigris or Yellow Rivers, right down to the most modest settlement, water, in one or more of its myriad transformations, was an omnipresent sound in community life. That the sounds of water are so frequently mentioned as among the most pleasant in sound preference tests can be explained in this way. It is more than aesthetic preference that is expressed here, for water is necessary for life and its sounds reassure us of the continuity of existence.

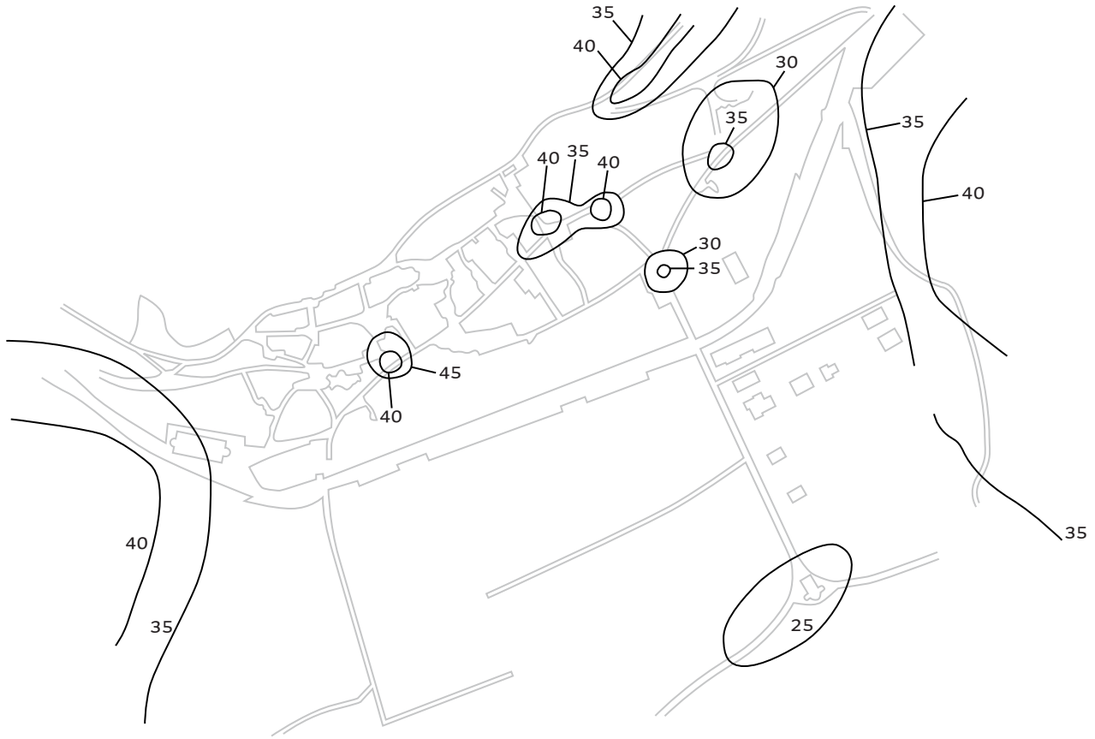
Settlers with heroic aspirations choose the banks of broad rivers, lakes and oceans as sites for settlement. From here they can travel out to explore, trade and conquer. More humble settlers are content to live at the edge of a stream, requiring only water to drink and to wash in, with perhaps enough to power a mill.

Three of the villages are situated on streams. Of these the largest and loudest is the Dollar Burn, for it tumbles through a steep narrow glen down from Castle Campbell, dropping over ledges in little waterfalls, cascading around rock outcroppings and over pebbles, swirling into caves and through deep pools, finally to broaden out momentarily at the Academy playing fields. From there it is funneled through town in a sort of canal, lined with stone walls and crossed by several humped stone bridges. Its splashing noise seems to increase here, sometimes exceeding 45 decibels as measured from the roadway (see isobel map of Dollar).

There is a footpath up the glen to the Castle and the visitor who enjoys hiking can follow the concert undisturbed for a good hour. When the footpath was formally opened in 1865 nearly a thousand people gathered and at the conclusion of the ceremony the Dollar Flute Band paraded through the streets. The Burn continues to have an attractive symbolism for its citizens. In the sound preference test we gave to Dollar school children, water sounds were rated the most pleasant and of these, the sound of the Burn was the favourite. Emphasizing the unification of an attractive soundmark with its vital importance, we note that when Dollar had a town crier, part of his job, in winter when the Burn had frozen over, was to announce the availability of drinking water once the ice had been cleared off at the fountainhead.

Unlike Dollar, Cembra, which is also situated on a steep hillside, does not have a stream running through it. But it does have a plentiful water supply in its several public fountains. Their tinkling noises are the loudest ambient sounds to be heard after the village has settled down for the night (see isobel map of Cembra). At the edge of town too, one is within earshot of the river below in the valley. Once it made a considerable noise, but since the building of a dam up the valley it has been tamed though it is still noticeable, or at least it was during the spring runoff when we were there.

Cembra is the only village in which women still wash clothes in the public fountains. We were told that they also do so in Lesconil, though we saw no evidence of this during our visit. The chief water sound in Lesconil is the sea, and isobel maps of this community show clearly how it encircles the community with its ceaseless presence, receding only as one moves well inland. The first map was made at low



Isobel map of Cembra, constructed from ambient sound level readings taken in the late evening. The most prominent village sound sources were the fountains in the public squares. Higher levels at the sides and top of the map were created by the river and sounds from the valley below the village.

tide with little swell. The second shows how a bigger swell and brisk westerly wind can push up the sound of the sea by 10 or 15 decibels. When we gave Lesconil school children a sound preference test, the sound of the sea was their favourite.

Bissingen and Skruv are also situated on streams. Even before the village of Skruv came into existence there was a flour mill there, dating from 1840. Little by little the mill moved the centre of gravity away from the Ljuder church, down to where the waterflow was sufficient to keep the paddles turning and the millstones grinding.

The story of water needs to be told in two parts. If the first part consists of the element's natural sounds, the second introduces a wealth of transformations, when water is poured, stirred, paddled or boiled. Many different kinds of manufacturing processes were annexed to water in the ancient community, and they in turn gave rise to a whole new vocabulary of signals and keynotes. Mills provide a great variety of such sounds. In our villages we encounter flour mills (Skruv and Bissingen), a saw

Wash day, Cembra

mill (Skruv) and a bleaching works (Do1lar), all situated on streams.

The acoustic differences between mills were considerable. The aged miller at Bissingen told us that the stream dropped sufficiently there to allow for an over-driven wheel, rather than a paddle wheel, which was equally popular. The millstones were rather quiet in operation. It was the shaking of the bin that produced the biggest noise, especially when grain was dumped into it from a large metal scoop, an action that used to be performed by hand. The last mill wheel in Bissingen was dismantled in 1960, and a gas turbine was substituted, so that, although it continues to operate, the gentle splashing of the paddle wheel has been replaced by a flat-line drone.

In Skruv both the flour mill and the saw mill, also powered now by new forms of energy, have moved away from the stream on which they were once situated. By contrast, Lesconil once had several windmills, which were quite noisy in operation. "Rack-rack-rack-rack!" was the way one inhabitant described the sound of the wooden sail-frames buffeted by the wind.

As the world modernizes it seems to move away from water, at least in its natural form. We can observe this happening in our villages. One by one they have retreated from the public fountains, as running water has been piped into houses. Dollar was the first to be provided with the modern amenity (1867). Lesconil followed in 1918, though in Cembra it did not begin to happen until 1938, and the transition is still not complete. In Bissingen the town council put an end to the public fountain (except perhaps for the watering of animals) in 1950 when they established a public laundromat with electric washing machines. Even the annual custom of washing sheep in the stream has died out (the bleating could be heard al1 over the village).

An abandoned windmill near Lesconil.

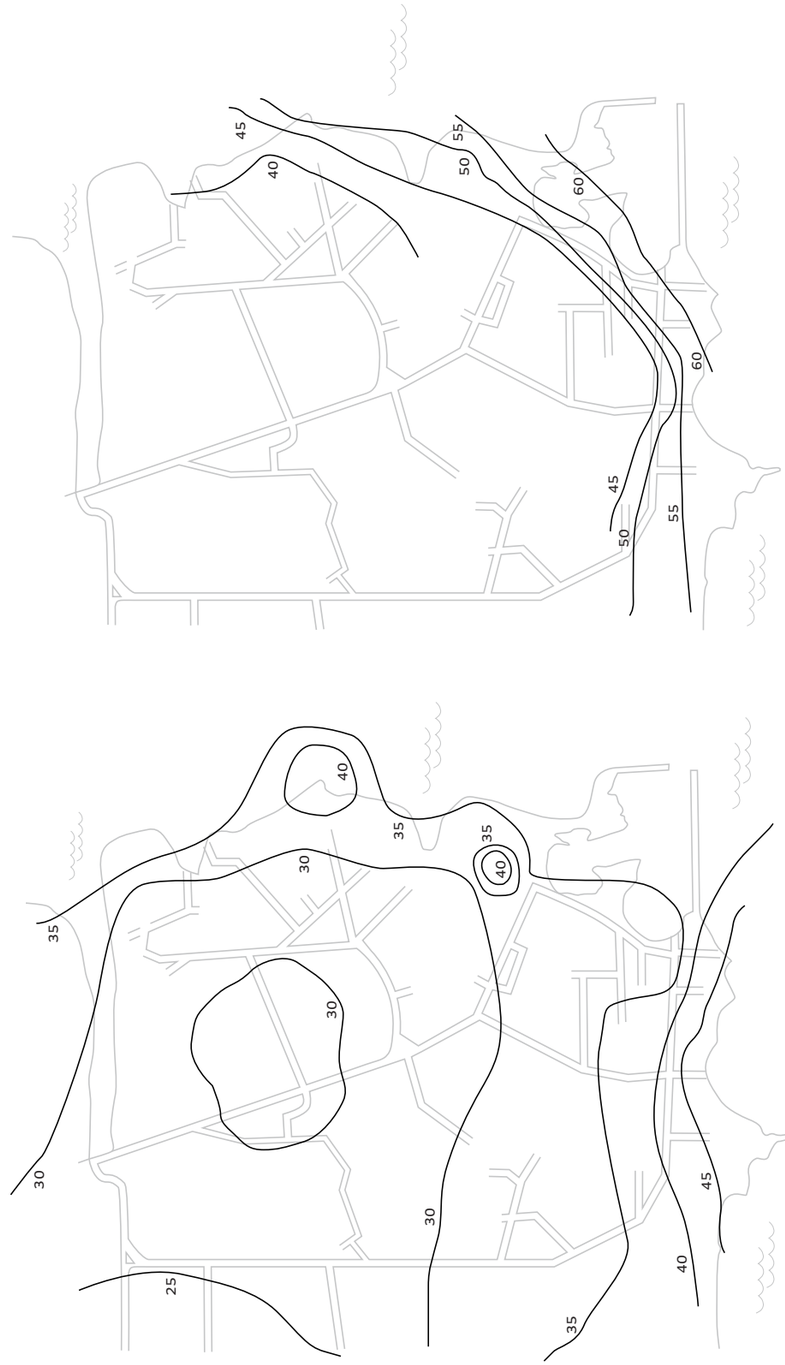
Today, as before, there are three public fountains in Bissingen, outside the Gasthaus Adler, the Gasthaus Ochsen and the Gasthaus Hirsch. They are there for the animals. But the last horse and wagon disappeared from Bissingen in 1972 and cattle are now seen only rarely in the streets.

Finally the modern town seems to turn its back on water. In both Skruv and Bissingen the streams have been covered over in the central part of town. They now run beneath the widened streets. In Dollar, where the original town lay around the Burn and to the east of it, the new town has been regrouping since the nineteenth century so that it now hugs the banks of the A91 highway, which forms the contemporary and more ambivalently appreciated keynote of the community soundscape.

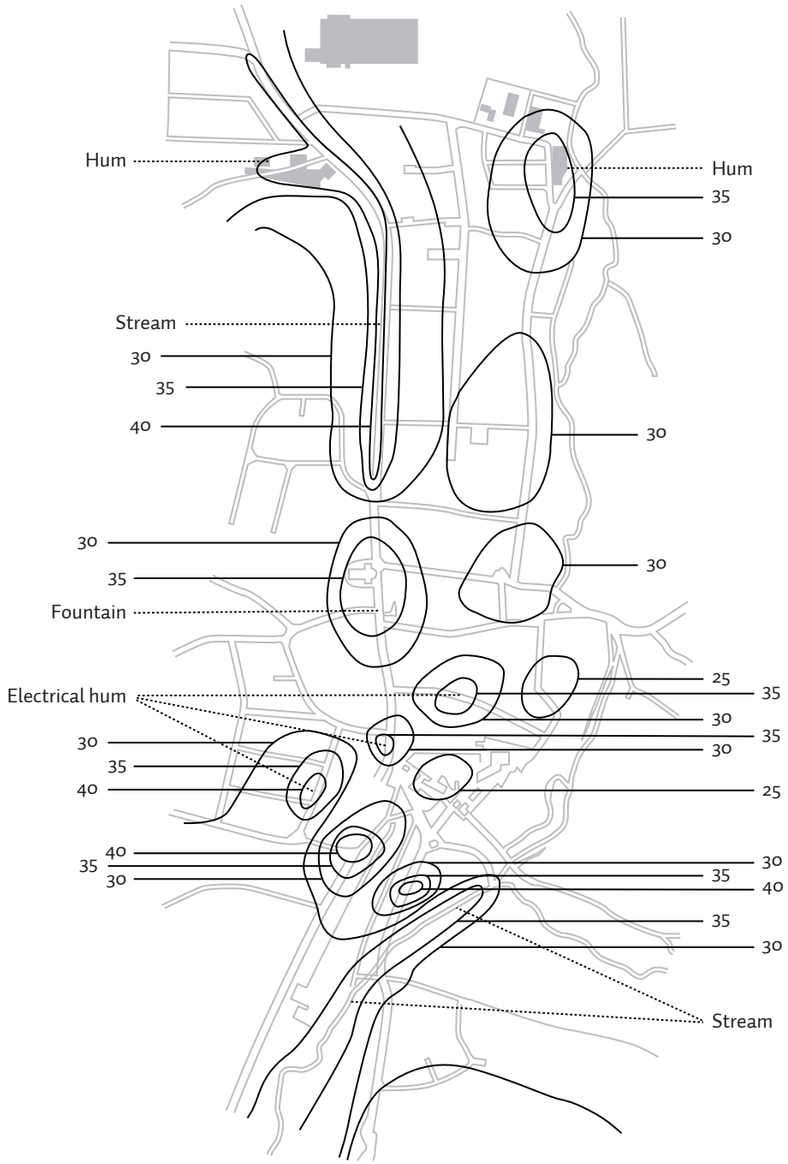
Unlike water, stone does not make a sound on its own; rather only when brushed, chipped, scraped or crushed. Like other building materials, stone also affects sound by reflecting and refracting it in different ways, producing variations in soundscape ambience. Some of these qualities will be explored in the following paragraphs.

One of the most common sounds in all community life is that produced by the wheels of vehicles in contact with various road surfaces. Today village life, like life everywhere, is dominated by the sounds of motorized vehicles with rubber wheels. But this is a modern transition and it is not yet quite complete. Originally the road surfaces in all our villages were dirt or mud and the vehicles were wagons or carts, drawn by animals. Even the bicycle did not arrive until the end of the nineteenth century (Bissingen 1898), thirty years after its invention, because the road surfaces were not suited to it.

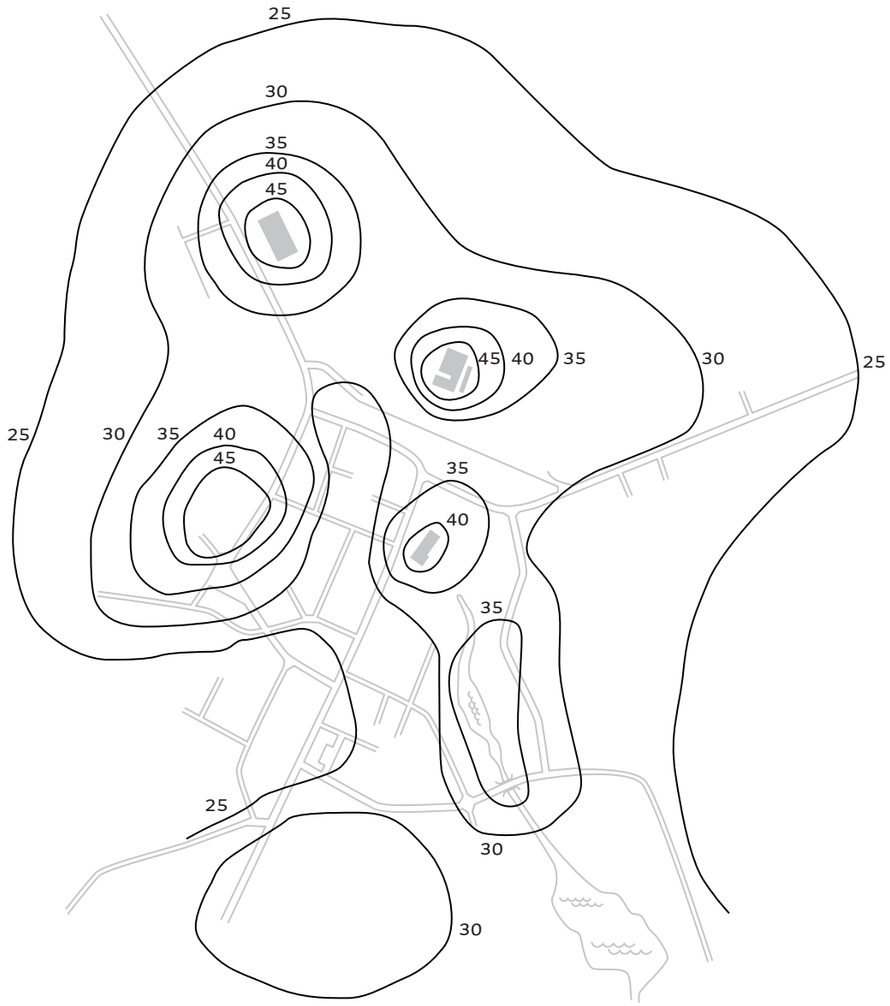
The first improvement in road material was frequently gravel (Skruv, Bissingen,



Isobel maps of Lesconil, constructed from ambient sound level readings taken in the late evening. The first map shows the pattern for a calm evening, the second when the wind is creating waves along the beach.



Isobel map of Bissingen, constructed from ambient sound level readings taken in the late evening. The prominent sound sources marked include hums from the factories and water sounds from a fountain and the stream.



Isobel map of Skruv, constructed from ambient sound level readings taken in the late evening. Prominent sound sources included the hums from the factories, shopping plaza and the sound of the stream.

Lesconil). In Bissingen we were informed that during the early decades of the present century, boulders were piled at intervals along the sides of the streets. When the roads became muddy, poor people or schoolboys were employed by the town council to chip them up into gravel, which was then flattened out by a steam roller. In fact, the sharp impact sound of mallets chipping stones must have been one of the

important keynote sounds of all communities in the past, comparing with that of the blacksmith's hammer. (In our villages the stone mason's hammer would have been especially prominent in Lesconil and Dollar.)

In Dollar, many of the roads were macadamized during the 19th century. The technique, invented by John McAdam, consisted of compacting into a solid mass successive layers of stone, broken into pieces of nearly uniform size. In Dollar the stones are about the size of tennis balls and a few of the roads and many of the pathways are still composed of them. Interviewees in Dollar mentioned the distinctive sound-memory of iron-wheeled vehicles and horses' hooves on water-bound macadam and the transition of tone quality as one left the village for the country lanes. During the present century, gravel gave way to asphalt paving in four of the villages (see Figure 20). Cembra has retained cobblestones on many of its side roads, though in 1960 the principal streets were repaved with flat brick-like stones, often in fan patterns.

Cobbled back street in Cembra.

The differences in sound quality between rounded and flat cobble is as noticeable as that between gravel and pavement; and even among the asphalted roads, there are detectable differences between the smooth surfaces of Skruv and the rough asphalt of Lesconil, if not under wheel, at least under foot.

Newly cobbled road in front of the Municipio (Town Hall), Cembra.

A great variety of boots and wheels have moved across the streets of the different villages. In the little museum at Ljuder, there is preserved an old cart with heavy wheels made of rough-hewn wood in four sections:

Contrasting with this is a special type of wooden cart, still occasionally used in Cembra. Because of the very steep roads these carts are provided with an unusual braking device, consisting of two heavy beams dragged behind the wheels and fitted with crossbars on which wood from the hills is loaded and brought down the back streets of the village. The scraping and rattling sounds produced by these carts once provided the village with a unique sound, and in our Sound Preference Test, school children remarked on it.

The majority of wagon wheels would have been fitted with iron rims in all villages. Bissingen, for instance, used to have a wagon master and a cooper as well as three smiths. The sound of animals, shod and unshod, can only be surmised, but Bissingen apparently heard a unique two-toned effect, for its horses and cattle were shod on one side only in order to keep the hooves in a healthier condition. The shoes were changed around periodically.

The last horse-drawn vehicles have left four of the villages now, the most recent being Skruv in 1970 and Bissingen in 1972 (see Figure 18). In this respect it is somewhat surprising to discover how much children in Skruv approved of horses' hooves, while in Bissingen they seem to have passed with scarcely a notice. Only in Cembra can one still hear carts, drawn by horses or oxen. Lesconil seems to have been a village (almost) without wagon wheels. In the past, when it was very poor, there was only one horse in town, owned by the fish dealer. Everyone else walked.

Human feet on road surfaces once provided considerable sound variation in the five villages and to a certain extent it still does. In Bissingen hobnails were used in everyday footwear and a charming picture of a school class from the early decades of the century shows a row of little boys sitting, feet outstretched, showing the soles of their boots covered with hobnails. A small detail in the altered Sunday soundscape of village life was that "Sunday best" included shoes without nails. The same custom existed in Lesconil, where, on confirmation, each child was given a pair of leather shoes (much too large, with the idea that they would grow into them) for Sunday use only. The normal footwear in Lesconil was *sabots* (clogs) and they are

A side street in Lesconil.

still worn by most of the older men. The custom will probably pass, however, for the local clog-maker died in 1970 and no one has followed him in his profession. Though they certainly sound differently from modern shoes, we found it interesting that none of the school children we interviewed gave them special attention. On the other hand they did express a liking for *claquettes*, a type of wooden slipper worn by the women in summer. We could only imagine the sound of *claquettes* on tile or stone cottage floors, for we heard none during our visit. On the other hand, to round off our consideration of characteristic stone sounds, Lesconil children expressed a strong dislike of the sharp impact of the gun used to fire nails into concrete, a recent acquisition to the village soundscape, but probably destined to be heard more frequently because of the building materials used there.

All building materials affect the acoustic ambience of a community. Flat stone or concrete provides the clearest reflection of sound, though a great deal also depends on the placement and height of the buildings, the width of streets, and the number

Narrow alley in Cembra.

and type of open areas between them. From our notes we can make the following general observations about the character of the streets of the five villages. See Table 6.

From Table 6 it is obvious that Cembra, with its taller buildings, narrowest streets and few open areas, should produce the greatest amount of reflected sound. Bissingen, Lesconil and Dollar represent a middle position. Skruv, being a much more open town suggests less acoustic congestion and overlapping. Such observations would only be true if materials and spatial configurations alone dictated soundscape character, but this is a great oversimplification. It depends largely on the activities taking place in each village. These activities and the resulting complex interjection between sounds and the community are the subject of the following chapter.

Table 6

	SKRUV	BISSINGEN	CEMBRA	LESCONIL	DOLLAR
Predominant Material of Buildings	*wood and brick*	*wood beams, covered with stucco; tile roofs*	*stone & stucco*	*stone & some stucco*	*stone or stucco; slate roofs*
Height of Most Structures	*1–2 storey, a few 2–3 storey apartments*	*1–2 storey; a few 3–4 storey public buildings*	*1–4 storey*	*1–3 storey*	*1–2 storey*
Buildings Set Back of Directly on Street	*houses set back with front lawn*	*houses directly on street or set back behind compost heaps*	*directly on road in old quarter; set back in new quarter*	*1–2 meter yards on main streets; 3–6 meter gardens on side streets with stone walls*	*set back 6–20 metres with stone walls and gardens*
Average Width of Streets	*10–12 metres*	*5–9 metres*	*1.5–6 metres*	*2.5–8 metres*	*5–9 metres*
Average Width of Sidewalks	*1.5 metres*	*1 metre (when present)*	*1 metre (when present)*	*1 meter (when present)*	*1–2.5 metres*
Open Areas: Squares and Plazas	*shopping plaza, station plaza, etc.*	*none*	*church plazas, otherwise none*	*shopping plaza, harbour front*	*academy grounds*
Open Natural Areas: Parks	*yes*	*one, around small lake*	*none*	*none*	*yes*
Trees and Vegetation	*plenty of trees; mostly aspen and evergreen*	*no trees, but extensive cherry orchards surrounding village*	*no trees, vine yards on slopes below village*	*no trees at waterfront, some further back, small grove of pine in one quarter waterfront, flatland behind*	*plenty of deciduous & evergreen trees & shrubs*
Geographic Situation of Village	*flat open & forested countryside*	*in a valley; high hills on 3 sides*	*on a mountainside, wide valley across*	*waterfront, flatland behind*	*at base of hillside, open country & river valley below*

V Acoustic Definition

Throughout this document we are working toward an understanding of each community by establishing relationships between a village's life and its acoustic environment. In the foregoing sections on rhythm and materials, we were concerned with different patterns of movement, and with ambient qualities. Together they reflect processes which make up the background of village life. In this chapter we will discuss sounds of a different order, sounds such as community soundmarks and signals that are the *foreground* to the ambience of the village. These are sounds that have some specific value or function in the life of the village. We recall, for instance, how in earlier times the sound of the church bell served to delimit parish boundaries, or how the human voice once carried fire distress calls throughout a fair-sized European town such as 18th century Vienna. Such sounds are typical of a highly defined acoustic environment in which certain sound events stand out in high relief to the ambient background.

The essential question in this context is: what *information*, and what levels of information, are communicated by the foreground sounds of a village? By this we mean not only the more obvious messages which certain sounds are understood to convey individually, but also the less obvious implications which these sounds have when taken together as interrelated elements of a coherent system of communication. We shall explore this concept from four different perspectives.

First, we shall consider *community sound signals* - those sounds which deliver recognized messages, such as shift whistles and church bells. These are sounds which define time and certain activities, and they are heard clearly over the entire village. Naturally though, they often extend beyond the village itself and become incoming sounds for certain other neighbouring communities. In this context they have a different level of information: their message as sounds is not important on a signal basis, defining work periods or activities, but rather it is important on a geographical basis, defining the *acoustic horizon*. This will be our second subject of discussion, the acoustic interconnections between a village and those incoming sounds which indicate its larger regional context.

Other types of incoming sounds however, constitute *sonic intrusion* (e.g. traffic, aircraft noises) and carry still another level of information. Usually they indicate nothing particular in themselves as sounds but their continued existence emphasizes the larger socio-economic context in which these villages function and by which they will perhaps eventually be absorbed. These sounds tend to mask and blur the overall acoustic definition of a community, reducing the clarity and spatial quality of its sound environment. Distraction from the centralized, tightly knit life of a village is the direct result of such sonic intrusions; by losing interest in the sounds of their community, people tend to disconnect themselves from the traditional rhythms of village life.

The question of soundscape definition would not be complete if we considered only the present day realities and ignored *historical changes*, the subject of our last theme. Change in acoustic definition of a community runs parallel to social change, and in our experience, the change in western industrial society is always toward reduced definition. Our thesis is that when a village surrenders its independence to a larger social system, the transition is marked by the disappearance of its unique soundmarks and sound events.

We will deal with the various levels of definition outlined above by concentrating on specific villages which are specifically representative of them, at the same time referring to the other villages as occasion demands.

COMMUNITY SOUND SIGNALS: SKRUV

We think of definition as that which gives order and coherence to the soundscape on the level of conscious perception, whereas rhythm and ambience, being less consciously perceived, function similarly to the ground in visual perception by giving the context for the definition.

Acoustic definition arises through foreground sounds, those which stand out conspicuously and regulate (or indicate regulation of) village life. These sounds indicate rules of behaviour and activity, articulating patterns which range from those which are universal (at least to the culture) to others which may be more peculiar to the village. Four such common patterns are work, worship, travel and consumerism, and they are all reflected in the foreground sounds of Skruv in particular. This village, with its several small industries, has grown up around the railway since 1874, and it is the sounds associated with the railway and the two largest industries which are the most significant and predominant in the village. Another community sound signal,

the church bells at Ljuder, originates 4 km. to the west, and so properly constitutes both a signaling and a geographical function, indicating the service times and also defining the westerly acoustic horizon.

Figure 21 shows the different physical areas encompassed by the signal sounds of Skruv, as estimated by villagers (except in the case of the train whistles, which we estimated). It also shows the measured intensity of several of the loudest sounds to be heard in the village.

We can interpret this information in three different ways:

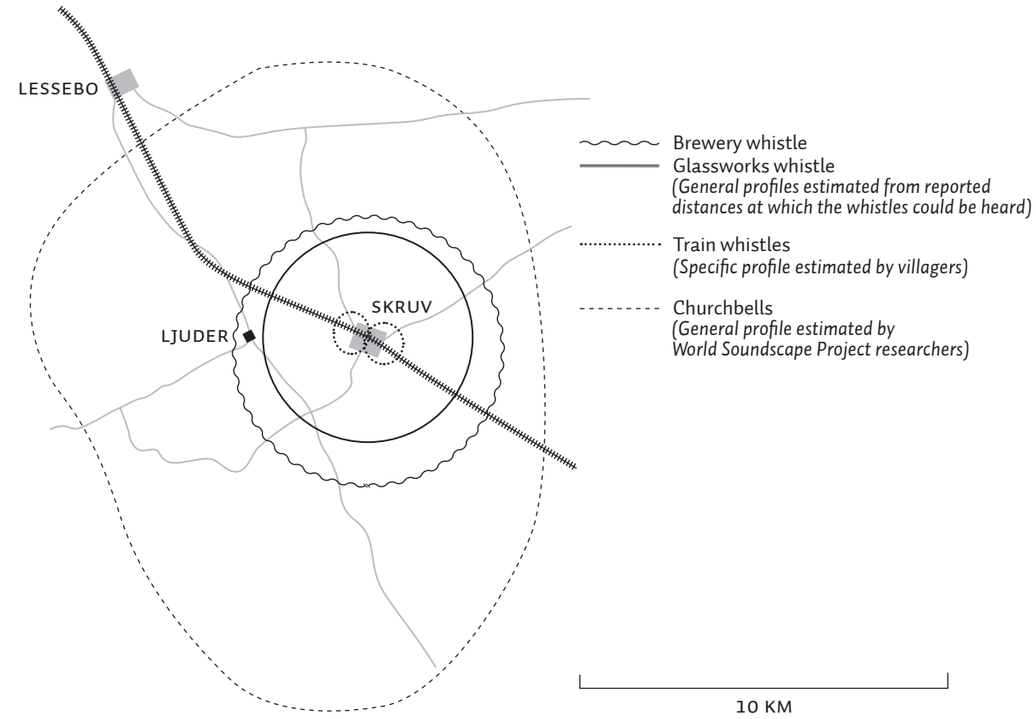
1. the largest profile (church bells) suggests the most important community sound;
2. the smallest profile is most significant, being most specific to the village area itself;
3. the map is "wrong" in terms of the measured intensity of the sounds and the most significant sound is the brewery shift whistle.

All three interpretations have interest. The measured sound levels suggest that the brewery shift whistle ought to have the largest profile, yet the acoustically less powerful church bells are defined by the villagers as spreading over a greater area. They think the bells reach farther, based presumably on what they have "noticed" but in fact this reach of the bells is probably largely a mental process that reflects the cultural values associated with the sound. Another factor could be that the church bells have a more complex pattern: they ring repeatedly and have more internal structure than does the single blast of the shift whistle. Also, the bells ring only once a week, on Sunday, when it is quieter. Although the church bells may figure larger in the conscious minds of the inhabitants, we wonder if the economic (and probably less consciously perceived) importance of the factory is suggested by the actual profile of its whistle.

The profile of the train whistles is also interesting, but for other reasons. It occupies roughly the area of the village itself, but more specifically, the whistles are blown at the outer edges of town, and thus define the physical limits of Skruv, not only by occupying its area, but also by identifying precise boundaries. These boundaries are at the edge of a fairly deep forest surrounding the village – an environment providing each whistle blast with considerable reverberation as a result of multiple reflections off the trees. The train whistles mark the physical boundary of the village, define its area, and in addition, represent its connection with the outside world. (This last function, of course, has also been taken over by those media which provide electroacoustic connections to the outside world.)

The sound of the train whistles appeared quite attractive to us personally, a reaction which was shared by some of the students in our Sound Preference Test: "The signals are very plain"; "The whistle from the train seems very lovely to me"; "In the train we sit very calm."

Before we go into this subject in more detail, we should investigate briefly the way sound signals articulate daily rhythms in Skruv, for besides giving spatial



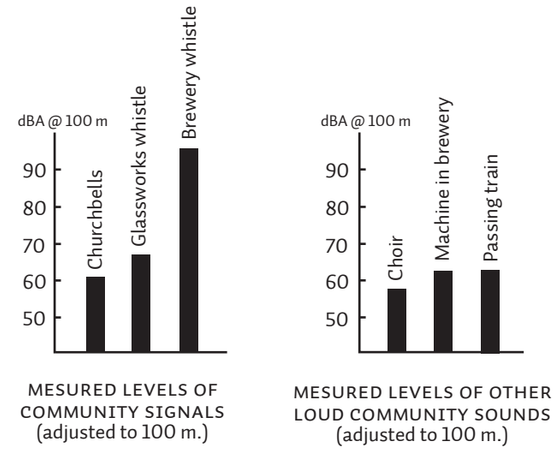


Figure 21. Acoustic profiles of the church bells, glassworks and brewery whistles in Skruv as preceived by local residents. For comparison, the estimated profile of the train whistle and the measured levels of various community sounds are shown.

definition to the community, they also mark time, punctuating the village rhythm at fixed intervals. Figure 22 shows the isorhythmic patterns created by these sounds. Together they give a clear indication of the passage of time, but the experience of time which each signal suggests is different. The factory whistle, for instance, emphasizes clock time, very mechanically marking off sections of the work day as they are completed or as they begin.

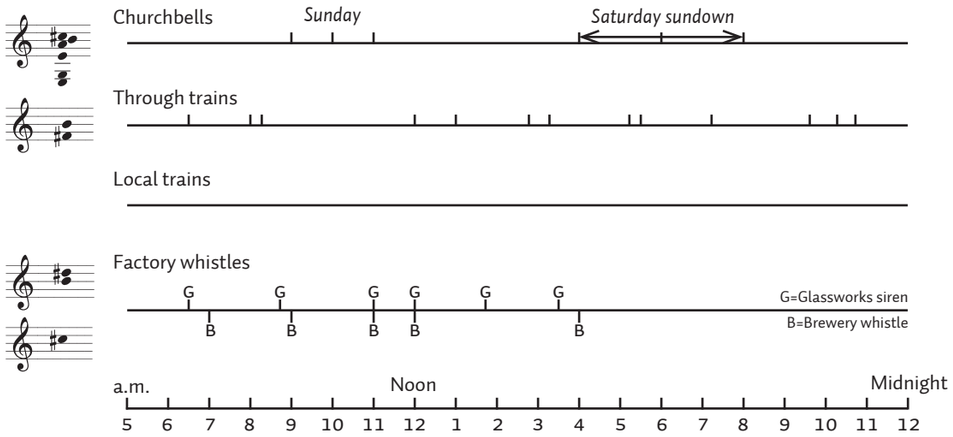
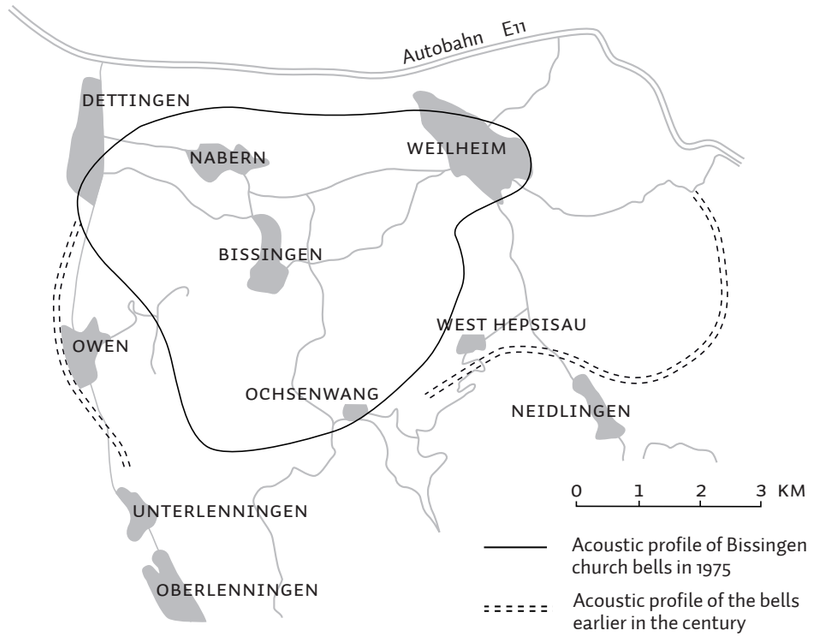


Figure 22. Pattern of community sound signals throughout the day in Skruv.

Many children found the shift whistles unpleasant, possibly echoing the displeasure of their parents, who work in the factories. The church bell, on the other hand, suggests a different rhythm, one which may be more benign. But this may be changing, as our Sound Preference Tests with school children showed: bells occurred only once as a pleasant sound, compared with 8 references to pop music. Of all the signals, the train whistles occur most often, and while they are more ubiquitous, they were generally well- liked by the students. Perhaps the train whistle suggests a possibility of escape from village ties. However, the chart indicates only the punctuating rhythms and pitches of each signal.

The chart also fails to show the very clear ambience in which these sounds appear and create their physical definition. Despite the relatively high traffic statistics given earlier for Skruv (Table 1), things are slow enough that cars and all other sound events are heard individually and clearly. *Any* sound, signal or otherwise, stands out in this village, and a good example of this is to be heard in a recording we made of the stream which flows quietly through Skruv. During this recording, which was made near the railway station, the sound of a freight train flying through at top speed failed to mask completely the sound of the stream, which



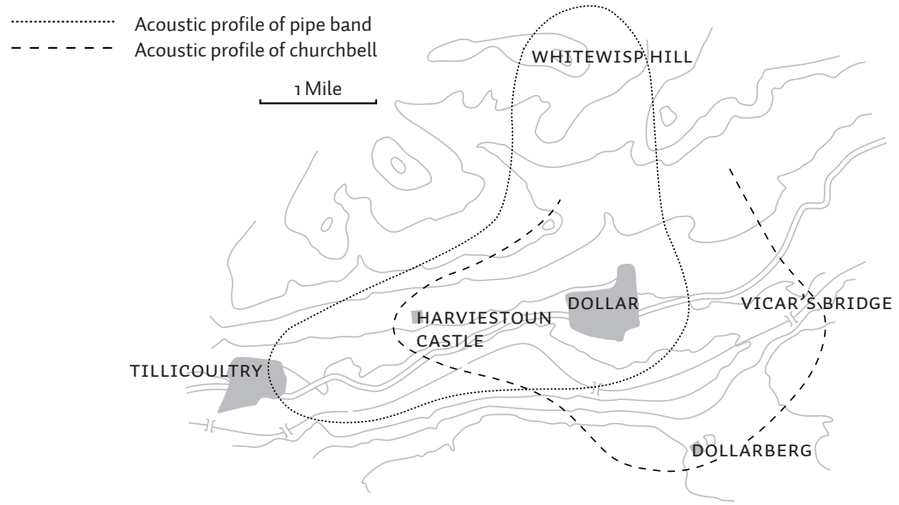


Figure 23. Acoustic profiles of the church bells in Bissingen and Dollar, and that of the Dollar pipe band.

was bright, and strong in high frequencies. Because the train's acoustic energy is centred in a lower frequency range, and because of the lack of any other masking noise in the village, the delicate sound of the stream somehow survives the blitzing of the high intensity train. The sound of the stream appears in an ambient context which allows subtle, complex and delicate sounds to stand out, and gives clear definition to individual and less conspicuous processes and events. This quiet ambience functions complementarily with the community sound signals to create a hi-fi soundscape where acoustic definition of single events is, along with the quiet droning keynotes, Skruv's most characteristic feature.

Signals in the other villages were less prominent or significant, but for comparison, Figure 23 shows the profile for the church bells of Bissingen and church bells and Pipe Band of Dollar. In the case of Bissingen, a second profile is given (dashed lines), corresponding to the pre-World War I profile of the bells.

ACOUSTIC HORIZON: LESCONIL

The community signals of one village often penetrate areas larger than the village itself, and thus are heard in neighbouring settlements. Any town might have a few of these incoming signals, arriving from various points, and thus defining an acoustic horizon in those directions.

In the ancient Indian text, the *Rig-Veda*, a primary relationship is suggested between sound and spatial orientation: "The moon was born from his mind; from his eye was born the sun ... From his navel grew the atmosphere; from his head the sky; from his ear the directions." (quoted in C.G. Jung, *Symbols of Transformation*, Princeton, Bollingen Series, 1967, p. 417). This mythological derivation could only come from a culture in which sounds were perceived with acute awareness as coming from precise points near and far. Notice also the consummate quality of the hearing function: put all the previous entities together (sun, moon, atmosphere) and you have direction, i.e. the relationship they create together in a specific context.

Listening at a distance is primarily a rural habit, and it is probably a very ancient one. In the modern city, however, most aural information comes from sounds that are near at hand, and because of their numerousness or intensity, distant sounds are rarely ever heard. Distant sounds entering a community from various directions relate the village to the region at large. The acoustic horizon created by such sounds is limited and modified by certain constraints: the intensity of the originating sound, the physical environment over which the sound must travel, weather and atmospheric conditions, wind flow, and most particularly, the ambient sound level in which these signals are heard. Thus, conditions at the source of the sound, in the medium of its transmission, and at the receiving end, all affect its audibility and quality.

In most pre-industrial societies the intensity of the originating sound would correspond to some limit of human activity: the strength of a bell ringer, for example.

Therefore, because of the human limitations in defining the acoustic horizon, it is not surprising that in those villages which preserved essential qualities of their traditional ways, few sounds appeared which were farther than a day's walking distance. This acoustic horizon would correspond to limits beyond which villagers would not often venture.

Of the five villages in our study, the French fishing community of Lesconil has the most clearly defined acoustic horizon, one which changes during the day and which corresponds to the socio-economic rhythms of the village.

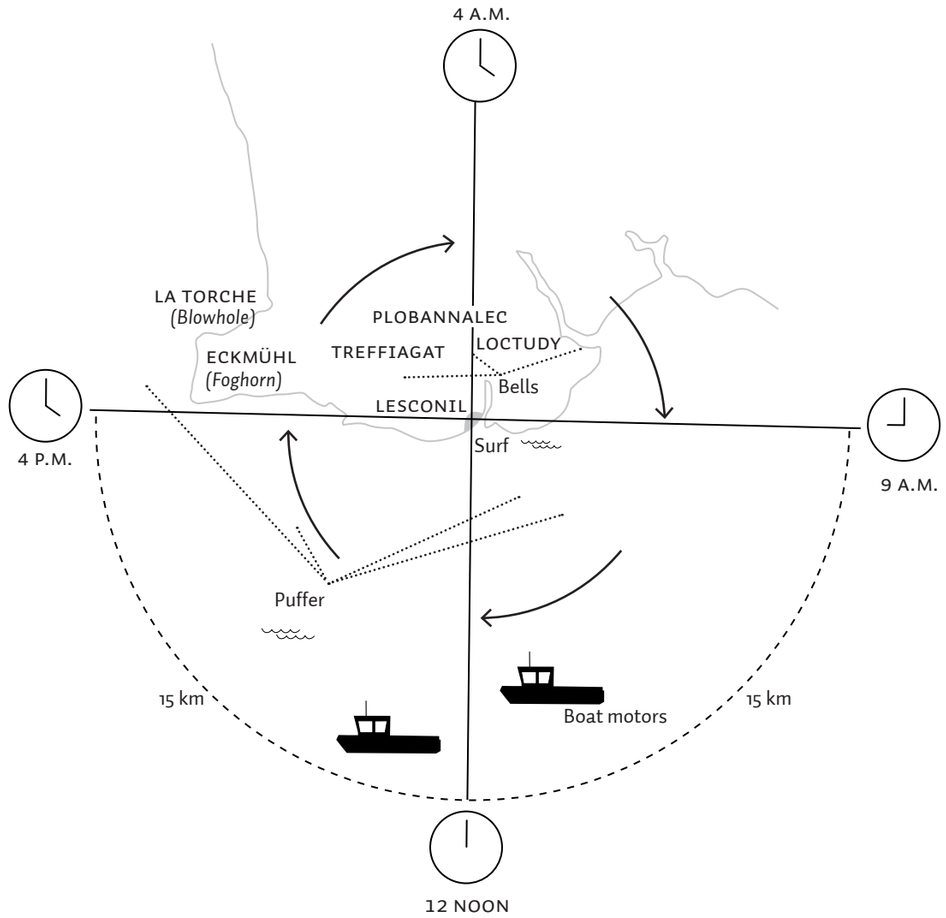


Figure 24. Daily pattern of the solar wind cycle in Lesconil showing the sound sources brought by the winds to the community throughout the day.

In chapter two we mentioned the offshore-onshore cycle of winds known as *les vents solaires* (solar winds). The daily cycle begins in the morning, when air is blowing from the north, off the land to the relatively warmer sea. As the sun rises, the wind begins to move in a clockwise direction toward the east, continuing on to the south toward afternoon, the west in the evening and back to the north again at night. Sounds are carried by these winds to the village from the surrounding communities, coast-line and open sea. Over the day a pattern is created which gives both spatial (directional) and rhythmic articulation to the soundscape.

Figure 24 shows the sequence of sounds and their geographical distribution. The interesting thing about this cycle, aside from its internal structure, is its parallel relationship to the daily fishing routine, and thus to the routine of the whole village. In the early morning when the men set out, winds blowing from the north carry land-associated sounds to the port, and so they hear the noises of activity in the fields, church bells and so on. Then in the afternoon when they return, the wind has rotated 180 degrees so that again it blows more or less from behind them, from the environment they are leaving. However in this case, the sounds of their engines are not blown out to the sea, but back to the village. The sound of the trawlers can be heard at a distance of 10 to 15 km. due to reflection from the water surface and atmospheric effects, in addition to the wind gradient. In effect the sound signals the arrival of the fleet back into port. This effect of the solar winds holds for wind speeds up to 3 or 4 on the Beaufort scale; beyond this, sounds are scattered and there is too much incidental noise for the distant sounds to be heard distinctly.

The various sounds which the solar winds bring together define a physical range which corresponds to the limits of the villagers' traditional activities. Rarely would they venture beyond Plobannalec or Loctudy. The trawlers never went further than 15 km. offshore, following the range of movement of the shrimp. (This movement, incidentally, is associated with another sound, the springtime singing of frogs, which is believed to signal that time of year when the shrimp have moved closer inland.) Of course this environmental perimeter has broken down since communication with the outside world by motor vehicle and electronic media became possible. However Lesconil has been slow in this development, not acquiring private motor vehicles until the early 1950's.

The fact that the boats have become motorized with diesel engines (1927-36) has not changed the basic daily cycle, which no doubt resulted partly from the winds themselves, as they blew sailing vessels out to sea and back each morning and evening. However, the sailors' hearing seems to have suffered from the motorization of the fleet, so that one may wonder whether the acoustic horizon of Lesconil is accurately perceived as it once was.

Apart from the summertime effect of *les vents solaires*, the southern acoustic horizon, defined at any time of year in Lesconil by the noise of the sea, contains useable and fairly precise information about weather changes. Quite simply, the

direction from which the sound of the surf or certain buoys are heard, precedes by 24 hours the weather to come from that direction. The type of weather, bad or good, is always associated with its source: south-easterly, westerly, etc. This is common information and it is supplemented by other cues, such as the presence of gulls inland, or certain atmospheric effects on sunlight. Together they form an accurate forecasting system, predicting 48 hours in advance (even ahead of barometric changes) alterations in weather conditions.

Naturally these patterns are not exclusive to Lesconil, but are characteristic of all coastal areas of the region. However, they do point very clearly to a well-defined acoustic environment which has a strong, precise relationship to the community and communicates useful information to the villagers, and to us as students of history and human settlement, about the environment in which the village functions.

Figure 25 shows for comparison the sources of various incoming sounds or Dollar and Bissingen. For Dollar, these sounds are audible only at the golf course, which rests on the slopes of the Ochil hills. Distant sounds can be heard here which normally would be masked by ambient traffic noise. The Bissingen map is more theoretical, for, standing on the hill overlooking the village, we were never able to hear any but the bells of the churches in Nabern and Unterlenningen, though we did hear trains from Dettingen. Elderly inhabitants of the village, however, claim that they used to be able to hear the church bells from all the sources marked on the map. But today one hears a new sound from outside the village, and with great regularity: that of aircraft.

SONIC INTRUSIONS: BISSINGEN & DOLLAR

The above profile maps of Bissingen and Dollar introduce the problem of interference from outside. Here the acoustic horizon of each is often simply that of automobile traffic or aircraft — sounds which do not belong in the village, and come into it simply by virtue of their inordinate intensity, which in turn is only the by-product of a mechanical process that is unrelated to the village.

> The bells are quite hopeless, there's a car every 15 seconds; I would reckon that a car within a quarter of a mile makes the bells inaudible... and I never heard anything from Blairingone at all. You'd never hear it with this traffic. (David Graham, commenting on the audibility of the Dollar Church bell, at a place on the road one mile out of town where his father once could hear four different church bells ringing together from neighbouring villages at several miles distance.)

The "noise" which the intrusions of heavy traffic or aircraft create should be understood in terms of its effects on the system of incoming and outgoing community

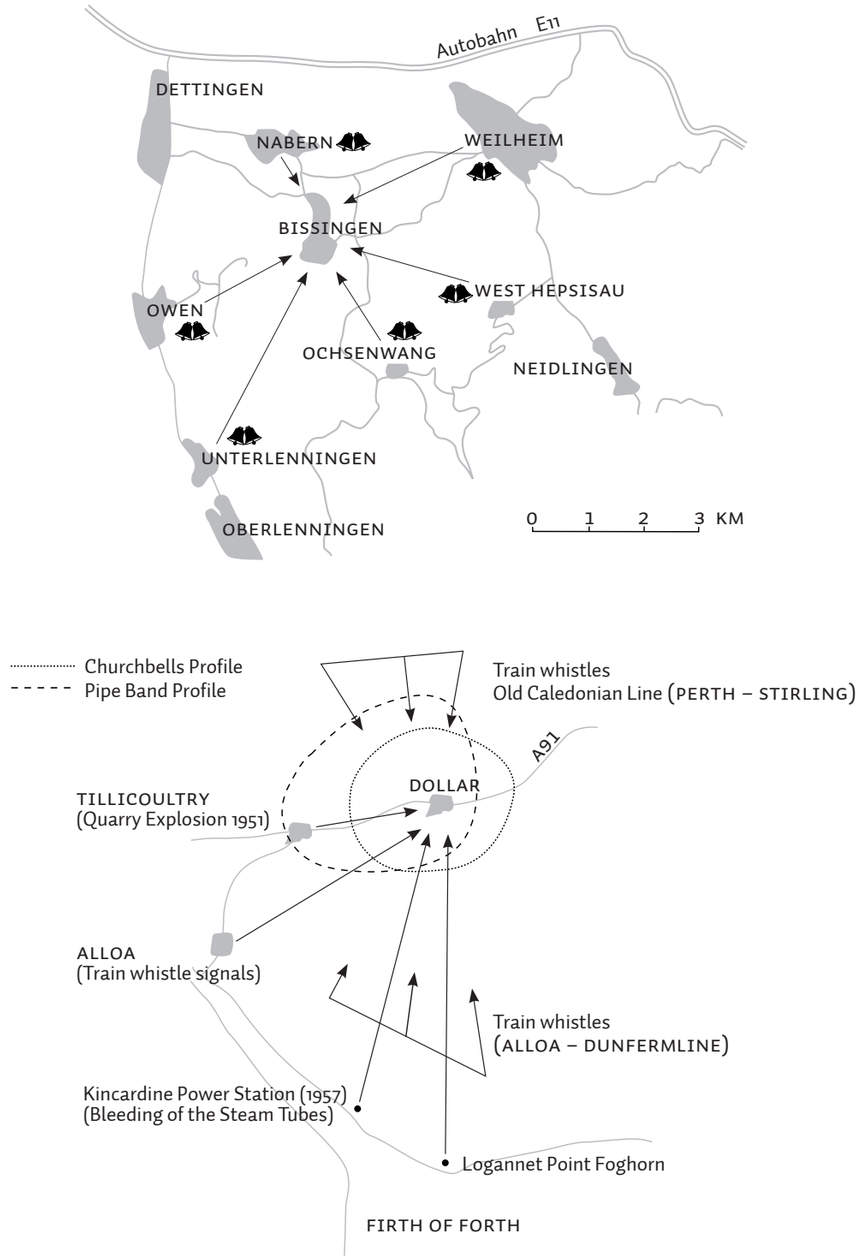


Figure 25. Incoming sounds heard in Bissingen and Dollar. In Bissingen the sounds are those of church bells from neighbouring villages. The sound sources on the Dollar map are more numerous, and can best be heard at the golf course, above the village.

signals described above. This kind of sound is continuous, compared to the relatively isolated events of local traffic. Local traffic may indeed constitute a noise factor, but it does so at another level: an individual traffic sound might interfere with other single sounds at any particular time, but because of its individual quality, it does not change the repeated pattern of the larger system of community signals audible on the acoustic horizon. However if the noise source is constant and loud or broadband, the audibility of incoming sounds may be reduced altogether or partially, over certain daytime durations. Thus, the acoustic signals which precisely define the interdependent relationship between village and surrounding region are rendered unusable, and consequently they become less clearly defined in the minds of the people. Once this happens, the relationship of the community to the region, which the perception of the sounds invoked, begins to disappear, or is replaced by centralized powers, as symbolized by aircraft or transport trucks.

One indication of the presence of ambient traffic sound is the difference between readings taken on the weighted A-scale and those taken on the less-weighted C-scale of the sound level meter. Low frequency sound is filtered out of the A-scale readings to make them correspond with the frequency response of the ear, which discriminates against low frequencies. Soundscapes heavy in low-frequency components are generally typical of both open and enclosed environments in urban industrial society. Building interiors and traffic noise alike share this characteristic, in contrast to the comparatively balanced spectrum of the natural soundscape, where C-scale decibel readings are usually no more than 2 - 5 dB higher than A-scale readings.

Table 7

Daytime Ambient Sound Level Readings
(measured at village perimieter)

	SKRUV	BISSINGEN	CEMBRA	LESCONIL	DOLLAR
dBA	36.1	40.0	35.1	32.0	36.7
dBC	51.6	55.9	48.7	45.0	51.9
dBC–dBA	15.5	15.9	13.6	13.0	15.2

Table 7 shows comparative A and C level readings of the daytime ambient sound environment of our five towns, measured at the perimeters. Especially interesting are the particularly high C levels measured on the hillsides of Bissingen. We can only speculate as to the causes of these high levels. However, one possible interpretation is that the bowl-shaped valley itself traps low-frequency noises and so possibly even remote aircraft might cause this buildup, without being visible and only barely audible.

Studies made on the hillside above Bissingen support this interpretation. The presence of high-flying jets was registered by listeners from the moment they appeared on the acoustic horizon until they disappeared. Figure 26 shows that aircraft are clearly audible over the village more than 50% of the time during daylight hours, and their inaudible vibrations may be present for more time still. The proximity of the Autobahn, less than 3 km. to the west, and of numerous other towns, which thicken as Stuttgart is approached, no doubt contributes to the rumble effects as well.

The intrusive increase of low-frequency sound and vibration into the contemporary soundscape is one of the more common, but unstudied trends in environmental acoustics. The relatively slight response of the ear to these sounds has distracted most researchers from the simple, but important fact that physical vibration affects the entire body. Over long periods of time, the physiological effects are unknown; however, we certainly know their effect at high intensities over a relatively short time: they tear tissue apart. At low intensities over the long term, their effect may be as much psychological as it is physiological.

On the perceptual level, low-frequency rumble affects one's sense of acoustic space. Low-frequency sound sources are difficult to locate, because the waves diffract easily around corners and are transmitted through walls and other surfaces. Because such sound is at the lower pitch threshold of hearing, it will not usually be consciously perceived. Therefore, while it provides the listener with little directional information itself, it also tends to mask other higher-frequency sounds which do; on both counts low-frequency sound is reducing perspective in the soundscape both indoors and outdoors, minimizing the difference between the two.

General low-frequency rumble in Bissingen, and to a lesser extent in Dollar, represents the intrusion of industrialized society into village life. This intrusion, however, also takes the form of individual low-flying military jets and the sonic booms they produce. While we were in Bissingen we heard at least one sonic boom per day, sometimes distant, sometimes frighteningly close. These are conspicuous events and are in contrast to the continuous but very quiet rumble which is in the background.

Intrusive sounds function as "noise" in the soundscape on at least three levels, depending on the system of acoustic exchange in question. One system involves those sounds which travel between the villages in a kind of circuit: the community sound signals. Another operates at the level of interpersonal exchange, and the third describes the relationship between each individual and the perceived world. In the first case, noise blurs the acoustic horizon and reduces the awareness of geographical relationships between villages. In the second case, noise contributes obviously to speech interference, although this may only come from certain main roads, such as the A91 in Dollar. Not so obvious however, is the role of noise in the third case of individual orientation. In a well-defined soundscape, the relationship between listener and environment is a highly interactive one, because most of what is heard contains useful information, often about aspects of larger patterns or cycles. Differences in

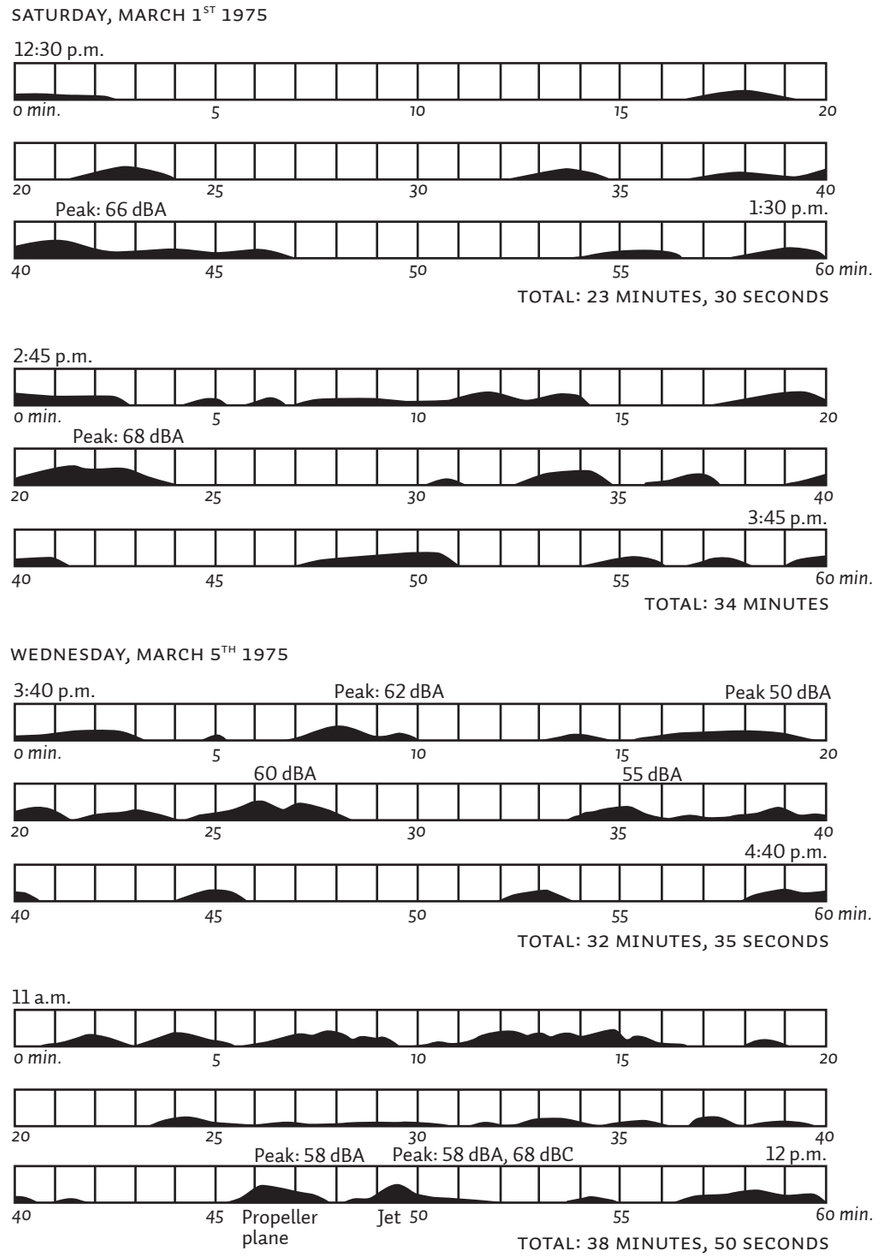


Figure 26. Time period of aircraft heard on separate days in Bissingen. The charts show both the period during which the sound could be heard and the peak sound level.

these patterns will indicate important changes. This information, by which the listener is in constant communication with the external world is extremely vulnerable to intrusive noise. Sonic intrusions raise the ambient sound level and contribute – in combination with other factors such as the electro-acoustically reproduced sound environment of radio – to the reduction of the interactive process which is at the heart of this system, converting it from an open process to a closed one. Noise in this sense works to isolate the individual from the environment.

As part of this process of change, radio and TV emerge as new "links" between listener and environment. These links may be to a larger world, but they are non-interactive. Moreover, the media are often used negatively by listeners as a way of dealing with excessive, monotonous or intrusive sound. Incoming sounds appear to be covered by a radio or TV and in the short term, the problem may seem to be solved by this technique. But in the long run, one merely hides intrusive sound by creating more of it, and the technique eventually works against itself, as the sound saturation develops. For instance, in Dollar, the observed use of background music in shops, mostly on the main street (the A91), was quite high.

Another clear effect of intrusive sounds is to obscure the definition of the natural soundscape by reducing the perceived seasonal changes which natural sounds normally indicate. The annual rhythms of village life are punctuated acoustically by certain seasonal events, and in Dollar, one such event mentioned by virtually everyone we talked to was the annual separation of ewes from lambs which used to take place on a hillside farm adjacent to the village. The young lambs were taken from their mothers and led in a flock down the hillside through the town to the train station, where they were shipped to market. On the day on which this took place, usually in July, the air was filled with the bleating of frightened and confused animals. Sheep are present year round, grazing on the hills overlooking Dollar, and their intermittent bleating is often heard in the distant background. This annual event created a seasonal acoustic focus which accentuated the agricultural life of the community.

As traffic increases on the A91, these and other events are less noticeable, but strangely enough, it is not always recognized that increased traffic noise is the reason for this. One gentleman we interviewed, who lived in a large house on the highway, regretted the disappearance of natural sounds once heard in Dollar, but did not relate this to traffic until it was suggested to him. This typical oversight points to the complete acceptance of traffic and traffic noise in our society, accompanied only by a feeling of vague discomfort about what is largely an effect of this noise.

This also brings to mind an incident in Cembra. It happened during our 24-hour recording of the village when, at 6:45 p.m., a driver pulled up to the Albergo door and left his car (an air-cooled Volkswagen type with a bad muffler) idling on the spot for over 20 minutes. Those of us living in cities may not fully realize the effect of this; in the quiet of the early village evening, the effect was shattering. The measured sound level of the engine was 73 dBA (87 dBC) at 15 feet in an ambient level of 35 dBA (40

The village square in front of the Albergo Cembra, where a 24-hour recording was made on Easter weekend.

dBC). The intruding noise filled the square with such an amount of sound that any sense of acoustic space was severely distorted and shrunken. Sounds which should have been audible across the village were hidden by a wall of noise which resulted in zero audibility. The altered state of the soundscape could only be described as a temporary environmental psychosis.

Events such as this were not untypical in Cembra, and were all the more conspicuous because of the relatively 10w traffic ambience. Motorcycles, tractors, automobiles would suddenly appear out of nowhere, to dominate the soundscape completely for a moment, then disappear as quickly again. The Italians take pleasure in speeding through narrow streets and in general playing with the sound of their vehicle engines. (Italians don't simply start a car with the ignition key; they play a little rhythmic tune on the gas pedal for several seconds after the motor has caught. This pattern of revving engines became almost as recurrent an element in our 24 hour recording as the voices and bells of the village.)

Any conclusions about intrusive sounds should take into account the element of public complicity in the process, when attitudes exist which to various degrees tolerate or even indirectly encourages the presence of such sounds. The Cembra example shows that even when significant long-term intrusions are missing, villagers bring in their own, whereas in Bissingen and Dollar, the intrusions are more constant, and come from outside. However, acceptance of them is still as complete, although what is accepted by the conscious mind may be a source of conflict and stress at other

levels of behaviour. Therefore, acceptance of these intrusions (i.e. denying their intrusiveness) is just as important a problem as the intrusions themselves.

HISTORICAL CHANGES IN DEFINITION: CEMBRA

So far in this discussion of definition, we have been mainly concerned with community sound signals, because in most of the five villages it is these – or the intruding sounds which cover them – which are the main defining factor. However, in Cembra, although the church bells ring loud and clear, it is the human voice which is most characteristic. Cembra's definition is clearly human, and this emerges even more strongly as we

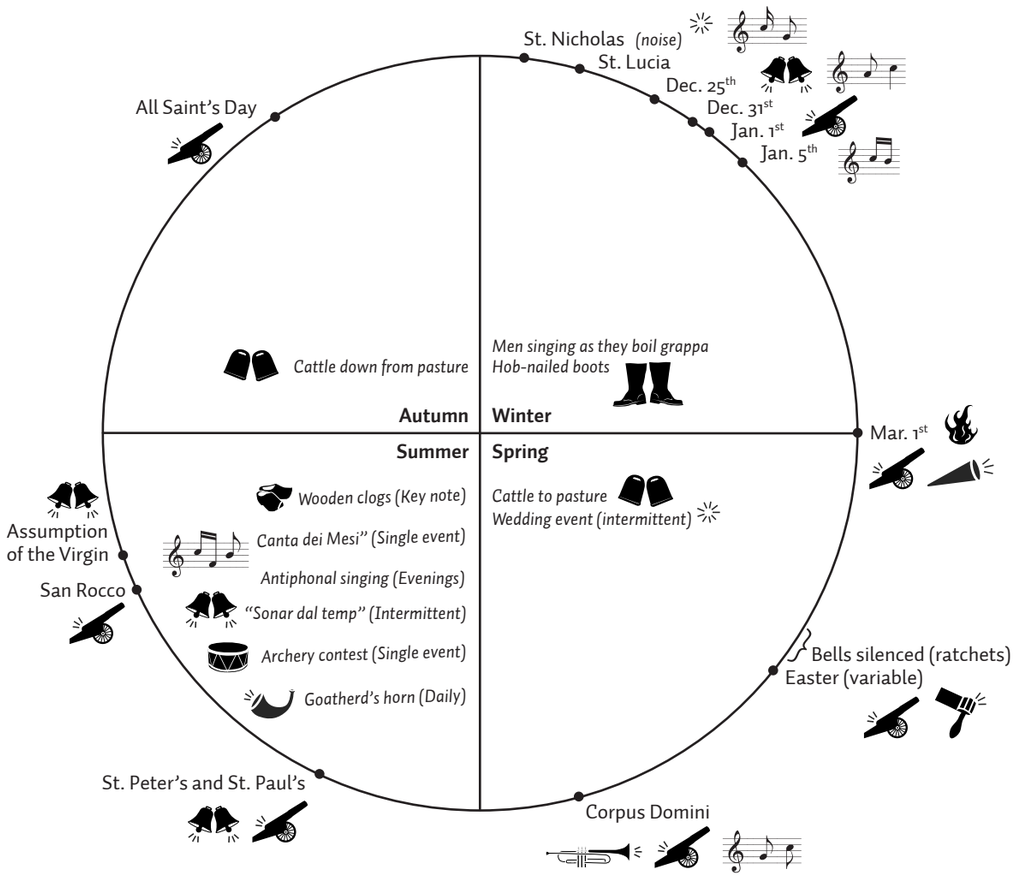


Figure 27. Traditional seasonal events and characteristic sounds heard throughout the year in Cembra.

investigate the village history, which of all our localities is richest in local folklore.

Until well into the 20th century, Cembra was virtually self-supporting. The village produced all of its own food, goods and services, and there was apparently very little exchange of any kind with the outside world. Probably as a result of this isolation and independence, the village developed a highly active and self-sustaining social life. Entertainments, festivals, church feasts and other activities were plentiful, largely acoustic in nature, and followed the rhythms of village life. Figure 27 shows the annual cycle of events.

Winter

Winter was generally less active than the other seasons, for obvious reasons, but it did contain events well marked with voices, bells and cannons, and one additional element we have not mentioned: noise-making. A noise event was staged each winter on St. Lucia's and St. Nicholas' day (Dec. 5) by the boys, lasting about an hour. They rang hand bells and banged things with chains, stopping every so often to sing a verse of a song about the saints. Following this on Christmas Eve the boys would go through the village carrying nativity scenes which they had made and singing carols. In return they hoped to receive fruit and other gifts in exchange. At 11:55 p.m. on New Year's Eve, a special bell was rung for the New Year, echoed the next day with a firing of cannons. On January 5, the *Canta dei Trei Re* (Song of the Three Kings) was performed. This was a very old song, handed down orally from generation to generation, and sung after sundown by a male choir usually in the church. Men would also gather at times throughout the winter season to sing together and boil *grappa* in the streets. Women, it seemed, were excluded from these activities, and had to be content with occasional visits to the home of one of the wealthy or aristocratic families to recite the rosary together with the wife of the household.

Spring

The relative quiet following these events for the next six weeks or so was shattered on the evening of March 1 with *Il Tratto Marzo*. Crowds of youths would climb to different peaks in the hills behind the village, shooting guns and making an uproar. There they would divide into groups, light fires and using cardboard megaphones, call names of those likely to be married in the coming year. If the marriage was a real possibility, cannons were fired and the sound would boom out and echo off the hills to mark the event. If the match was only a joke, they would blow a horn instead.

A month later, during Holy Week, the church bells were silenced, and ratchets were used instead to announce services. Dating back to the pagan period, some of these devices were huge and were pushed about the streets like wheelbarrows. In the spirit of Lenten sacrifice, these loud, startling sounds took the place of the bells,

substituting their beauty with ugliness.

An amusing story is told about the Easter processions: apparently these were held each year until once in 1821, when the man playing Christ in the procession stumbled on some chestnut husks a few prankish lads had placed in his tracks as he was carrying the cross, barefoot. He swore and cursed so vehemently that the Bishop prohibited further processions from that date.

On Easter day the bells were rung once more – *El Campano*' style – and cannons also were fired. A month later, during Corpus Domini (Pentecost), the largest procession of the year was held with singing, cannons and the village band playing. In late spring, cattle which had wintered in the village would be driven up to pasture in the hills above; they all had bells, and they were accompanied by a fair number of villagers, who went along to spend a week or so together in the hills, where they would indulge in small festivities.

Summer

In summer, winter hobnailed boots were traded for wooden clogs, and the sound of footsteps – always distinct in Cembra – changed from metallic crunching to hollow wooden clops. Every day the village would hear the goatherd's horn when he took the animals to pasture each morning, and returned again in the evening. Summer evenings were also a time for group singing: men, women and children would gather in groups after supper and sing antiphonally together. One special singing event was the *Canta dei Mesi* (Song of the Months) when people would dress in costume and sing a verse of the song for each month of the year.

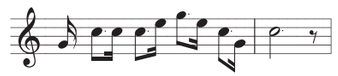
Drums could be heard during the annual summer archery contests; the drummer would signal each round of firing and the all-clear sign with a pattern which, according to one old villager we talked to, went like this:

Summer was also the time for thunderstorms. The *Sonar dal Temp* (bells for prayers against bad weather) would be rung to save the crops most often during this season.

Autumn

The principal summer church feasts (St. Peter's and St. Paul's, San Rocco's, and the Assumption of the Virgin) were followed in autumn by All Saints' Day. After all the spring and summer activity, this season was relatively restful. The cattle were brought back from pasture, bells ringing, and apart from these there were no regular

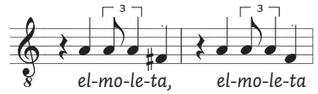
events other than the sound of the post horn, heard twice daily at 11 a.m. and 6 p.m. in Cembra until after World War I. We spoke to one old gentleman who could still remember hearing this, and he hummed the tune they played:



This pattern was blown three times on the outskirts of the village, and was heard throughout the year; other, less regular sound events could be heard at various times of the year, such as the clamour before the marriage of a widow or widower. The night before the ceremony a great noise event took place, when people would gather outside the groom's house with pots and pans, banging and making a racket until the man would make an acceptable offer of money or service to the community.

Other noise events were staged by military draftees (*I coscritti*). The boys belonged to three different groups each having its own fraternity, and each with a different date when the boys were to be drafted into service. The night before, the gang would roam the village carousing, making a racket and generally getting into trouble.

Finally, punctuating the yearly cycle of sounds every other month or so, were the itinerant knife grinder and coppersmith whose cries would be heard in the streets:



While we have no tape recorded documentation of these events, it is not difficult to imagine them from descriptions given us by villagers and from written accounts found in *Cembra e suo Folklore*, a book by a local man, G.P. Zanettin, published in 1970 by the Gruppo Folkloristico Cembrano.

Running throughout these descriptions are the sounds of voices, in song, laughter and shouting; along with them two other elements appear: bells and cannons. Directly or indirectly, the voices run through all the events, which range from the solemn to the playful; bells are associated naturally with the more serious church festivals (although if our Easter visit to Cembra was any indication there is a great deal of merrymaking on these occasions as well). Cannons were fired off for both the solemnities and the festivities, almost it seems, on the slightest provocation. These were small, 15 mm. diameter weapons, called *mortaretti*.

There is an interesting traditional relationship between bells and cannons: during wartime, bells were taken down from village churches all over Europe and melted down to be recast into armaments. After hostilities ceased, they were usually cast back again into bells. The two sounds, one of peace, one of war, have recurred alternately throughout European history for the past two or three centuries. Their occurrence together

in the soundscape of Cembra is therefore not accidental. They even occur together in the same event, such as on the Assumption of the Virgin Mary (mid-August), and at Easter. More usually though, they sounded at different times, and while we know little of the particulars concerning the actual firing of the cannons, we do know something of the patterns of bell-ringing on these and other special occasions.

There were five different uses to which the church bells were put, apart from the normal daily and Sunday ringing for mass and Angelus. Of these, three were functional, two ceremonial (i.e. part of a larger ritual process). The three functional ringings themselves worked on different levels as signals. First there was the fire warning bell: someone would climb the bell tower when fire or other calamity occurred and manually strike the clapper against the rim. This produced a distinctively different sound from normal, which suited the urgency of its purpose. All other uses of the bell involve ringing in the regular way. A second functional signal for which the bells served was to call for snow-clearing operations in the winter. Unfortunately we do not know the particular pattern used for this purpose, nor for the third type of functional ring, the *Sonar dal Temp*: during bad weather in the summer, the bells were rung to invoke prayers from the villagers to save crops. In each case, the bells were rung to summon some kind of activity, but apart from this, the activities were of quite different types, and responses to the sounds would of course vary accordingly.

This complexity of function is paralleled in complexity of form given to the ritual bell ringing in Cembra. Little or no trace of this complexity remains today, and this is typical in soundscape morphology of a trend from highly articulated and defined patterns to greatly simplified and less articulated ones. As the village developed its connections with the outside world in this century, it lost its economic and cultural independence. (A similar thing happened in Dollar, where traditionally the bell-ringers went to the lairds of the nearby estates and to the well-off villagers to solicit funds for their duties. After the Second World War, with its unsettling effects on traditional social patterns, this practice died out, and the bells, which used to ring the daily Angelus, have remained silent except for Sundays.) This important change is reflected generally in the loss of form and pattern in its acoustic environment.

The two ritual uses of the bells in Cembra were during certain church ceremonies and on the occasion of death in the village. After there were two churches in the village, an interesting bell-play developed between them during those feasts which involved processions. As the villagers processed from one church to the other, the bells of the first church would ring, then as the crowd neared the second church, its bells would ring and the first church would stop. A special ring, using a specific rhythm, followed by the ringing of all the bells together (a custom called *El Campano'*) marked the occasions of the feasts, such as San Rocco's and St. Peter and St. Paul's. Funeral bells and the *El Campano'* are still rung now, but more rarely.

The use of bells surrounding death relates to the functional uses described earlier. There were three types of ring: when death was imminent, a single bell was tolled to

invoke prayers for the person's soul; when the person died a second bell was rung, followed by another one whose pitch – high or low – indicated whether the person was male or female. Just before the funeral itself, another bell was tolled (3 times for men, twice for women); then finally the people would sing, and the bells were rung together during the funeral procession itself. Thus three different processes were involved: calling for prayers, announcing the event, and burial. Here, formal and functional complexity are deeply intermingled.

All the sounds and events described above represent an ideal point in Cembra's past. Cembra is now exclusively a wine-producing community, and is no longer economically self-supporting. It depends a great deal on the outside for food and services. This change runs parallel to the changes to the soundscape. The unique and highly differentiated sound environment that resulted from the village's independence and isolation has declined. Now, while certain elements of the soundscape remain (the voices and bells), little of its original form and structure has survived. The *Canta del Mesi* is still heard, and also the *Il Campano'*, but more rarely. Instead, the throbbing jukebox, Cembra's electroacoustic link to the outside world, pounds

Volunteer Fire Brigade, Cembra, in full dress for Easter Sunday.

out for hours each day (Sundays too) its imported rhythms. (Some day its speaker – which hangs in a comer of the room and is so overloaded with bass frequency it has become unhinged inside and rattles on each downbeat – will fall right off !) And yet Cembra is the only place where one can still hear a sound like that of the sacristan, a portly young man who rides a child's bicycle, huffing and puffing after ringing the bell or evening mass as he climbs back onto his creaking vehicle and spins off down the street into the darkness.

VI Community Attitudes to the Soundscape

An outsider's attitudes to the soundscape will obviously be different from those of a native, and the wider the cultural separation between them the greater the difference that may be expected. New sounds to the one may be timeworn to the other. The church bells which North Americans find so intriguing in Europe (our report demonstrates this obsessional interest) are sounds to which the European is habituated. Signals once, today they are perhaps more like keynotes, unconsciously overheard rather than consciously listened to. Similarly, sounds which are more novel in parts of Europe (power lawn mowers, for instance) are old clichés to the North American ear.

How do these differences affect listeners' attitudes? We don't really know. We only know that the student of culture must try to measure the culture under investigation with reference to the perceptions of those living in it.

Despite the difficulties of a brief sojourn in each village, together with the language barriers, we were determined to gather as much information as possible on local attitudes to the soundscape. This was accomplished by giving our Sound Preference Test to schoolchildren in each village and by seeking out and interviewing citizens with a special sensitivity to their acoustic environment.

We have already made several references to our Sound Preference Test. This test, which simply asked for lists of the most liked and disliked sounds in the local environment, was given in the elementary school of each village under the supervision of the teacher, usually after a brief introduction by one of the researchers in which the attention of the class was focused on the local environment as distinct from the world at large. Despite this we encountered a number of sounds which had obviously been heard on television ("elephant trumpeting" in Skruv; "lion

Interviewing an elderly Lesconil woman about the sounds of the past while she works on a piece of Irish lace.

roaring" and "beaver slapping its tail" in Cembra), demonstrating how natural such incongruities have become to the modern mind.

A general breakdown shows the sounds most frequently liked and disliked in each community. See Table 8.

The general results of this test agree fairly well with those we have conducted in other parts of Europe and North America, in particular with respect to a fondness for natural sounds and a strong dislike for technological noise. But in the present test, German school children form an interesting exception: here there is a fair division of opinion over the sounds of technology, and natural sounds are not the solid favourites they are elsewhere. Germany was, however, the only place where silence was mentioned as a pleasant sound.

In all other cases, natural sounds are high on the list, though understandably these vary according to the geographical setting and climate of each village, so that, for example, while the burn is favourite in Dollar, in Lesconil it is the sea. In fact the sea was mentioned by 39 out of 40 students interviewed in Lesconil and of these only two disliked it.

It is here that the ambiguities mentioned in the first paragraph become apparent, for the heavy and ceaseless presence of the sea was considered oppressive by our researchers (see the entries under the dateline of Lesconil in *European Sound Diary*).

Similarly in Skruv the factories and factory whistles received negative attention from the inhabitants while for us they were among the chief attractions of

Table 8

SKRUV	BISSINGEN	CEMBRA	LESCONIL	DOLLAR
22 students tested	*26 students tested*	*55 students tested*	*40 students tested*	*23 students tested*
11–13 years old	*14 years old*	*11–14 years old*	*9–10 years old*	*10–12 years old*
Most Pleasant Sounds				
birds (18)	*church bells (9)*	*birds (46)*	*sea (37)*	*birds (19)*
music (& instruments) (17)	*motorcycles (8)*	*bells (25)*	*birds (35)*	*burn (13)*
water (11)	*voices (8)*	*voices calling (16)*	*boats (16)*	*leaves rustling (13)*
horses (11)	*music (8)*	*water (15)*	*wind (13)*	*water (10)*
wind (6)	*birds (8)*	*wind (12)*	*rain (7)*	*clinking coins (8)*
rain (6)	*cars (8)*	*hammering (11)*	*fire crackling (7)*	*rain (5)*
cat (4)	*kissing (5)*	*horses (9)*	*seagulls (7)*	*wind (5)*
leaves rustling (4)	*water (5)*	*clocks (8)*	*music (3)*	
sea (4)	*siren (4)*	*laughter (8)*	*cats (3)*	
motorcycles (3)	*leaves rustling (4)*	*fire crackling (7)*	*animals (3)*	
	silence (3)	*rooster (7)*		
Most Unpleasant Sounds				
traffic & cars (18)	*cars (9)*	*door slam (15)*	*cars (27)*	*traffic (5)*
thunder (12)	*alarm clocks (9)*	*crying (14)*	*motorcycles, motorbikes (25)*	*chair scraping floor (5)*
factory noise (10)	*siren (7)*	*door creak (12)*	*boats (10)*	*screeching brakes (4)*
factory sirens (9)	*screeching brakes (7)*	*screaming and shouting (12)*	*door slam (7)*	*chalk on blackboard (4)*
chalk on balckboard (4)	*jets (5)*	*chair scraping floor (12)*	*wind (7)*	*door slam (3)*
power saw (4)	*screaming (5)*	*chalk on blackboard (11)*	*gunfire (6)*	*desks banging (3)*
gunfire (4)	*high sounds (5)*	*cars (8)*	*door creak (6)*	*rain (3)*
crying (3)	*barking dogs (5)*	*scolding (8)*	*children crying (6)*	*screaming (3)*
screaming (3)	*thunder (5)*	*insults (7)*	*storm (5)*	*squeaking (3)*
insects (3)		*gunfire (6)*	*construction work (5)*	*styrofoam (3)*

the village. Sometimes, however, our attitudes were in agreement. Thus, church bells were strong favourites in the two communities where they occurred most frequently (Bissingen and Cembra) just as to our ears also they enriched the soundscape character of these villages. Also, the vocal character of Cembra was as conspicuous to the inhabitants as it was to us. Voices calling laughing, crying, screaming, shouting; even insults and insulting words figure in the Cembra list – and only here – as examples of soundscape dissonances. By comparison, in Sweden "too many people talking at once" was cited as unpleasant. We have also noted (in chapter two) how vocal overlapping in Cembra attracted our immediate attention following our travels in Germany and Sweden.

Some of the sounds mentioned result from the predominant materials of the village. Thus, in both Cembra and Lesconil a strongly disliked sound was the banging of doors (heavy wooden doors with latches and bolts are intended) though in the other villages, where the streets are wider and the doors smaller, this sound is not even mentioned. In other cases industry creates unique sounds with strong associations. The trawlers of Lesconil are an example, but there are others. For instance, in the glass-blowing village of Skruv one student mentioned the highly idiosyncratic sound of "a truck full of glasses" and several students mentioned the sound of glass breaking.

The equivalent in Cembra would be the mountain carts used for fetching wood, which we have described in chapter four. This is only one of several strongly resonant sounds produced when stone meets wood and in the same chapter we mentioned the positive response of two students to *claquettes* sounding on the stone floors of the fishermen's cottages in Lesconil. On the other hand our Sound Preference list shows a strong antipathy in Dollar and Cembra to the sound of wooden chairs scraping on stone floors. The fact that our informants in this inquiry were all children has given rise to certain characteristic sound phobias: for instance, chalk scraping on a blackboard. Although it is not our main concern here, let us draw attention to the fact that owing to their extended hearing range, children are acutely conscious of certain high-frequency sounds (screeching brakes, styrofoam squeaking, insects chirping, etc.) in a manner that makes them unpleasant and possibly even painful. Some psychologist might profitably investigate this theme.

The information provided by the Sound Preference Test is very general and at the present stage it is only useful to confirm or contradict impressions which the soundscape researcher may have about the effect of certain sounds on those who hear them most frequently as part of their everyday lives. The only way to obtain detailed information about the affective qualities of the soundscape is to interview local citizens in depth. In each village we managed to conduct some valuable interviews of this kind, for instance, with a 94 year old Bissingen woman whose memory for sounds and ability to date them was quite remarkable. In another case we interviewed a captain who patiently revealed the effect of the solar winds on the acoustic horizon of Lesconil. Nor can we forget Yngve Wirkander's phenomenal knowledge of

birdsong in the Swedish countryside. But it is not easy to extract such information where all conversation has to be sifted through an interpreter or where the interviewer steps into subject areas involving technical knowledge of unusual vocations such as those of the vintner, the fisherman or the blacksmith.

In Dollar, at least most of the language problems were gone so we could develop our interviews to a greater depth of detail. We end this chapter with a portion of an extended interview Bruce Davis conducted with David Graham, formerly the Town Clerk for over 20 years. Although in its isolated form it contributes little to the comparative approach of our study, it does display Mr. Graham's remarkable ear and memory for sounds. The interview was conducted at different sites around the village, an approach we have found useful in stimulating the memory of earwitnesses.

Bruce Davis (right) interviews David Graham in Dollar.

THE DOLLAR CHURCH BELLS

(On the road a mile outside Dollar)

Graham: The bells are quite hopeless, there's a car every 15 seconds. I would reckon that a car within a quarter of a mile makes the bell inaudible ... and you can't hear anything from the Blairingone direction at all. You'd never hear it with all this traffic.

Davis: How many bells would you have heard in the 1920s?

Graham: My father used to reckon he could hear four church bells sounding together from this point, though I wouldn't be certain which four they were. Certainly you were aware of different bells ringing at different pitches.

Davis: But the bells are not rung together anymore.

Graham: No, where churches are sharing a minister they've got to give him time to move from one church to the other, so the bells are staggered.

Davis: What kind of traffic would you meet when you came up here as a boy?

Graham: None on a Sunday morning. Most people who had cars went to church. They just weren't on the roads then.

AT THE BLACKSMITH

Graham: This, as you can see, is the Dollar smithy. I don't know how old it is. I was here frequently in my young days about 50 years ago, and horses from a fairly wide area were brought in to get new horseshoes. With his left hand the blacksmith would pump the large leather bellows at the forge while he held the tongs in his right hand. You had different tones when the hammer was hitting the metal to be made into horseshoes. You got other sounds as well: the clomp of the horse's feet as he moved in and out. And you had the noise of the instructions being given to the horse, particularly as he was being manoeuvred back into the shafts of the vehicle. The floor was covered with old wood, and you got a different note from the horse as he went from wood to earth and from earth back to the road.

Davis: Do you recall the rhythm of the hammering on the anvil?

Graham: It went BOING, BOING, DING-DING-DING, BOING, BOING, DING-DING-DING and you could hear it over most of Dollar. The forge, of course, had its own noise as well. There was a distinctive squeak from the bellows and you could hear the air rushing through the fire. And another noise was the expression James Gilligan produced when a spark landed on his bare arm!

Davis: What time would he have stopped work?

Graham: Oh, about five o'clock. He'd be going by about half past six in the morning.

Davis: When did he retire?

Graham: I think he died during the Second World War. But even before that horseshoeing had almost ceased.

AT THE ELECTRICAL GENERATING STATION

Graham: This is where the electric supply for Dollar was generated from 1906 to 1932. Two Crossley gas engines drove direct current machines; the exhausts came out through the tin roof above us and made a very typical sound over all this part of Dollar: BOOMP, BOOMP, BOOMP. One of them used to keep going all night, and that led to a fair amount of complaint from people living round about. But I used to come down here because I liked the look of the machines when they were running and I liked the sounds they made.

Davis: Both engines were running during the daytime?

Graham: That's right. Both engines ran from about seven o'clock until six or so at night. They ran at almost the same speed but not quite and you used to get the alternative beats of the two exhausts. Then one engine would begin to gain or lose a bit on the other and the governor made it miss a beat so they were more or less where they were before. It was quite a distinctive sound and if you were in the middle of a boring cricket match over in the school playing field, you could always fill in time by listening to the exhausts of the generating station.

Inside it was the governors which made the most noise. They were the "hit-and-miss" type and you got a lot of mechanical racket from them. It used to be very interesting to listen to the governors because you could hear when they hit or missed – they gave a different note – and then you'd hear the engine slightly speeding up or slowing down.

AT THE RAILWAY STATION

Davis: What kinds of sounds did you hear at the station here?

Graham: All kinds. The steam trains were running through Dollar, I suppose about one an hour on the average. You got the noises of the locomotives themselves, and then there was a small goods yard over to this side of the station and it was visited twice a day. At half past six in the morning a train went towards the east, and he used to drop off full wagons at the Dollar siding. He would return at 11 o'clock in the morning and he used to go into the yard then, do a bit of shunting, sort out the empties and take them away. There were all kinds of shunting noises: the clash of the buffers, and the shouts of the shunters.

Some of the trains had distinctive sounds. Occasionally, fairly late in the evening, you got what was called the "Belgrove Special". That was a train consisting entirely of cattle trucks, which used to move cattle from Perth to the Belgrove sidings in Glasgow. Then you had thirty cattle trucks, each with seven or eight beasts in it. You could always hear it, and it also had a very distinctive smell!

Davis: Do you remember the station master calling the arrival and departure of the trains?

Graham: Not in Dollar. The signal box was about 200 yards from where we are standing and you could tell when trains were arriving from that. You had a bell to signal the communications from Rumbling Bridge on the east and a gong from Tillicoultry on the west. If you knew the codes, you knew what was happening with the trains. You could hear a signalman accept a train from Rumbling Bridge, and then after a few minutes you'd get the two pings on the Rumbling Bridge bell. You knew by that time that the train had left Rumbling Bridge and was entering the Dollar section, and you could follow its progress as far as Tilllcoultry from the bell signals.

There was also the very typical noise the ticket machine made, giving the date of issue of the ticket: PLIMPONK! PLIMPONK! Then you got the slamming of the doors on the carriages, the guard's whistle and the instructions from the station master to all round about.

Bringing me down here reminds me of all sorts of sounds. Just to look down the track I can remember the noise of the ganger shouting to his men when they had to reset the track on a hot day. The touch of the sun would move the rails and the ganger would bring his men down to reset the rails back on the right curvature. They would place crowbars – pincers as they're called in this part of Scotland – under the rails and on the ganger's order they would all heave together. You'd also get a man who was "walking track" going along with a hammer to knock in the wooden keys when they had been loosened by temperature changes or by the passage of trains. You see how these keys are all metal. They came later. In the older days the keys were all made of wood and you could hear the thump of the workman's boots on the wooden sleepers and the occasional knock of his hammer.

(Later, on the hill to the north of the village)

We used to follow a lot of railway operations up here. We could usually hear whistling from Alloa, about six miles away. We knew all the whistle codes and could tell when a driver was trying to get out of the siding onto the main line, or when he required assistance to help him up the incline. We also used to be very interested when we got the occasional three-cylinder engine through Devon valley. The great majority of the locomotives had double action cylinders, giving four beats per revolution, but sometimes we got a three-cylinder local which gave six. Then we would hurry down to see what was at the station before it got away again.

The WSP group in the churchyard, Dollar (Scotland), 1975. Left to right: R.M. Schafer, Jean Reed, Bruce Davis (standing), Peter Huse, Howard Broomfield.

VII Conclusion

Soundscape studies, as applied to our particular study of these five European villages, is concerned with the nature of the interaction between a community and its sonic environment. In order to establish that a true interaction exists, it is necessary to show that the sonic environment is not merely a reflection of the community, a kind of acoustic by-product, but that it functions actively in regulating community behaviour. If a community and its acoustic environment function as a system, then a change in any aspect of either effects some corresponding change in the other. In fact, it is only when we demonstrate this kind of mutual influence that our application of the term soundscape has any true significance.

Therefore, although we may begin by examining the structure of the sonic environment, we should enquire further as to its function within the entire community system. Our first task is to ascertain what levels and types of information about a community are reflected in its sonic environment and develop methods for the acquisition of such information. The complexities of this stage have largely been the concern of the World Soundscape Project to date. With this document we take the next step by treating the soundscape as a system of communication where information is constantly being interchanged between the individuals of a community and their sonic environment. That is, we attempt to combine a simple description and classification of community sounds with an explication of how they function socially. Further, we observe the conditions which result when the character of such a system changes. The kind of change we observe confronts us with the most important development known to date in terms of its power to change a soundscape, that of the technology and associated economics of the 20th century.

We will now examine the evidence acquired in this study in relation to two of the most fundamental issues of soundscape studies. First we consider how the structure of a sonic environment interacts with the behaviour of a community and the mental attitudes of those living within it. Secondly, we are concerned with the process and consequences of change within the environment that have already occurred and that will continue to occur. That is, we will examine the implications of soundscape evolution for what we call acoustic design, with particular regard to both small community and larger urban problems.

With regard to the first of these questions, we note that although every community sound reflects some aspect of village life, it is the information conveyed by certain sounds that contributes to the definition of the soundscape. *Definition* is the term we have used to describe the set of relationships between the environment and members of a community, both individually and collectively, as created by acoustic information. Thus, definition is a mental construct based on what is perceived and understood. The information on which it is based may derive from the properties of a sound itself, such as that coded or represented in a sound signal, or from the statistical pattern of groups of sounds. It is always conditioned by both the ambience which is background to the perception, and by the social and psychological experience of the individual.

For instance, in Skruv, the musical pattern of hums we noted on arrival probably affects the community's sense of definition less because of the pitches involved than because it is a constant background to daily life that reminds people of the economic basis of the village. The otherwise quiet ambience in Skruv, as we have noted, allows each sound signal to be heard clearly over a wide area. Such signals contribute both to a sense of geographic definition and to a temporal cycle of events, besides denoting major economic and social institutions within the community. The sea in Lesconil and the traffic in Dollar function similarly as keynote sounds that signify a major influence on the community.

In Lesconil, the importance of the solar wind cycle for community definition lies not in the individual sounds which it brings to the community but rather in the overall pattern of sounds as they recur throughout the day. The wind cycle seems to have favoured the community's shift from an agricultural to a fishing economy, particularly when the boats were dependent on these winds, and even now the daily pattern still correlates with the economic base of the community and brings useful information to the inhabitants. As such it gives the village's relationship to its environment a strong acoustic basis.

The effect that sonic intrusions have on the definition of a soundscape has also been discussed, particularly in terms of Bissingen and Dollar where air and motor traffic form a significant "foreign" element in the acoustic environment. Being broadband in spectrum and frequent in occurrence (aircraft were heard an average of over 32 minutes per hour on separate days in Bissingen), these sounds have considerable masking power in the environment. Geographical relationships and events in the seasonal cycle are obscured, reducing these contributions to definition.

Moreover, acoustic information normally available to the individual about the environment, and in particular, changes in any given pattern are seriously jeopardized by such intrusions. Thus the delicate chain of communication between individuals and between them and their environment is easily disturbed, if not broken. Compensating links in terms of electroacoustic media offer a substitute, but one that lacks the important ingredient of interaction found in the acoustic environment. Further, mental attitudes of complicity and acceptance of such intrusions by the community prevent any substantial reversal of the inevitable deterioration in definition.

The nature of a soundscape depends on the mental attitudes of those living within it. This presents us with the methodological difficulty of acquiring reliable information about such concepts. The Sound Preference Test is a simple indicator of general attitudes, and it has been useful in putting our own evaluations in the perspective of those of the inhabitants. However, its use should be extended to all representative age and social groups within the community. Further tests regarding such questions as sound profiles, acoustic rhythms and sonic intrusions need to be developed as well. But reactions to sound are not easily communicated by the individuals living within, i.e. habituated to, an environment. Simple questionnaires or the standard 'social survey' cannot bring out the habitual reactions or processes, many of which are so ingrained and subconscious that their verbal identification would require unusual powers of self-analysis. This situation is particularly striking in reactions involving unwanted or unpleasant intrusions (noise) where avoidance and desensitization are the common psychological means that people use to cope with these sounds. Techniques for the inference of such effects are required. We can also seek out those individuals who are extremely sensitive to acoustic information and who have a long history within the area, and compare their knowledge with our own as outsiders.

Keeping these difficulties in mind, we approach the second question stated above, regarding the nature of long-term changes within a soundscape, its consequences and implications for acoustic design. The three main criteria that emerge in our attempt to describe such change are *variety*, *complexity* and *balance*. The former two refer not only to the range and quality of individual sounds, but also to the kinds of information perceived in both the sounds themselves and in the patterns they form. Balance refers to the coexistence and interaction of such sounds in the environment with particular reference to the stability of the soundscape.

In this study we have used for the first time quantitative data other than sound level readings and spectrum analyses to support our argument. In this case, the data was derived from simple counts of traffic movements at the centre of the village and sounds heard on walks throughout the community. Although our methods need to be refined and extended to include a wider range of samples, various suggestive results have been derived from the initial data. As would be expected, the types and numbers of sounds heard in a village reflect practically every aspect of its social and economic life. Interesting differences lead to a sense of the unique character of each

village. However, another level of implication arises when we consider the correlation of traffic and sound counts. The traffic count is used as one indicator of the level of impact of current technology that also reflects the level of economic development in the community. Although more accepted economic standards may also be consulted in future, the present emphasis on traffic seems justified since it is the prime (or in the case of Cembra, the secondary) contributor to the soundscape of the community.

A comparison of motorized and non-motorized traffic counted at the village centre to the same categories of sound heard throughout the community led to an understanding of how prevalent these sound sources were in the entire area. In Skruv and Dollar, motorized traffic predominated in both the centre and the residential parts. In Cembra and Lesconil, non-motorized traffic predominated, revealing less technological impact on the community. Additional community characteristics were revealed: namely, that in Lesconil, traffic sound from outside the village to the landward side clearly dominated in the residential sections, whereas in Cembra, the presence of traffic sound dropped off toward the residential part because of the layout of the mountain village, and the containing effect of the labyrinthine streets.

When the villages were considered as a group, ranked according to amount of traffic activity, the pattern of increase in the variety of village sounds could be examined. It should be noted that since this information is normalized for population, the cause of increased traffic in one community over another has to be attributed to social and economic processes related to growth. It was seen (Figure 17) that as both motorized and non-motorized traffic increased from one village to the next, the number of sounds associated with them throughout the village kept pace (namely at a constant rate of 1:4, that is, one new residential traffic sound for every 4 additional traffic movements at the centre). This constant rate was as expected. However, the more serious question arose when we considered the growth rate of the total number of sounds heard in the community as a function of traffic increase (Figure 14). Although more data is needed to substantiate a firm conclusion, the trend indicated was that the number of community sounds dropped off with traffic growth. Our interpretation of this result, in terms of an "ecology of sounds" is that increased motorized traffic, producing high intensity, low information sounds, tends to desensitize the populace and result in less social interaction, as indicated by fewer resultant sounds. It is not merely a question that many quieter sounds are masked; this is true to some extent but since only a small rise in ambience is involved (Figure 15), this is not the only factor. We contend that the fundamental social changes taking place result in a soundscape of reduced character and variety, and that this leads to a reduced interaction between community members and the environment.

Although a highly varied sonic environment indicates a potential richness of information in a soundscape, it does not guarantee that this information will necessarily be used meaningfully by those living there. Conversely, it is quite possible that a seemingly simple sound environment can be interpreted in highly complex ways by

local inhabitants, showing that an assessment of the environment as being 'simple' merely reveals an inability of the outsider to make the same distinctions and subtle differentiation as those who depend on such information. Therefore, we see that variety itself, deriving from description and classification analysis also depends on the observer's ability to differentiate between types of sounds in the way that local inhabitants make such distinctions. In order to include this necessary attribute of the criterion of variety, we link to it the concept of *complexity* by which we refer to the types of relationships involved in the interpretation and understanding of sounds.

Acoustic complexity already begins at the level of interaction between a sound and the environment. Every subtle attribute of a sound source, its interface to the air, the type of terrain, proximity of other surfaces, and atmospheric conditions (which depend on time of day and season) affects the quality of the sound that reaches the listener. A sound brings with it a complex history of its past, and it is the ability to decode this kind of information that characterizes the competent listener who depends on this information for orientation and problem solving. Natural sounds, and vocal sounds in particular, are constantly changing throughout their duration, and therefore are capable of creating the most complex relationships with their listeners. Consider, for instance, the people of Lesconil who can interpret subtle distinctions in incoming sounds as a weather forecast, or the people of Cembra whose varied use of the voice is the basis of all social interaction.

The influence of technological sounds strikes at the basis of acoustic complexity. These sounds are generally what we call "flat-line" sounds which by their constancy of quality (as in a drone), or their broadband spectrum (as in white noise, rumbles and hisses) have little discernible pattern of interest. It is not only their often high intensity or piercing timbre that makes such sounds unpleasant to listen to, but also the redundancy of their information content. Of course, there are instances where environmental modification of sounds (as in Doppler shift, phasing and other colourations) give these sounds more information and therefore potentially more interest (note, however, that most of these effects are dependent on speed and motion). In addition, drones and broadband sounds have traditionally been used (as in mantras, waterfalls, drumming, etc.) to catalyze altered states of consciousness. However, in conventional environmental perception, the sounds of technology generally produce uniformity in the environment and a dulling of listening, if not also hearing, abilities.

The soundscapes of our five villages exhibit many symptoms of the trend towards simplicity and predictability brought about by technology, urbanization and economic development. Patterns decrease in number, variety and structure; human and natural sounds give way to technological sounds, even though these are seldom regarded as favourites on the Sound Preference Test. This evolution is largely the result of a standardization in energy sources, materials and information exchange. In Cembra, for instance, we have noted a decline in the number and complexity of social customs and their acoustic components. Fewer sounds are used that define

the community geographically, socially or culturally. Many natural sounds, water in particular, are being abandoned by most of the villages in favour of modern power sources and conveniences. Materials too, such as in roadways and housing, are being standardized such that little variety, acoustic or otherwise, remains.

The loss of such information in the sound environment is important, because it is this information which the mind uses for orientation, learning and the achievement of greater awareness. One essentially ignores that which cannot be patterned. Just as homes and buildings are designed today to be unaffected by outside changes, by means of artificial heat, light, air movement and in most cases, built-in sounds as well, so the listening habits of most people living in these closed environments become insensitive to incoming acoustic information. At one level it is a slow hearing loss, at another, a lack of inclination to listen carefully. The less useful information there is in the immediate environment, and the less one is dependent on that information, the greater the decline in listening ability. The result, we claim, is an alienation that leads to reduced social interaction and community cohesion.

Finally, the criterion of *balance*, incorporating both variety and complexity, leads us to a basis for acoustic design. However, we must first distinguish between the requirements for balance that are based on physical properties of sound, and those based on information content. In order for sounds to be perceived separately, their physical attributes of intensity, frequency range and timbre, spatial distribution and rhythmic variation must be compatible to avoid masking. Although the interaction of these variables is considerable, the general rule is that complementarity and contrast lead to the least overlap and masking. However, the type of information conveyed by the sound must also be considered and thus, knowledge of human information processing is required. For instance, sounds must be understood to be semantically appropriate within an environment for them to be perceived as balanced. (An extreme but common example is that of a radio playing in a natural environment. Even if the physical characteristics of the sound and its environment are mutually appropriate, most people will not think of them as being compatible.) An acoustic designer must have a knowledge of both the acoustic criteria and the information-processing strategies involved in perceiving balance in the organization of environmental sounds.

In the design of an environment, balance is the result of suitable constraints acting on the development of complexity and variety. An unrestrained increase in complexity could easily lead to chaos unless the structural principle of balance acted as a stabilizing force in the sense of negative feedback. For instance, in Cembra, where the greatest variety of human and other sounds predominated, the increase in variety was constrained by such natural influences as the physical layout of the village (which tended to contain sounds), the rhythm of the daily cycle (alternating peaks of activity with periods of rest), similar to the seasonal cycle, and finally, the social pattern of the village (involving different times for the men and children to leave for work and school, the women to gather for washing, as well as church

services and social gatherings). All of these constraints contribute to the balance of this soundscape where human-produced sounds predominate. To a limited extent, such a system can survive the introduction of technological sounds which are also constrained in the same way. However, once such sounds tend to dominate in numbers and/or intensity, and are no longer constrained by human energy and endurance, then the natural balance will deteriorate and eventually disintegrate. Once the factories, such as in Bissingen, operate continuously, or aircraft and traffic noise spreads over the entire community; once the differences between seasons are minimized, and the long-term organizing influence of church, family and social groups begins to weaken, the balancing process breaks down. The balanced hi-fi environment gives way to the chaos of the lo-fi environment.

We conclude our study at the point of being able to ask how *acoustic design* can be used to counteract the negative effects of technological and economic growth within a community. Our analysis of the evidence in this and previous studies has arrived at a model of the traditional village soundscape (which we presume is analogous to that of a pre-literate culture or the natural environment itself) that is rich in information and patterns of interaction. A wide variety of sounds function in a complex social interaction, and the whole system is balanced by natural forces as well as those of the social institutions which define the community. Such a system seems adaptable to considerable change in acoustic population, but not to change in the balancing or control structure that organizes it, unless new levels of control are introduced as well. With economic growth and the introduction of technological sounds, we observe both a degeneration in the variety and complexity of community sounds and a break-down in the balancing forces that once organized the community. The strength of a previously balanced soundscape does not preserve it from this kind of destruction.

It appears that such change is irreversible in the sense that no natural process will restore the original balance to a degenerate soundscape. Nothing can prevent the continual increase of sound intensity, and for the individual, noise-induced hearing loss and social alienation are the limiting responses to such an unchecked increase. Since we regard this natural "solution" as non-acceptable, we must look to the development of a scientific discipline, called acoustic design, which will concern itself with techniques for the analysis and improvement of existing soundscapes and the creation of new ones. The basis of the discipline is a concern for *behaviour* – individual, social, economic, cultural – and from it develops a study of the systematic relationships between behaviour, sound and the environment. Our analysis provides a guiding principle for the practice of acoustic design. Techniques need to be developed for *increasing variety within a soundscape, promoting a complexity of relationship and function, and establishing controls which will act to balance the soundscape on the larger scale.*

We may look first to the technology itself to determine whether it may be used to promote these goals. Since technology itself is neutral, and it is only its organization that is biased, we should look for methods of using technology to bring about

solutions. It is probably true that small scale changes may be made within the current structure of technology, but that large scale reform will only come about through basic political and social change. Thus, in order for it to be applied effectively, acoustic design must assume a political and social responsibility. Since we also recognize the dependence of the soundscape upon individual and public attitudes, we must look for techniques of analyzing and influencing these through experiment and education. The relevance of soundscape studies to music must also be brought forward since it is apparent that this form of acoustic education is not concerned as yet with environmental problems. In fact, acoustic design needs to be applied in all disciplines related to sound, and therefore professional people in government, law, medicine, planning, architecture and engineering need to be made aware of acoustic problems such that they can individually and collectively exert a positive influence.

Soundscape studies takes a positive approach to the problems of environmental sound, as opposed to the primarily negative approach of most noise studies. It seeks to make people aware of the positive benefits of sound and the listening attitude, and to encourage acoustic design as the means by which desirable improvements are made. In contrast, noise studies, as they have proliferated in the last 15 years particularly, are solely concerned with numerical and statistical representations of noise levels and correlated public annoyance. A typical result of such a survey shows the degree of public annoyance and protest given a certain measured noise level. No thought is taken for the social impact of the noise, or the long-term deterioration in physical and psychological well-being. Such studies are conducted as if the public's relation to sound were unchanging. Their results, at best, specify 'acceptable' levels of noise with no consideration of what would be a desirable environment, or how an existing one could be improved. At worst, they merely justify economic expansion that allows noise levels to increase at the slow rate (about half a decibel per year in North America) that people can adapt to negatively through gradual deafness and increased tension.

The soundscape approach concerns not only the problems of pollution, but also the larger questions of *acoustic ecology*, the balanced relationship of individuals and communities with their sonic environment. It is clear that humans cannot adapt as rapidly as changes in the environment necessitate without adapting negatively. Conscious effort must be made, therefore, both informally on the individual level of listening and making choices about personal living spaces, and formally as a non-exploitative design science, if we are to restore our acoustic environment to a humane, balanced state.

The Music of the Environment Series

no. 1 The Music of the Environment.
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Five Village Soundscapes
No. 4, The Music of the Environment Series

FIVE VILLAGE SOUNDSCAPES

CD Program Notes

These 2 CD's contain excerpts of the original Audio Cassettes that complemented the book of the same title and are thereby considered to be a part of Document #4 in The Music of the Environment Series.

FIVE VILLAGE SOUNDSCAPES

CD Program Notes

Prepared by Bruce Davis and Hildegard Westerkamp,
with additional editing by R. Murray Schafer and John Grayson.
Audio tapes edited by: Bruce Davis, Hildegard Westerkamp and Barry Truax

ORIGINAL INTRODUCTION:

To record sounds is to put a frame around them. Just as a photograph frames a visual environment, which may be inspected at leisure and in detail, so a recording isolates an acoustic environment and makes it a repeatable event for study purposes. The recording of acoustic environments is not new, but it often takes considerable listening experience to begin to perceive their details accurately. A complex sensation may seem bland or boring if listened to carelessly. We hope, therefore, that listeners will discover new sounds with each replay of the cassettes in this set.

R. Murray Schafer
Director
World Soundscape Project

SKRUV

CD 1, Track 1. Winter Images.

We begin with a series of short vignettes; it is February in the village – the ambience is quiet and clear, with most of the activity taking place indoors in homes, stores and factories. The places visited in this short overture are:

- The Glassworks (0.00–0'35): the acid bath machine & guide's commentary.
- Near the railway station (0'35–1'20): a passing train.
- Village stream (1'20–2'10).
- In a home (2'10–2'45): voices in conversation.
- The main street at night (2'45–4'05): footsteps on frozen ground, pause to listen to a bird (squealing tires?), and factory ambience in background.
- Railway station (4'00–5'15): passenger train arrives, *bop bop* of its electric motor.
- Outside the Brewery (5'15–6'30): the creek again, & Brewery shift whistle.

CD 1, Track 2. Glassworks & Brewery.

Inside the glassworks and the brewery, it is a loud day's work for many village men. Here we move through both of Skruv's main industries (2'25).

CD 1, Track 3. Home Workshop & Station Platform.

It is 12 noon, and both shift whistles can be heard throughout the village. The recordist walks, pauses, hears the bird again. Inside, at the home of the Bohman family, we hear the smaller-scale sounds of glass engraving in Mr. Bohman's workshop (2'40–4'40); he talks about his work, and what the various sounds associated with it

mean to him (4'45–5'45). The family clock chimes 11 a.m., and the scene changes as we move outside and walk toward the train station. A passenger train pulls in and idles a short while before shutting off its engines, waiting for a non-stop freight train to pass through at full speed (10'10). Then the train starts up again and pulls away into the quiet countryside (10'50). Sequence ends (11'39).

CD 1, Track 4. The Bells of Ljuder.

In this recording we listen for the sound of the distant church bells in Ljuder, 6 km away, from our hotel window in Skruv (Skruv itself has no church) to find out just how audible they are to the villagers. In the foreground are the sounds of men loading a truck and birds singing; very faintly in the background the bells can be heard, in between the louder local sounds (1'10–2'55).

In the hotel later on, we ask directions to the church to get a closer recording of these bells. The ring pattern begins with each of the three bells rung separately, then all together; it is presented here in its entirety (3'30–8'50). Then we move back again to Skruv for a last listen to the bells in the village, as the men continue working. (See Chapter 5, "Acoustic Definition" for more on this and other community soundmarks.) (11'36 total)

BISSINGEN

CD 1, Track 5. A Children's Church Service, and the Bells of Bissingen.

There is one church in Bissingen (Lutheran denomination). A separate service is held for the children here, where the first sequence begins as the offering is being taken. Coins ring in the collection trays, then the rush of voices calms down for a series of hymns and responsive readings (0'50–3'45). Outside on the street, the five powerful church bells peal a long ring (to 8'20), ending with the street sounds again; a military helicopter throbs overhead toward the end – as typical a sound now in Bissingen as the bells, birds and roosters, and one which is amplified by the bowl shape of the hills surrounding the village. See Chapter 5, "Acoustic Definition" for a further discussion. (10'27 total)

CD 1, Track 6. Bissingen Town & Country.

A weekday morning: 6 a.m. A single bell signals mass in the empty streets. Seven o'clock (1'30): the birds are awake, people are moving about, there are voices, a car, the clatter of milk cans and wagons, the sound of footsteps, and then a tractor pulls up and the driver talks with another man on the street. Just under the loud idling motor, you can hear the church bell ring 8 a.m. (5'20) as they continue their conversation.

The sequence continues with a slow dissolve to the hillsides on the outskirts of Bissingen (6'40). Children are playing near one of the farmhouses, and there is a tractor (perhaps the same one as earlier) working away in the distance. A bell rings in the village below, and the scene begins to change again: we hear the blacksmith (who is now retired) working with an assistant, hammers bouncing on hot iron in dancelike rhythms. He talks about former times, sharpens a scythe for us (9'55) and cracks one of his old buggy whips for the microphones. He explains his craft to the soundscape people, then the scene changes once more: this time to the butcher shop, located just below our guesthouse on Bissingen's main street (11'40). The men struggle with a large pig, then electrocute it, slit its throat, and slip the carcass into a vat of boiling water to remove the hide: all in a day's work.

We move back to the textile mill again, where the siren signals a shift change. After work, people gather at the same butcher shop and hotel, which becomes the village pub, to wind down the day with beer and music (14'05); this particular day was the occasion of a wedding celebration: the M.C. (Master of Ceremonies) explains the rules for a party game and dance. Finally we move out of the pub and into the quiet evening streets of Bissingen as the sequence ends (15'35).

CEMBRA

CD 1, Track 7. Cembra, Easter Morning.

During the Easter weekend, we planted our microphones behind a screened window on the upper floor of the village guesthouse overlooking the main plaza; we took a 10-minute sample every hour from midnight of Easter Eve to the following midnight. This passage from that recording takes place between 7 and 10 a.m., Sunday morning, and gives an abbreviated version of the village coming alive on the festive weekend. A heavy snowfall is melting from the rooftops, a car passes in the distance, and 7 o'clock mass is rung from St. Peter's church (one of 3 in Cembra). Footsteps appear, and the spring loaded locks of the sliding shutters covering nearby shop windows are released with loud bangs; birds, a rooster, more shutters, and by 9 o'clock the streets are filling with sounds and people. It will not die down now until after midnight. For the conclusion of this recording, refer to CD 2, Track 3. (7'15 total)

CD 1, Track 8. Easter Eve, St. Maria's Church.

In the vestibule of the church, (Cembra's newest, and the one in which most services are. presently held), St. Maria's tiny bell catches the recordists a little off guard before they move inside for the Easter Evening service. Heard under the singing are the bells of St. Rocco's church across the other side of the village (0'47, 2'15), and the recordists move to the plaza outside for a closer audit of them (2'37). People are still

coming in, and move past the microphones. The three bells die off to one, which rings underneath the four Hallelujahs sung by the congregation inside (4'10), muted behind the large wooden doors. On the fourth and final repetition, the recordists move back inside to rejoin the service. The music is sung in the old church modes, with a choir of men and boys, singing antiphonally with the congregation, a capella. A second hymn occurring later in the service (7'00) is mixed in at this point to conclude the sequence. (8'14 total)

CD 2, Track 1. Morra.

Seven a.m. Easter Monday morning: footsteps mark their way across the plaza facing the Albergo, and other things come and go – a tractor, voices, birds, a moped, a stone, more footsteps, a tin can, and a laundry truck advertising itself with amplified voice and clarinet. Boys' voices in the street transform into men's voices playing *Morra* (4'10), an illegal betting game which often causes havoc (which is why it is prohibited). Players sit opposite each other and signal numbers with their fingers in quick succession, shouting out their guess for the combined total each time. As long as one is correct, the play continues; when both are wrong, new partners enter. This game was arranged especially for us on the night of our departure by the son of the hotel keeper; it was supervised by a visiting priest who kept the language clean. Suddenly the scene changes back to boys' voices in the street, (5'45) before the recordist moves through big creaking double doors into the relative safety of the Albergo (6'30) to greet his colleagues and eat a late supper. (7'09 total)

CD 2, Track 2. Snow Games.

The higher part of Cembra reaches up the mountainside, a maze of closely spaced houses and winding lanes. This recording was made on a walk through the dense neighbourhood, listening for its moods. A fresh snowfall, together with the Easter vacation give the children plenty of time for fun, sledding down the steep curving streets. Towards the end of the sequence, the recordist moves around a corner or two to a quieter section, surrounded by the dripping eaves of melting snow. Sequence ends (5'27).

CD 2, Track 3. Cembra, Easter Evening.

The 24-hour recording concludes here: it is 4 p.m. outside the Albergo, where the vibrations of the jukebox are heard through the walls and windows. Bells ring, and an Easter Procession can just be heard from a couple of blocks' distance (0'40). Voices and cars mingle with the jukebox bass throb, and traffic builds to a wild crescendo following the conclusion of the afternoon service (ca. 3'30–4'30). A short calm is

broken by a hotel customer who parks his idling car just outside the door, leaving it running for 20 minutes, burying the 7 o'clock announcement of the recordist (6'28). Sequence ends at 8 p.m. (8'08).

LESCONIL

CD 2, Track 4. Point d'Eckmuhl Lighthouse.

This lighthouse stands a few kilometers from the village of Lesconil; its large moaning foghorn can be heard plainly in Lesconil however and it is the most conspicuous marine sound signal in the region. Inside the tower, a spiral staircase winds up a glistening tiled interior spire; sound reverberates wildly, and the blast of the horn itself – heard first outdoors, then inside, almost inhabits the place like a ghost. One of the attendants talks to us about the foghorn and how it works: you can hear the gas motor droning away from high above (1'10). It was built in 1897, and he says that nobody minds when the horn goes off. The recordist then climbs to the top, along with a dozen tourists, reaching it out of breath and exhausted. The perspective then opens out to the sea below (3'25), and we hear the horn again, with the sea in the background, birds closer up.

Once inside again (7'00) footsteps join voices on the way down, and just behind the microphones a woman is counting the steps in a whisper as she descends (there are 271). Sequence ends (8'30).

CD 2, Track 5. La Criée.

The port of Lesconil comes alive every day for the auction ("la criée") of the day's catch at the pier warehouse in the late afternoon. The boats begin to come in towards 4 p.m.; they have been gone since the early morning, after shrimp, and in the afternoon sale about 13,000 kilos of seafood will be sold and trucked out to the major inland centres. The long airhorn blast (1'51) announces the opening of the sale, and at 3'35 we move from the pier to the warehouse and walk around between 10–15 buyers who come from as far as Paris. They bid with quick nods of the head, continuously bobbing up and down as the auctioneer registers the bids in rapid fire. (See Chapter 3 for more details.) (4'52 total)

CD 2, Track 6. Bretagne Dialect.

Two men work with planes and hammers building a small fishing boat in a yard just off one of the main streets; they speak the Gallic language of Bretagne. In the song which follows (2'50), recorded in one of the cafe-bars, one of the older women of the village tells the story of a sailor and his girl. Later, in the same place, two men oblige

us with a sample of Bretagne dialect (5'25). They remark at the beginning in French (4'50) how it used to be discouraged, but that now they are proud to speak their traditional language. It must be true: real Bretagne folk music is in the jukebox, and after the conversation lapses back into French (7'20), traditionally tipsy sailors sing more traditional folk tunes (9'00). We move out to the street, and in the quiet afternoon, *Le Glas*, or funeral bell, is heard coming from the direction of the church. Then we hear the village priest, in fine voice as he preaches to his flock. Sequence ends (13'00).

DOLLAR

CD 2, Track 7. On the Road to Muckert.

The sequences on this side centre around a set of interviews with the former Town Clerk, Mr. David Graham, carried out at the same places he once frequented as a boy. Mr. Graham's knowledge of Dollar was extensive, and included detailed recollections of community sounds from his early youth. Not much escaped his attention: even details of local gates were familiar to him (0'00–1'40).

A major highway, the A91, runs through Dollar. In fact it is the main street. Outside of town about a mile, we stand with Mr. Graham next to the highway, at about the same point where he remembers his father saying he could once hear four different church bells ringing simultaneously on a Sunday morning. Our talk also took place on a Sunday morning, and we listen for what there is to hear, but observe only the single bell of Dollar church, and even that is being carried away by the wind. Congregations have dwindled and can no longer support their own minister, so services are staggered, and such soundscapes are now a part of the past. The last sound is the 'clicking' of a dead leaf as it is blown by the breeze. Sequence ends (6'35).

CD 2, Track 8. Pipe Music.

Here are three pipe tunes, played end to end during a practice session on the Dollar Academy playing grounds. The town is proud of the school band, which regularly collects top honours in the yearly competitions. This sound carries well over the townsite itself, and over to the neighbouring village of Tillicoultry, carried in part by the tall Ochil hills which run to the north of the two communities. (3'28 total)

CD 2, Track 9. The Cemetery Gate. (0'13)

CD 2, Track 10. Golf Course and Railway Station.

In conversation again with David Graham, now high above the town, on the hillside by one of the golf course fairways. From this vantage point many of the village

sounds can be heard and Mr. Graham recalls others from the past. Just as our tape was running out, he notes one further detail: the voices of the players passing by on the fairways "were not locals; the accents were English." (2'55)

Cars swoosh by on the A91 as we move back down to the town again to the site of the abandoned railway station (3'55). As children play in a nearby yard, Graham talks about the sounds that once abounded here: shunting in the goods yard (buffers, men shouting), the signal box codes (bell and gong), the ticket machine, weighing machine, the car doors unloading passengers, the guard's whistle and shouted instructions, the ganger and his crew resetting the track on hot summer days, the man who 'walked track', hammering back the wooden pegs which had become loosened (thump of boots on sleepers, the occasional whack of a key). (10'05 total)

CD 2, Track 11. Dollar Church - Special Request.

The one Sunday we had to record Dollar's church bell, something went wrong with one of our tape recorders and we asked the minister if he would have it rung again for our microphones. He declined, thinking it might be confusing. But when people heard that Dollar's bell might be the only one missing in our five village study, they rallied to the cause and we asked on their behalf whether the Minister wouldn't reconsider. He did, and this recording, made on a Tuesday morning as the postman was walking by (0'20–0'50), was the result.

Following this, the sequence continues with a visit to the church (1'25) during the Sunday morning sermon, then a quick cut to the Academy grounds (2'40) where the pipe band gets itself together for a drill practice. (4'11 total)

LIST OF EQUIPMENT USED FOR THE RECORDINGS

Field Recording Equipment

Nagra Model IV-S 1/2-track portable stereo tape recorders;
Uher Model 4200 1/2-track portable stereo tape recorder;
AKG Model C-451E Condenser Modular Microphone Systems, including:
CK-1 cardioid condenser microphone cartridges,
CK-9 interference tubes (shot gun),
C-451 E preamplifiers,
W- 17 windscreens;
AKG Model D202ES dynamic cardioid microphones;
AKG Model K-60 headphones;
Superex Model ST-PRO-B headphones.

Studio Recording Equipment

Three Ampex Model AG/350/2 1/2-track stereo tape recorders;
Ampex Model AG/440/2 four-channel (in-line) tape recorder;
AKG Model C 12A Electrostatic Microphone System;
Two Krohn-Hite Model 3100R band-pass filters;
Tascam 12:4 mixer

Analytical Equipment

Brüel and Kjaer Model 2205 sound level meters;
Brüel and Kjaer Model 4230 sound level calibrator;
Brüel and Kjaer Model 3347 Real-time Third-octave Analyzer, including:
Type 4710 Control and Display Unit,
Type 2130 Frequency Analyzer;
Model 2305 Graphic Level Recorder.

Studio Equipment

Two binaural construction microphone pistol-grips;
Bidwell Variable Speed Control Unit (for tape recorders);
Tape study unit (tape-loop playback machine).