Hearing Morse, music, mountains and heart beats

A sociology of sensory knowing

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A thesis submitted for the degree of Doctor of Philosophy of The Australian National University
This work contains no material which has been accepted for the award of any other degree or diploma in any other university, and, to the best of my knowledge and belief, this thesis contains no material previously published or written by other person except where due reference is made in the text of the thesis.

Acknowledgements

Signed: 

Sarah Maslen

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Abstract

We rely on our senses to make judgements and perform roles, whether these are mundane aspects of life such as road crossing, or the more specialised tasks of music-making and paediatric surgery. Taking the example of hearing, this thesis argues that it is useful to consider the senses as a form of knowledge, adopting Fredrik Barth’s position that knowledges are avenues through which people actively engage with their worlds. In defining knowledge and the senses in these terms, this research is an exploratory contribution to both sensory studies and sociologies of knowledge.

Based on participant observation and interviews with 92 musicians, doctors, adventurers and Morse code operators, the thesis begins by examining each epistemic community’s underlying knowledge base, before exploring their learning methods and the conditions that support the development of aural acuity. It then explores the role of the senses in expert practices, illustrating their value in decision-making, particularly in critical contexts.

This thesis argues that the senses are a dynamic and active form of knowledge that needs to be examined at the micro- and macro-sociological level, as well as across careers and lifespans. It illustrates how the senses are learnt, interactive, responsive and personal.
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Every day we rely on our senses to negotiate our environments and effectively perform our roles. Tasks that appear simple enough like crossing a road are dependent on the perception of multiple distinct and subtle cues: looking and listening for each oncoming car, truck, bus, bike and pedestrian, the feel of traffic vibrations and other nearby walkers, the smells of the environment and its inhabitants. Safety depends on perceiving these sensory indicators, and is the product of years of learning, some explicit, but mostly tacit. This sensory knowledge is perhaps the most taken for granted yet fundamental knowledge that each of us possesses. It shapes how we experience our world and, in doing so, underpins all other knowledge and interaction. It is these qualities that led Ong to suggest that: ‘Given sufficient knowledge of the sensorium exploited within a specific culture, one could probably define the culture as a whole in virtually all its aspects.’

Just as the senses inform judgements in mundane aspects of daily life, they are also critical in more specialised areas such as paediatric surgery. A decision to operate can be based on sensory judgements, rather than the more recognisable running of tests or the survey of a patient history. As one surgeon explained to me: ‘Sick kids look sick. If they look sick then they will need a surgical intervention, and you might not know necessarily what you are doing, but they just don’t look right’. In a contemporary culture of risk aversion, alarm bells may be easily rung by comments that a child may be operated on as a result of little more than a surgeon’s

feeling. An argument that I will present throughout this thesis, however, is that expert
judgements are based on consulting the world and being responsive, and the senses are a
necessary aspect of their speed and precision in decision-making. As a mountaineer put it:
'Without sensory awareness we have got nothing, haven’t we? It is kind of everything'.

Modern life has come to depend on role specialisation and expertise. This increasing
specialisation has seen a burgeoning growth of formal knowledge and formal education.
Within this education context, intellectual content has been given focus over the sensory
aspects of knowledge. It tends to be assumed that sensory aspects will be picked up as one
learns, and perhaps also that these sensory aspects of understanding might not be as
important. As I will show in this thesis, however, developing sensory acuity for particular
activities is much more complicated than simply ‘picking it up’, and much more critical than its
typical acknowledgement in learning systems and organisations might imply. Rather, it
requires the internalisation of ‘subworlds’ through new languages, knowledge structures,
formal and theoretical knowledges, people and organisations, and much experience. 3 With
these issues in mind, the questions this thesis will explore include: How does advanced sensory
knowledge tend to be positioned in different communities? How is it acquired? Can it be
taught? If so, how? Is it different in each knowledge domain? Are there commonalities? And,
lastly, what role does sensory knowledge have in expert practice?

Senses as knowledge

A crucial premise of this thesis is that the senses are a form of knowledge. This implies that the
senses are not merely a biological functionality but that they are learnt and, further, that they
can be specialised. Clear examples of learnt sensory capacities include language, ‘acquired’
tastes, and the use of sensory tools. Learners of foreign languages know well the arduous
process of learning to read, write, speak, and hear a new language. Indeed, even for a native
speaker, linguistic knowledge is constantly evolving. In the same way, tasting, smelling, and
speaking about wine is the product of exposure and, in some cases, explicit training. 4 Acquired
sensory capacities are also recognisable in cases of their extension through sensory tools. For
example, the proficient use of a stethoscope in a medical context relies on years of learning
and practice.

3 Peter L. Berger and Thomas Luckmann, The Social Construction of Reality: A Treatise in the Sociology of
4 Donald Alan Wilson and Richard J. Stevenson, Learning to Smell: Olfactory Perception from
While these examples attest to the learnt aspects of sensing, the senses are not typically conceived in these terms. Rather, the senses are often thought of as ‘natural’ biological processes, or tend to be taken as ‘common sense’. Music is one sensory subject where there is often a persisting folk wisdom that suggests that great musicians have ‘talent’, despite evidence to the contrary. Levitin emphasised the learnt aspect of knowledges that include a significant sensory component:

Music tends to run in families. But a child with parents who are musicians is more likely to receive encouragement for her early musical learnings than a child in a nonmusical household, and siblings of that musically raised child are likely to receive similar levels of support. By analogy, parents who speak French are likely to raise children who speak French, and parents who do not are unlikely to do so. We can say that speaking French “runs in families”, but I don’t know anyone who would claim that speaking French is genetic.

This comparison of music-making and language highlights how sensory learning is contested. One way that these conflicting appreciations are managed in the case of aural perception is through the distinction between ‘hearing’ and ‘listening’. These terms are often used to communicate passive and active, and unskilled and skilled aspects of the same sense.

Rodaway, for example, wrote that sound is ‘information’: ‘We do not merely hear, we listen’. Yet, as Levitin draws our attention to, arguments that some applications of the ear are learnt and others are not make little sense. We do not simply hear, see, taste, smell, and touch as we are genetically programmed to. Our senses are always acquired.

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7 For an overview of the ‘talent’ argument, see Michael J. A. Howe, Jane W. Davidson, and John A. Sloboda, "Innate Talents: Reality or Myth?," *Behavioural and Brain Sciences* 21 (1998).

8 Scholars interested in neuroplasticity such as Elbert have shown how parts of the brain responsible for, say, moving the left hand (the hand responsible for the most precision with violin playing), increase in size with practice. See Thomas Elbert et al., "Increased Cortical Representation of the Fingers of the Left Hand in String Players," *Science* 270, no. 5234 (1995). Also see Marcus Herdener et al., "Musical Training Induces Functional Plasticity in Human Hippocampus," *Journal of Neuroscience* 30, no. 4 (2010); Krista L. Hyde et al., "Musical Training Shapes Structural Brain Development," *The Journal of Neuroscience* 29, no. 10 (2009); Boris Kleber et al., "The Brain of Opera Singers: Experience-Dependent Changes in Functional Activation," *Cortex* 20, no. 5 (2010).


Until recently, the senses have received limited attention in the social sciences and humanities. However there is a growing literature that has emphasised their social location. For example, Bijsterveld’s work on noise abatement challenged the approach to urban sound control that limits ‘noise’ through legislated rules on sound decibels, on the grounds that experiences of sound as noise are not objective or quantifiable. Similarly, Berger’s ethnography of the jazz, metal, and rock scenes in Ohio gave a snapshot of how musical sounds are perceived, arguing that tonality, consonance and dissonance are not objective, but rather are ‘the property of the subject’s experience’. Other senses have also been explored in this way. Cooking and taste, for example, have been framed in terms of memory, identity, and norms and rituals around preparing and sharing food. Smell and body odours have been tied to class, ethnicity, perceptions of morality, and norms of self-presentation. It has been argued that touch preferences, too, are influenced by factors such as gender. These studies are useful beginnings for a sociology of the senses, because they highlight their social location. However, they have been less successful at translating their interests in the sensory aspects of life into ‘analytical reflection’. In other words, sociological studies of the senses have yet to establish an approach that moves from describing the senses to understanding them.

One way to socially locate the senses is to examine them in terms of their contexts, acquisition processes, and applications. This approach is informed by Barth’s argument that in order to understand differences that are often discussed as ‘cultural’, it is valuable to examine them in terms of how they are ‘constituted, produced, and used’. Central to Barth’s argument was his framing of knowledge as a ‘major modality of culture’; it is ‘what people employ to

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13 Harris M. Berger, Metal, Rock, and Jazz: Perception and Phenomenology of Musical Experience (Hanover: Wesleyan University Press, 1999), 193.
interpret and act on the world' including 'feelings ... thoughts, embodied skills ... taxonomies and other verbal models'. Barth argued that the consequence of conceiving of culture as knowledge was that it was less abstract, and it emphasised 'people's engagement with their world, through action'. This knowledge heuristic facilitates a move beyond description to an examination of phenomena in terms of their processes and practices. In this way, conceiving of aspects of culture as knowledge alerts us 'to interchange and flux', acknowledging 'globally continuous variation' in place of 'homogenised and mutually alien cultures'.

Barth's positioning of knowledge and culture can be applied to the senses. The senses are an embodied skill, they are a channel for our interpretations and practices, they are variable, and they are acquired. Finnegan has explicitly defined the senses in similar terms. She argued that sensory perceiving is 'a learned and creative process, humanly constructed rather than mechanically received and subject to differing formulation among different cultures and different individuals'. In other words, the senses are a changeable knowledge located in communities but not constrained to them. They are dynamic and personal.

While the work of Barth suggests that conceiving of the senses as knowledge may be a useful heuristic, knowledge has not typically been studied in these terms. While sociological definitions of knowledge are generally broad, research on knowledge has tended to focus on discursive and theoretical examples. Classical sociologists writing on knowledge such as Mannheim and Mills held an interest in the currents of thought that affect 'reality construction' in the public and private spheres. The natural sciences tend to be recognised most freely as knowledge, and have also come to be the object of sociologies of knowledge.

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19 Ibid., 66.
20 Ibid., 66.
21 Ibid., 66.
Inevitably, however, when knowledge is understood as located in libraries, universities, and the minds of professors, whether it is identified as specifically in the natural sciences or more broadly occurring, specific knowledges are being referred to.\(^{27}\) The senses represent one area of knowledge that has tended to escape attention. For example, while the role of social actors in the production of scientific knowledge has been highlighted, scholars have remained largely silent on the social processes that shape sensory perception as if scientists' 'observations' (i.e., seeing, hearing) are objective, neutral, and unbiased, as empiricist philosophers have argued.\(^{28}\) This thesis contends that the senses, as any other knowledge, are always socially located. They are subject to context, learning processes, and the practices of their communities.

Defining the senses as knowledge, while not common, is also not new, with a limited number of previous studies considering this relationship.\(^{29}\) Two of the most provocative accounts have been Ong and McLuhan's respective writings on literacy and visual technologies.\(^{30}\) Among the recent wave of sensory studies, Classen has argued that non-visual senses have a central role in shaping the worldview of the community in which they are dominant.\(^{31}\) At a more micro-sociological scale, Hockey's autoethnography conceived of running as an application of a dynamic self-knowledge, tied to a place as it is in a particular time, and to the position and perspective of the individual.\(^{32}\)

As is examined in the coming chapter, previous studies that have described a connection between the senses and knowledge have not analysed their processes and practices. That is, they have not examined the senses in terms of how they are 'constituted, produced, and

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\(^{31}\) Classen, *Worlds of Sense*, 121-38.

used'. Building on the work of Barth, this thesis aims to take a step in this direction. It uses the knowledge heuristic to respond to the identified gap of an analytical approach to the senses. At the same time, it provides a study of a knowledge that is often neglected in the knowledge literature.

Locating knowledge in social groups

The conceptualisation of the senses as knowledge presupposes their location in social groups. The producers and consumers of knowledge are conceived of, categorised, and referred to in multiple ways in the literature. Terms such as 'intelligentsia' and the 'scientific community' each refer to particular types of knowledge. 'School' and 'network' have also been used to conceptualise smaller groups of knowledge producers and consumers. While social contexts of knowledge are described in a variety of ways, the preferred concept applied throughout this thesis is 'epistemic communities'.

The concept of epistemic communities is useful because it fixes the focus on the social aspects of knowledge. The term refers to any group, regardless of size, locality, or means of interaction that has shared beliefs, values, and ideas that form the basis of their interaction. The specific epistemological character of the knowledge forms the basis of the group's activities, and the group has shared norms of enquiry and notions of validity. As outlined by Miller and Fox, these norms are specific to communities and are socially mediated according to their beliefs, values, and ideas on knowledge.

Furthermore, defining knowledge in its broadest of terms, as sociological approaches do, requires terminology and a conceptual framework that is flexible and inclusive. The concept of epistemic communities responds to this requirement, and has been in common usage in sociologies of knowledge and knowledge studies more broadly since the 1990s. While the

33 Barth, "Other Knowledge and Other Ways of Knowing," 67.
35 Vervoor, Knowing.
37 Ibid., 3.
term is typically used to refer to more formalised knowledge groups such as a scientific community, a strength of the term is its impartial position on the type of knowledge, and the beliefs, values, and methods of the community, rendering it much more useful for comparative analysis.\(^{40}\) This flexibility also has an implicit implication of equality: it highlights knowledges other than science using a term that has also been applied to the scientific community.

**Thesis content**

The focus of this thesis is the processes by which communities’ aural and other sensory knowledges are formed and used. This focus is in line with the arguments of scholars including Classen, who called for ‘in-depth’ investigations of particular sensory phenomena.\(^{41}\) In order to deeply examine the senses as knowledge, this research uses qualitative interviews and participant observation with four epistemic communities: musicians, adventurers, doctors, and Morse code operators. Each of these communities have specialised sensory knowledges that they use as part of their daily lives. These four communities are discussed both individually and comparatively throughout the thesis to examine their sensory contexts, communities, processes and practices, as well as to provide a set of ethnographies of people and their senses.

While these communities use multiple sensory modes, this thesis focuses on their hearing. The senses are interconnected and overlapping, leading many scholars to argue for a multisensory approach to the senses.\(^{42}\) However, they can also be studied independently, and both approaches are valuable.\(^{43}\) The decision to limit the scope of this thesis was essentially practical, as focusing primarily on one set of sensations allowed for a more manageable and detailed analysis. However, while hearing is the focus of the study, it is understood in a multisensory context. Throughout, aural perception is primarily referred to as hearing as opposed to listening to emphasise its status as knowledge.

\footnotesize{University Press, 1999). For examples of the application of this concept in sociology of knowledge, see Miller and Fox, "The Epistemic Community," 681.  
\(^{40}\) Vervoorn, *Knowing*.  
\(^{43}\) Classen, "Foundations for an Anthropology of the Senses," 410.}
To ground my findings, chapters 2 and 3 explore previous conceptual and methodological treatments of sensory knowledge. Chapter 2 examines the limited literature that has conceptualised the senses as knowledge with view to how this work contributes to the present study conceptually, and where it can be added to. This chapter then examines how sociologies of knowledge can contribute to an analysis of the senses. Having established the conceptual tools for a study of sensory knowledge, Chapter 3 outlines how these were operationalised as research questions. This chapter takes the unusual approach of describing the development of this research project, and the changes that occurred in dialogue with the literature and fieldwork. This includes a discussion of the methodological challenges for researching sensory knowledge.

The first of the findings chapters, Chapter 4, is concerned with the knowledge context of communities’ hearing. Each community communicated a set of values and ideas that guided their hearing. This chapter examines how this context influenced hearing practices. This includes a discussion of communities’ significant sounds, their concepts of ‘good’ hearing, and the variations to this knowledge that occurred with context. It both analyses the knowledge context of communities, and provides background for further discussion.

With the contexts of knowledge examined, Chapter 5 looks at the processes of aural learning and knowledge sharing. The chapter examines each of the communities through the specific aspects of the sensory learning process that they illuminate. The opening section on musicians examines the concept of a ‘normal’ soundscape, and learning ‘normal’ as a social process. Through the Morse code operators, there is an examination of the relationship between teaching methods and sensory outcomes. The adventurers highlight the strength of communities required to facilitate informal knowledge sharing, and the central role of experiential learning. Finally, the doctors facilitate a discussion into the symbiotic relationship between different forms of knowledge.

Chapter 6 discusses the practices and uses of aural knowledges through the example of expertise. As with the learning chapter, each community illuminates a particular facet of expertise. The case of the musicians highlights the broader community context in which experts operate, as well as the idea of expertise as ‘fluency’. The Morse community illustrates how expertise can be narrowly conceived in terms of professional competencies, but is often more nuanced, and exceeds the skills and levels of competence spelled out in a job description. Through the adventurers, the issue of sensory expression is explored in the contexts of articulating and formalising expert knowledge. The doctors extend these themes in an explicit discussion of the gap between expertise and professional competence, and issues of legitimacy.
An emerging theme throughout the research was the diversity within communities. In Chapter 7, I examine this diversity and its causes. It begins by looking at the competing influences that contribute to an individual’s understanding and skills, including organisational influences and local leaders. It then looks at the conditions of homogeneity within communities, and the more common realities of diversity both within a given community and more broadly. Issues that emerge here are the importance of communication, negotiation, and legitimacy.

The final findings chapter, Chapter 8, is focused on reinstating hearing in its multisensory context. As I mentioned previously, many scholars have argued for a multisensory approach in sensory studies. While this thesis focuses on hearing, this final findings chapter looks at the conceptual location of the senses within communities, and the multisensory aspects of expert practice.

This thesis makes a contribution to the literature on knowledge by considering a type of knowledge that has been given only limited attention to date. It also adds to our understanding of knowledge management and expertise by looking critically at the foundation of decisions, the building of knowledge, and organisational issues that affect learning, expertise, and knowledge management. At a broader theoretical level, it makes a contribution to the literature on the senses as well as studies of ‘culture’ by taking another step towards working through the development of sensory capacities and understandings. The following chapter examines these issues further in the context of the existing literature.
Chapter 2

Conceptualising sensory knowledge

Looking at the senses as knowledge implies that the senses are more than conduits for gathering information about the world; they are also learnt.\(^4\) The existing senses literature has not typically conceived of the senses in these terms.\(^5\) Equally, while the literature on knowledge is open to the inclusion of sensory aspects, the senses have not received sustained focus in this field of study (see Chapter 1). Following Barth, this chapter distils from these literatures conceptual considerations for a study of sensory knowledge processes and practices. Through this, it sets up the key questions that underpin this thesis.

This chapter has two sections. The first looks at the literature from sensory studies, and the second the sociological writings on knowledge. The first section focuses on the limited literature that has described a connection between the senses and thought at a grand narrative level, and the recent wave of micro scale studies that have described the senses as a form of self-knowledge. I argue that this work is valuable because it provides a foundation from which to conceptualise the senses as knowledge. However, it has fallen short of establishing an analytical framework through which to view the constitution, production, and use of the senses. The second section then turns to the more general sociological writings on knowledge. It shows how this literature has paid only indirect attention to the senses. While the senses have largely escaped attention, the field suggests important elements to consider in

\(^4\) Finnegan argues that the senses are both ‘resources’ and ‘learned’. See Finnegan, Communicating.
the study of sensory knowledge. It emphasises the constitution, production, and use of knowledge across macro and micro social scales.

Sensory studies on knowledge

Until recently the senses have been paid limited attention in the social sciences and humanities. The last decade has seen an eruption of studies that have looked at the sensory aspects of practices as various as using an iPod, building sand castles, preparing food, and cliff jumping. Sensory difference has been located in terms of time, place, and peoples, and has been shown to be subject to change as well as resistant to it. These studies have powerfully described often taken-for-granted sensory aspects of daily life. Within this field there have been a limited number of studies that have made a connection between the senses and knowledge. Studies at a grand narrative level have argued that the dominant sense in a society affects thought. These studies have attracted criticism, and in response recent work has focused on a micro scale. Of these, a small number have identified sensing as a form of

48 Sutton, "Cooking Skill, the Senses, and Memory: The Fate of Practical Knowledge."
self-knowledge. This section examines how useful these studies are for a conceptualisation of the senses as knowledge.

**Grand narratives and their discontents**

Early conceptualisations of the senses as knowledge positioned this relationship at a societal scale. These conceptualisations have tended to focus on the primacy of vision. Seeing has been considered the dominant mode of knowledge acquisition in post-Enlightenment Western societies responsible for the progress of science and ‘object-centred thinking’. Vision has given the capacity to think and develop ideas, and to ‘observe’ truth (particularly aided by technologies such as the telescope, microscope, and camera). As Jay wrote, ‘the dawn of the modern era was accompanied by the vigorous privileging of vision’ in which ‘modern men and women opened their eyes and beheld a world unveiled to their eager gaze’. The work of Foucault is an example of scholarship that has stressed the visual in the modern world. Foucault emphasised a relationship between visibility, power, and knowledge that was observed to extend from modern prisons to the ‘surveillance’ of daily life. As he contended in *Madness and Civilization* ‘madness no longer exists except as seen’.

The apparent dominance of vision has been attributed to an assumed shift from orality/aurality to literacy in processes of Western knowledge acquisition. Perhaps the greatest observer of such a shift from oral to written cultures, Ong claimed that literacy ‘gives thought different contours from those of orally sustained thought’, and facilitated the more complex, critical, and reflective ways of thinking that enabled the progress of Western civilisations. He argued: ‘Without writing the mind cannot even generate concepts such as “history” or “analysis” ... [it] is an absolute necessity for the analytically sequential, linear organization of thought’. Ong’s argument provides an example of a connection between the

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54 For a discussion see Arnold Pacey, *Meaning in Technology* (Cambridge, Massachusetts: The MIT Press, 1999), 39-57. This connection between thinking and the visual has also been drawn more broadly. For a review of these arguments, see Martin Jay, *Downcast Eyes: The Denigration of Vision in Twentieth-Century French Thought* (Berkley and Los Angeles: University of California Press, 1993), 21-147.

55 Jay, *Downcast Eyes*, 69.


senses and knowledge at a macro level: vision enables analytical and rational thought, and by inference, oral/aural knowledge traditions lack these attributes.

McLuhan’s work on communication technologies such as the alphabet and print media made a similar connection between thinking styles, knowledge, and sensory modes. For McLuhan, these technologies affect cognition and social organisation, specifically through the change in perceptual input. He claimed: ‘when the sense ratios alter in any culture then what had appeared lucid before may suddenly be opaque, and what had been vague or opaque will become translucent’. 60 This focus on the senses was captured by his well-known phrase ‘the medium is the message’. 61 This is the idea that the sensory mode of delivery is so influential that it should be the primary object of enquiry, not the content. Print technology, for example, was understood to alter sensory habits towards the ‘visual homogenizing of experience’. 62 In this way, McLuhan argued that the development of print technology contributed to key ideological shifts in the modern Western world, including the rise of individualism, democracy, and capitalism. Similarly, Anderson argued that literacy and print media were primary technical means by which national identity could be maintained, because they ‘mapped different realms’. 63 In other words, the acquisition of new visual technologies was accompanied by visual skills which enabled a national identity.

While these scholars have drawn attention to the capacity for the senses to mediate thought and action, they have also been criticised for taking a selective view of the senses and knowledge in modern Western culture. Their ‘visualism’ or ‘ocularcentrism’ prompted a significant body of work which challenged the underlying assumption of a hierarchy of the senses. The edited collections titled *The Auditory Culture Reader*, *Hearing Cultures*, and *Hearing History* each took this hierarchy as their starting point, and have sought to highlight the aural aspects of cultures in response. 64 Given the emphasis on visual tools for knowledge creation such as the telescope and microscope, Schafer critically wrote: ‘It is almost as if the great achievements of Western philosophy and science were produced in a huge anechoic

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chamber'. Gouk was critical of what she termed ‘simple, linear models’ that suggested an all-encompassing and final shift away from hearing towards knowledge through the visual, on the grounds that it was an inadequate model for understanding both early modern European thought as well as appreciating knowledge comparatively and cross-culturally. Erlmann echoed these themes, and suggested that ‘arguments over the hierarchy of the senses are also always arguments over cultural and political agendas’. He continued: ‘a simplistic dichotomy between the eye as the quintessential modern sensory organ and hearing as some kind of pre-or antimodern mode of perception must be replaced by a more nuanced approach’.

While the work of Ong and McLuhan has been critically received, Classen’s cross-cultural work on the connection between the senses and thought has escaped such criticism. Echoing Ong and McLuhan, Classen argued ‘sensory models are conceptual models’, and ‘the way a society senses is the way it understands’. Looking at this relationship across time and culture, her research argued that the dominant sense in a community – including a sense of thermal dynamics, smell, and colour – influenced their worldview. That is, she held a similar interest in the connection between sensory modes and knowledge. However, while she argued there was a relationship between the senses and thought, in her cross-cultural focus and inclusion of non-visual senses she also addressed any ‘natural’ hierarchy of the senses. Rather than one sense being best, sensory orders related only to time and culture. With these concerns over a sensory hierarchy addressed, the concept of sensory models acting as a foundational knowledge emerged as useful.

There are observable parallels between reception of Ong and McLuhan and that of Adorno. Adorno’s work opened debate over fundamental questions such as the influence of music on social organisation. However, with no empirical work to support his claims or machinery for their exploration, Adorno was much criticised. Scholars including DeNora maintained that

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68 Ibid., 5.
70 Ibid., 121-38.
Adorno’s work was valuable, because while it had ‘the power to frustrate’ it remained a significant development in understandings of music and the social.\textsuperscript{72} It lacked ‘conceptual scaffolding ... to view music in the act of training unconsciousness’, but abandoning ideas such as a society/music nexus would be tantamount to throwing the baby out with the bathwater.\textsuperscript{73} Like Barth, DeNora argued that to build on Adorno’s work, his concept needed to be developed and refined; it had to be addressed in terms of ‘process’.\textsuperscript{74} In other words, how, in DeNora’s case, ‘music “gets into” social reality’.\textsuperscript{75}

In the same way, while arguments particularly about visual dominance have been critiqued, the more basic relationship between sensing and knowing is one of enduring interest for this thesis. These grand narratives position the senses as a foundational knowledge that structure or facilitate thought. However, their discursive foci have opened them up to criticism, and inhibited their capacity to provide a framework from which to analyse the constitution, production and use of these sensory knowledges. In keeping with the arguments of DeNora and Barth, a senses/knowledge nexus can be extended by addressing it as active rather than abstract.\textsuperscript{76} In this way, this literature draws attention to the senses as knowledge, and the need to examine these knowledges in terms of how they are formed and come to operate.

The senses as self-knowledge

While some work that has emerged recently in the field of sensory studies has been more concerned with challenging sensory hierarchies, the use of the senses in everyday life has also attracted interest, and has contributed to an empirically-based knowledge/senses nexus. For example, an awareness of this relationship simmered beneath the surface of Tilley’s study of gardening, which suggested that the sensory qualities of material artefacts became so significant to our lives that they ‘actively mediate how we think and how we act’.\textsuperscript{77} In this case, the relationship between the senses and knowledge was not a central argument of the research. Tilley demonstrated some of the significance of the senses in gardening, but he did not explore the relationship between the senses, knowledge, and practice. However, a limited number of studies have been more direct in their conceptualisation of the senses as

\textsuperscript{72} DeNora, \textit{Music in Everyday Life}, 2.
\textsuperscript{73} Ibid., 2.
\textsuperscript{74} Ibid., 3.
\textsuperscript{76} Barth, "Other Knowledge and Other Ways of Knowing."
knowledge at this micro social scale, preferring the idea of the senses as a form of self-knowledge.

One study that has been more direct in its consideration of the senses as knowledge was Hockey’s autoethnography of long distance running. Hockey brought together what he termed the ‘corporeal skills, knowledge and experiences’ of runners negotiating their training routes on a daily basis. Running was conceived as an application of a dynamic self-knowledge that was intimately tied to the senses in a particular place and time. As Hockey wrote:

> How distance runners see a hill as it approaches them, what the ground feels like as they ascend it, how their cadence changes as they engage with it, what the odor of their own sweat means to them as they labor up it and what their lungs tell them at the top of it – these cognitive and corporeal ways of knowing unfold as the route does itself.

This reflection demonstrates the role of the senses in an athlete’s performance feedback during a run. Their cerebral and physical knowledge is dynamic, multisensory and responsive. Hockey reflected that during the research process he became aware of a substantial stock of knowledge that may not be shared by a non-runner, indicative that this sensory knowledge was both tacit and specific to this epistemic community.

Like Hockey, DeNora argued that people had a remarkable self-knowledge when it came to their music and how they used it. For De Nora, music was a ‘technology of the self’ used in self-regulation, self-modulation, and self-identity. In her research, respondents exhibited strong practical musical knowledge in terms of what they ‘needed’ musically at any given time, regardless of musical training, whether that was to enhance or maintain a preferred physical state like excitement or relaxation, or to promote concentration, evoke memory, regulate emotion, or validate identity. One participant, for example, described using different combinations of music to gently wake up before switching music to get going in the morning. Another described needing to be ‘careful’ with music in minor keys because it could make her sad.

A similar idea was presented in Bull’s studies of personal audio technologies. He argued such technologies accompany many daily lives as tools to negotiate the urban environment, enhance pleasure and connection, just as disconnection and calmness. He wrote: ‘Sound both

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78 Hockey, "Sensing the Run," 184.
79 Ibid., 198.
81 Ibid., 35.
82 Ibid., 36.
moves and removes us.' One iPod user in Bull’s research expressed such a sensitivity and self-knowledge of musical sound: ‘I always plan what I will listen to and it reflects what I want to hear or feel at that time’.

This issue of the relationship between the senses and knowledge again becomes a question of how they are established and come to act. Macpherson spoke to this point in her study of a blind walking group in the UK. She argued that: ‘While we may all have objectively relatively similar bodies our actual sense of embodiment and sensation depends on how our body is put to use, our body’s past, and its future.’ Blind touch must then be understood as situated in, but not entirely limited by, its contexts. This argument resonated with the account by Hull, in which he observed that his own blindness changed the way he thought, and equally, that the resulting lack of knowledge prevented him from performing certain tasks. For example, he described how he could theoretically cross the road as well as a sighted person, but in practice he lacked knowledges like whether the lights had changed colour or whether the road was clear of traffic. These observations point to sensory influences such as context, experience, and knowledge, as well as physical ability. However, the focus of both articles was the ‘qualitatively different’ sensory experiences people may have, and the issues this raised for discussion of the senses. These qualitatively different experiences have methodological implications, as will be discussed in the following chapter. Despite such difficulties, however, it is important to discuss the senses and their development to understand them further.

Studies have carried out this task with varying degrees of success. Hahn’s ethnography of the Tachibana school of nihon buyo explored the teaching and learning of this dance form, and its relationship to embodiment and cultural knowledge. Learning, according to Hahn, was multisensory, and included visual, touch/kinaesthetic, and aural/oral aspects. In writing up the research, Hahn focused on the cultural history of the dance form and its broader social aspects. The study was rich in description, supplemented by video footage. However, she did not deeply address the underlying learning processes. Berger similarly explored music

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83 Bull, Sound Moves: iPod Culture and Urban Experience, 8, 18.
84 Ibid., 30.
86 Ibid., 190.
90 This finding is in keeping with the assessment of Vannini et al. that sensory studies have been more descriptive that analytical. See Vannini, Waskul, and Gotschalk, The Senses In Self, Society and Culture, 9.
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perception as learnt, but like Hahn, paid more attention to describing the meaning-making process than assessing it. 91 Both of these studies had a goal of examining the senses in terms of how they are constituted and used, but focused more on description than analysis of these processes.

This literature has illustrated some of the contexts in which sensory knowledge is used on a daily basis. These studies conceptualise the senses as acquired, personal, and applied in the everyday. In other words, sensory modes can not only be observed as macro level discourses, but they are also more nuanced, specialised, multisensory, dynamic, and responsive. These studies make a significant contribution conceptually, but have not included sustained analysis of the uses of sensory knowledge, or its acquisition. This thesis aims to build on this foundation by analysing sensory knowledges in terms of their underpinning ideas, contexts, learning methods and practices.

Knowledge studies on the senses

Sociological definitions of knowledge are broad. However, in this field, case studies have tended to focus on discursive, theoretical, and scientific elements, with more recent interests in indigenous and tacit knowledges. Sensory knowledges can fall within the scope of sociologies of knowledge, though they have been paid little attention. Given their limited inclusion, the primary value of this field to my thesis is the conceptual tools it provides: the context of knowledge, knowledge practices and processes, and the social scales at which it operates. This section is not intended as a comprehensive review of sociologies of knowledge, but rather refers to key scholars who have been useful to this thesis conceptually. It particularly makes reference to studies that have referred to sensory knowledges.

Knowledge frameworks

Much of what has been written about knowledge focuses on the macro level: patterns of thought, paradigm shifts, issues of legitimacy at a broad level such as the subordinate position of women, 92 dominance of particular languages, 93 and the ‘peculiar epistemic authority’ of

91 See Berger, Metal, Rock, and Jazz.
The key contention of this body of work has been that knowledge production, even of the most seemingly objective knowledge, occurs in a social context and is made by social actors. This analysis operates on a scale and a level of generalisation that has attracted criticism by scholars such as DeNora, on the grounds that it cannot describe how things work in actual cases and contexts, as well as in real time. While limited in its capacity to describe how knowledge (and hopefully also the senses) works, this level of analysis describes contexts, ideas, formalised aspects of knowledge, and observable influences at an organisational level.

A foundational proposition has been that knowledge is intimately entwined with broader social contexts. Marx’s writings on ideology, class, and means of production can be regarded as representative of this proposition. He argued that people’s beliefs and ideas were directly related to their material existence, social relations, social life and, most fundamentally, to socioeconomic structure. That is, while cultural and intellectual life could influence social conditions, it was the underlying social structures of a society that fundamentally influenced thought. Durkheim echoed this basic proposition, writing that ‘social life must be explained not by the conception of it formed by those who participate in it, but by the profound causes which escape their consciousness’. This focus on the correspondence between social structure and belief was extended by Mannheim and Scheler. For Mannheim, thought was a collective experience contingent on common social structures and social locations that foster common experiences and thus collective thinking. Similarly, Scheler argued that knowledge, particularly of the everyday, was ‘a priori knowledge’ that preceded the individual.
This proposition that knowledge is socially constituted has also been a chief concern of scholarship on knowledge production, as it has been argued that the ‘paradigms’ in which knowledge is situated determine the theoretical and methodological strategies available to knowers at any given time. Kuhn’s *The Structure of Scientific Revolutions* is often credited with establishing this notion of paradigm and its relationship to the operation of the scientific community. Using examples from the history of the natural sciences, Kuhn argued that the evolution of scientific theory did not emerge from the linear accumulation of facts, but rather from a set of changing intellectual circumstances and possibilities. Paradigms suggest which experiments are worth conducting, influence the methodologies and technologies used, and provide rules that limit the possible solutions.\(^{102}\) Indeed, Kuhn claimed that paradigms were prerequisites to sensory perception itself, as ‘What a man sees depends both upon what he looks at and also upon what his previous visual-conceptual experience has taught him to see’.\(^{103}\) That is, the ideas and hypotheses that underpin scientific research fundamentally affect research outcomes. Miller and Fox expressed a similar idea: ‘We can “see” only those parts of the objective world that can be apprehended through the words and categories located in our cultural subjectivity. We cannot see facts if we are not preequipped with categories that enable them to come into view.’\(^{104}\)

Knowledge paradigms are fundamentally normative for both knowers and knowledge, and are punctuated by what Kuhn termed ‘scientific revolutions’ or paradigm shifts. In order for knowledge practice to function effectively, particularly in the natural sciences, its knowers are socialised or educated into the knowledge framework and its concepts, laws and theories. This education prepares the knower for membership in a specific epistemic community, and ensures that the knower’s practice limits disagreements over fundamentals.\(^{105}\) For Kuhn, ‘normal’ scientific research was ‘a strenuous and devoted attempt to force nature into the conceptual boxes supplied by professional education’.\(^{106}\) This process of forcing the new knowledge into predefined categories was dependent on exclusion of or resistance to anomalies. However, Kuhn claimed that when a scientist could ‘no longer evade anomalies that subvert the existing tradition of scientific practice’ research commenced that led ‘to a new set of commitments, a new basis for the practice of science’.\(^{107}\) Pivotaly, Kuhn argued that new paradigms were likely to be sparked by scientists that were new to the tradition who

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\(^{102}\) Kuhn, *The Structure of Scientific Revolutions*, 27.

\(^{103}\) Ibid., 113.

\(^{104}\) Miller and Fox, "The Epistemic Community," 675.

\(^{105}\) Kuhn, *The Structure of Scientific Revolutions*, 11.

\(^{106}\) Ibid., 5.

\(^{107}\) Ibid., 6.
were presumably less affected by the knowledge frameworks previously taken for granted.\textsuperscript{108} In other words, knowers not yet bound by the paradigms of their new epistemic community were able to 'observe' phenomena differently.

Also at a macro scale, scholars such as Lam have argued that there is an 'interactive relationship' between knowledge types, learning methods, organisational forms and institutional factors such as educational systems and labour markets.\textsuperscript{109} One finding from this research pertinent to my thesis is that tacit knowledges, an umbrella that covers much sensory knowledge, are context specific, embedded, and tend to be 'sticky' – not quickly or easily transferred – dependent on experience and doing with others.\textsuperscript{110} Lam argued that in a 'professional' culture, formal knowledges and formal qualifications were given greater importance than the mastery of what might be termed practical skills.\textsuperscript{111} Professional systems geared towards specialisation, codification, and individual learning were found to be inherently weak in the development and sharing of tacit knowledges because they did not support the tacit knowledge conditions of collective learning, strong social networks, and experience.

As a body of literature, these macro studies reveal the influences on knowledge at societal, community and organisational levels. This contributes to this thesis' conceptualisation of sensory knowledge because it highlights the importance of a macro scale of analysis. As with any other site of knowledge, the senses can be examined in terms of the ideas and values that inform them, as well as structural factors such as a deference of formal education. Such factors can shape the types of sensory acuity that can be developed within an epistemic community. As Lam highlighted, tacit knowledges, including much sensory knowledge, are located in a particular context, and cannot be simply generalised and formally transferred.\textsuperscript{112} Despite its macro focus, this literature is useful conceptually when considered in concert with other layers of analysis.

**Located knowledge**

In addition to the work that has examined knowledge in terms of the connections between patterns of thought, paradigms, and macro social structures, some of the questions that drive

\textsuperscript{108} Ibid., 90, 152-53.


\textsuperscript{111} Lam, "Tacit Knowledge, Organizational Learning and Societal Institutions," 505.

\textsuperscript{112} Ibid.
contemporary sociologies of knowledge regard its production and practice. These questions include: 'What kinds of symbols and knowledges are used and by whom? How are they produced and disseminated? What do they teach? How are they linked to strategies of action and opportunity?' The focus of these questions on knowledge production and practice draws attention to the 'located' aspects of knowledge. This is the idea that knowledge is not objective, universal, nor merely 'local', but its production and use is always at the intersection of places, peoples, and their performances.

As Lam's work on organisational forms and knowledge attested, the way things are done is never completely captured by formal procedures, which means that much practice relies on mentoring and experience. This is the type of understanding that Duguid had in mind when he noted that: 'codified knowledge ... rests on an uncodifiable substrate that tells us how to use the code.' The reliance on this type of understanding coupled with its development primarily through collective performance means that social groups have their own idiosyncrasies, practices, values, and interests.

The model of 'communities of practice' is one way that the production and location of knowledge in smaller social groups has been conceptualised, and points to the active attributes of knowing. Within this conceptual framework, learning and knowing are at the intersection of community, meaning, practice, and identity. This model reasoned that while people may be employed by a large organisation, and may have been educated within an education system and its curriculum, they worked within and for much smaller groups. This work is valuable for this thesis because it is focused on the process through which tacit knowledges, including many aspects of sensory knowledge, are fostered. It also located this learning and practice in communities, and provided a foundation to address variation.

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113 McCarthy, Knowledge as Culture, 24.
115 Ibid., 19.
118 Wenger, Communities of Practice, 6.
Knorr-Centina’s concept of ‘epistemic cultures’ resonates with the claim that practice occurs in small social groups. Taking the unit of the laboratory, Knorr-Centina located knowledge in the practices, interests, and technologies of a given locale. She argued that ‘laboratories allow natural processes to be “bought home” and to be made subject only to the new conditions of the local social order.’

In other words, at its most basic level, the production of scientific knowledge involves knowing how to produce knowledge in a laboratory environment, and while this knowledge is transferrable, it is not universal. Knorr-Centina was not directly concerned with potential variations in sensory acuity between laboratories, but this finding that knowledges and practices are located in smaller social groups informs the research questions for this thesis.

In addition to this argument that knowledge is contextualised in small communities or groups that share practices, knowledge has also been situated in time and place. Turnbull, for example, argued that knowledge is always ‘local and contingent’. Through examples such as cathedral building and navigation, he contended that ‘local' Indigenous knowledges were more mobile than was often assumed, and that scientific knowledge was more ‘located’ than was implied by its claims to universalism. Also drawing on knowledge production in the laboratory, Turnbull wrote: ‘the way a scientist learns to solve problems is not by applying theory deductively but, in a Kuhnian fashion, by learning to apply theory through recognizing situations as familiar'. Through his argument, Turnbull addressed the relative authoritativeness of knowledges in the context of scientific dominance and expanding diversity. This has relevance for this thesis, because taken-for-granted knowledges such as the senses are rarely granted epistemic authority.

In his examination of Pacific navigation, Turnbull also demonstrated that the senses were one vital aspect of ‘local’ knowledge. There has been debate over the efficacy of Micronesian navigation methods, which are typically judged in the context of the Western emphasis on calculation (time, length, and direction). Turnbull argued that this was misguided, because if their navigation was as lacking as it seemed when assessed against these criteria, then they would have been unsuccessful voyagers, which they were not. Rather, Turnbull claimed that their navigation system was ‘a dynamic spatial organisation of knowledge’ inclusive of their star compass (etak), seamarks, and a sensory capacity to estimate drifts and currents.

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120 See Rouse, *Knowledge and Power: Towards a Political Philosophy of Science*, 72.
122 Ibid., 19.
123 Ibid., 43.
124 Ibid., 136.
wrote: ‘The apparent inconsistencies of the Micronesian system then drop out because the Micronesian navigator, like all experienced sailors, is able to estimate the speed of the canoe through direct sensory inputs like the sound of the hull in the water.'\textsuperscript{125} This connection between the 'local', problem solving, and hearing is valuable for this thesis, because it shows the senses in practice, and emphasises the importance of context for sensory knowledge.

Together, these concepts of 'communities of practice' and 'located knowledges' highlight knowing as an active, dynamic process that is specific to smaller communities. This locatedness of knowledge opens up the possibility of exploring how knowledge is made and used at this level, including the role of mentoring and experience. With its interest in foundational knowledges and aspects that are not readily codified, this literature directly speaks to the development and application of sensory knowledges. The arguments of this body of research are particularly useful to an understanding of how sensory knowledges are built and used when considered as one piece of a knowing puzzle that occurs across micro and macro social scales.

**Personal knowing**

The last two sub-sections have explored the literature on knowledge production at macro and micro social scales, and what this can contribute to a conceptualisation of sensory knowledge. They have introduced arguments that the broader societal and organisational contexts set the bounds of what is thinkable and perceivable, while knowledge is located and meaning is made in smaller social groups. With knowledge being formed at multiple social scales, it makes sense to conceptualise it synthetically. One argument to emerge from Kuhn's macro theorisation of paradigm shifts that supports this was that changes in knowledge were often sparked by people who had come from outside the community. This finding highlights the role of the personal in the collective, as well as pointing to the idea that an individual's knowledge is developed across a career or a lifespan, rather than time spent in a discrete epistemic community. In the context of sensory knowledge, this gives rise to a hypothesis that sensory knowing is a dynamic part of social life that is situated across social scales, times, and places, and needs to be examined in an accordingly inclusive way. This is in keeping with the conceptualisations of sensory knowledge presented by scholars such as Hockey and DeNora.\textsuperscript{126}

There are four scholars in particular who have conceptualised a synthetic understanding of knowledge that are necessary to mention here. The connection between the personal and

\textsuperscript{126} DeNora, Music in Everyday Life; Hockey, "Sensing the Run."
social structures (at the scales of discourse and practice) is encapsulated in Bourdieu’s notion of ‘habitus’. Habitus refers to the matrix of acquired perceptions, appreciations, and dispositions that are durable, transposable, structured and structuring. As described in Webb et al., it is ‘the values and dispositions gained from our cultural history that generally stay with us across contexts’. Scholars such as Corbin have explicitly drawn a link between the notion of habitus and hearing, arguing that sound enters the habitus of the community and its ‘culture of the senses’. Gracyk also adapted the notion of habitus to a culturally multiple context, arguing that modes of auditory perception are the product of multiple schemata according to the multiple objects of hearing. The concept of habitus encourages a relational mode of thought that considers both the individual and the social, while maintaining and relating these dualisms. This intertwining of the personal and the social is everywhere present in the examination of sensory knowledges in this thesis. While Bourdieu speaks to this point, his conceptualisation of the relationship is problematic for empirical work because habitus is observable primarily in terms of its effects.

Mills also paid attention to this dynamic relationship between the personal and the social, framing it as a conversation between an individual and the broader group. His article ‘The Cultural Apparatus’ opened by declaring that people ‘live in second-hand worlds’, aware of more than their own personal experience, and always experiencing phenomena indirectly. Knowledge of reality is filtered through the social structures, institutions, agencies, and contexts that produce and distribute it, providing individuals with a ‘lens’ through which to view their world. Mills argued, however, that while the influence of the community in knowledge cannot be avoided, it was equally not enough to explain knowing in exclusively collective terms. He claimed: ‘Even if we grant that “thought” in some manner involves social processes, the thought is, nevertheless, a lingual performance of an individual thinker’. Mills’s work is valuable for this thesis because he frames thinking in terms of an active, ongoing conversation. His terminology of ‘worlds’ and the ‘lens’ is also useful for

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132 Ibid., 61-62.
134 Ibid., 406.
conceptualising both the effects of sensory knowledges on understanding, as well as the often plural contexts in which people live and operate.

The more recent work of Glaser has also adopted an approach to knowledge as the product of both broad social structures and personal dynamics. He conceptualised knowledge in terms of ‘careers’. He argued that ‘careers are links’: they link individuals with institutions, and they link social structures with knowledge production, providing a ‘channel for societal influence’. This focus on careers implies several social contexts. He argued that these social contexts included the layers of organisations, communities of specialities, and the broader societal influences through educational opportunities, work options, and work conditions. Particularly in the contemporary world of work, this conceptual tool of ‘careers’ also assumed not only multiple social contexts in one workplace and profession, but changes to influence and role across a lifespan. In this way, Glaser points to the many influences on a professional’s knowledge, including their sensory knowledges.

Similarly, Klein highlighted the different knowledge sources of experts, as well as some characteristics of decision-making in critical contexts. Klein was particularly interested in tacit knowledge, which is personal by virtue of being ‘embedded’, and often not readily articulated. Based on his research with fireground commanders, pilots, nurses, and military leaders, Klein argued that professionals are reliant on specialist knowledges that can be unconscious and unarticulated. Much of this knowledge is acquired through experience, and is activated through pattern matching and mental simulation. Klein’s work is helpful for this thesis because he described knowing in action, including sensory knowledges. While the senses were not his focus, sensory indicators were often described as factors for decision-making. Given their inclusion, his discussion of how knowledge is developed and used is highly pertinent. By highlighting the critical role of storytelling and analogies among other knowledge sources, Klein’s work also takes expertise from a static ‘knowledge’ to an active and situated knowing that is formed and used in particular contexts and as a result of particular processes.

Together, the existing literature on knowledge highlights the importance of undertaking analysis across micro and macro social scales. Studies such as Glaser’s and Klein’s point to the

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137 Ibid., 700.
importance of focusing on individuals both in terms of their careers and, at a more micro level, the means by which their knowledge is used and developed on a daily basis. Both of these approaches are useful to the goal of observing and tracking influence and practice. Glaser and Bourdieu’s focus on lifespan points to a process that deserves attention in the context of sensory knowledge: learning. They raise questions about knowledge sources, as well as how knowledge and skills develop. As I have emphasised, while this literature does mention the sensory aspects of knowledge, and in some cases points out its valuable role, it has been paid little direct attention. As a body of research, it provides a conceptual framework to approach the senses, along with empirical evidence to help understand sensory knowledge. With specific studies of sensory knowledge remaining under-researched, however, this thesis also contributes to this field through its direct consideration.

Conclusion

There is only a limited literature in the social sciences and humanities that has approached the senses as knowledge. Of the sensory studies research, the majority has largely been descriptive. Grand narratives have drawn a connection between the senses and thought, and at a more micro social scale, it has been argued that the senses are a self-knowledge that guide action. This thesis aims to extend this literature by looking at the senses/knowledge nexus in terms of how they are developed and used.

Despite the senses tending to go unnoticed in sociologies of knowledge, this literature has provided critical groundwork for their analysis. The literature on knowledge contributes to this understanding of sensory processes by highlighting the different scales at which this knowledge works, and its dynamic experience in daily life. The work of scholars such as Kuhn and Lam highlights how communities and organisations are subject to broader structures of power that influence the types of learning and knowledge that are supported, as well as the ideas that can be readily conceptualised. These issues of the broader context of knowledge, organisational structures and gatekeeping, will be examined in chapters 4, 6, and 7.

At a more micro level, the work of scholars including Wenger and Turnbull highlighted the essential ‘locatedness’ of knowledge in social groups, times and places. In the context of tacit knowledges, a category that encompasses much sensory knowledge, this locatedness is particularly relevant, as the subtleties of sensory knowledges are difficult to capture in a formal learning format. Accordingly, these processes of meaning-making and practice in small groups, and learning from experience, are critical to sensory knowledge. These are issues that will be discussed in terms of learning and expertise in chapters 5, 6 and 8.
The hypothesis that emerges from my review of the literature is that knowing is more dynamic than micro or macro social scales imply. As such, a study of sensory knowledge needs to maintain an awareness across social scales, times, places, and communities. Knowledge, including sensory knowledge, changes as it takes on new roles and challenges, and is responsive to contexts. The following chapter outlines the methodological challenges that researching sensory knowledge introduced, and how its study was operationalised as research questions.
Conclusion

The analysis conducted within this study emphasizes the importance of understanding the mechanisms of adaptation and resilience in various ecosystems. By utilizing a combination of empirical data and theoretical frameworks, we have been able to identify key factors that contribute to the success of adaptation strategies. This approach not only enhances our understanding of current challenges but also paves the way for future research and policy development.

In the broader context of environmental science, the findings of this study underscore the need for integrated and multidisciplinary approaches to address the complex issues of climate change. It is crucial for policymakers to consider these insights when formulating strategies that promote sustainability and resilience. By focusing on adaptive capacity and resilience, we can work towards a more informed and proactive approach to managing the impacts of environmental change.

The methodologies employed in this analysis can be expanded upon and further refined in future studies. Collaboration across disciplines and sectors is essential to ensure that the outcomes of such research are impactful and translate into effective policy actions. The insights derived from this work can serve as a foundation for ongoing discussions and efforts aimed at fostering resilience and adaptability in the face of environmental challenges.
Chapter 3

Researching common sense

In the previous chapter, I argued that research in sociologies of knowledge can contribute to a conceptual framework for understanding the senses. This literature highlighted the multiple social scales at which sensory knowledge can operate. From this I argued that, in keeping with the work of scholars such as Glaser, sensory knowledge needs to be considered as active and cumulative. While this literature is useful conceptually, speaking about and theorising sensory knowledge remains inherently challenging. These two findings point to potential research questions, as well as the methodological challenges for eliciting data.

This chapter is concerned specifically with the development of the research process. In the context of the research questions and the case studies, it describes the research methodologies used, and outlines the issues and strategies for studying knowledge and experiences that are often taken for granted. I first give an overview of my initial research plan and the challenges encountered. I then introduce the communities used as case studies in this research, before moving to an explanation of the methods I adopted, the emergence of themes through the research process, and an explanation of how the data is treated throughout the thesis.

Early lessons

My research began with a general interest in music perception, and the social and intellectual contexts of hearing differences. My provisional research questions were: Is musical hearing

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141 Glaser, "Macrostructures, Careers and Knowledge Production."
142 Macpherson, "Articulating Blind Touch."
specific to epistemic communities? How do the ideas of a group affect their understandings of musical sound and musical listening practices? To explore these research questions empirically, I had aimed to focus on conceptual and sensory differences between music sub-communities. The focus on music sub-communities was significant because my own awareness of differences in hearing music was the impetus for this research, and because most of the research that has been broadly interested in sound and its perception has also focused on music. I ultimately moved away from this focus, but beginning with these research questions led to a reconsideration of how to add to this research area.

My first step in the research process was a review of how musical hearing and aural difference had been examined previously, and what findings these approaches had generated. Neuroscience and psychology have had a long concern with aural perception of music and musical learning using positivist methodologies. A major interest has been musicians with 'perfect' pitch: the ability to identify and name or reproduce a pitch without external reference. These studies have focused on quantifying the incidence of 'perfect' pitch, the effectiveness of teaching methods, and the neurological changes that occur with aural skill development. In my review of this research area, I found that many of

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my questions about hearing differences and community knowledge remained unanswered. Some scholars within the field also contended that these methods had not generated the desired results. Vitouch, for example, claimed that after examining perfect pitch for over 100 years, this aural skill was still ‘insufficiently understood’.147 My survey of the literature convinced me that insufficient attention was being paid to the context of aural experience. Later reinforcing this impression, one of my research participants expressed: ‘You can’t do this sort of thing in a vacuum’. Given that hearing is used in context, it intuitively made sense that an examination should also be contextualised.

I also looked at how music and its perception have been examined in the social sciences and humanities. A strength of this research field has been their greater concern for the contexts of sound. While generally concerned with this context, studies have tended to favour textual enquiries focused on the macro relationships between musical cultures and social structures such as class,148 and gender.149 These approaches have been recently criticised on methodological grounds. Pieslak, for example, questioned studies that dedicated ‘more attention to the surrounding musical (sub)culture and its transformations than to the songs and music itself’.150 In other words, many studies have been more interested in the meanings of music conceptually than the actual sounds and their aural experiences. Methodologically, 


these studies were peripheral to my research, because their focus on ‘text’ meant they were not able to examine aural experience. Through my assessment of the dominant methods for studying music, I concluded that any examination of hearing needed to take account of the context, aural practices and experiences of a community.

Further reading uncovered some research on music that used ethnographic methods with more success at examining practices and experiences. DeNora, for example, used a combination of in-depth qualitative interviews, participant observation, and recordings to trigger observable experiences for this purpose. She asked participants to describe how they used different musics, what they meant, the emotions they elicited, and the situations in which they were experienced. As was discussed in the previous chapter, DeNora’s findings showed that participants heard different music in different ways according to the type of music and the situation. They also showed that musical listeners had a significant self-knowledge that guided their music selection in given contexts.

Berger’s ethnography of music perception in rock, jazz and metal communities also used in-depth qualitative interviews, aural triggers, and participant observation. Berger argued that in order to understand perception, it was prudent to move beyond studies of affect that looked at discourse and structures at a macro level. Instead, he claimed that focus should be on the acts of meaning making and practice at a micro level, because meaning is constituted in the act of listening. He found that metal musicians did not experience their music as rebellious, meaningless noise. Rather, in the context of communities, these sounds were made meaningful and enjoyed. Like DeNora, Berger’s findings indicated that aural experience was specific to communities, contexts, and musical knowledges.

Building on the work of DeNora and Berger, my initial research plan was to conduct focused interviews with musicians using sounds as triggers, in the hope of eliciting data on musical hearing. I expected to find observable relationships between community involvement, musical preferences, and aural experiences. To explore this relationship, I planned to play musicians aural excerpts from within their community, as well as sounds likely to transcend communities for comparative purposes. I also planned to ask participants to bring an example of an important musical work for them, as a foundation for a discussion of their hearing, and the meaning of their significant musical sounds.

151 DeNora, *Music in Everyday Life*. A similar method has been used to observe music and memory. See Catherine Strong, *Grunge: Music and Memory* (Farnham, Surrey: Ashgate, 2011).
153 Berger, *Metal, Rock, and Jazz*. 50
As I was working on the research design, I conducted a small number of pilot interviews to
gauge the effectiveness of these methods. These test interviews showed that musicians heard
music uniquely. Musicians pulled out different musical elements, they used distinctive
languages to describe music, and demonstrated diverse understandings and preferences. I was
dissuaded from attempting to quantify the extent of this variation in musical hearing across
communities given the limits of such an approach identified in studies on ‘perfect’ pitch.
Rather, through these pilot interviews, new research questions began to emerge: How was
people’s knowledge and hearing of sound formed? What was the involvement of communities
and their contexts? How was hearing used in daily life? These emergent questions suggested I
might have to redefine my research tools.

Concurrent with the new research questions emerged the methodological challenge of making
taken-for-granted knowledges visible. Negotiating this challenge required a consideration of
when these knowledges were most visible, in whom, and how they were most effectively
accessed. To answer these questions, I turned particularly to the work of Klein, whose research
on expert decision-making grappled with similar issues. In *Sources of Power*, Klein suggested
that tacit knowledge was rendered most apparent in situations that were particularly
challenging or non-routine, because these situations highlighted where specific knowledge or
skills made a difference. As such, experts in any given skill or field made ideal subjects of study
because their knowledge tended to be the most tacit and, equally, it was the most noticeable
because it was extraordinary.

Klein preferred interviews structured around a participant’s repeated description of an event
as a ‘pathway into their perspective’.[154] The approach found to be most effective was to make
four ‘passes’ through a scenario, with tacit knowledge identified and drawn out at each pass.
In the first pass, a brief version of the story was given to establish whether the example would
be fruitful and to prepare the researcher.[155] The whole story was then told with details. In this
second pass any inconsistencies were highlighted, and a diagram of the story was
established.[156] In the third pass, the thought processes were explored in specific and
hypothetical terms. The purpose of this process was to establish whether a participant noticed
drawing on any skills or knowledge, and to highlight any hidden assumptions by changing the
details of the scenario.[157] The fourth pass examined points where an expert may notice things

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[155] Ibid., 190.
[156] Ibid., 190.
[157] Ibid., 190.
that a novice may not. It asked questions such as: If someone was not a cardiologist, what diagnostic mistakes could be made in this situation? Why would these be made?

Klein’s methods had three major influences at this stage of my research process. His interview style suggested a tangible approach that I could apply to examine hearing, a knowledge that is typically taken for granted or tacit. On the basis of Klein’s argument, I also planned to limit my scope to experts, with a focus on eliciting stories. When it came to my fieldwork, I did not use Klein’s ‘four passes’ approach, and also broadened my scope beyond experts. These changes occurred in response to participants in the first instance, and difficulties in locating experts in the second. The most influential and enduring aspect of Klein’s research was his multiple case study design. My supervisors and I had become aware that my research questions had implications beyond hearing musical sound. With Klein’s positive example of multiple case study management and use, I broadened the scope of my research to include other communities with distinct knowledges, learning practices, and significant sounds.

As my engagements with Klein’s research indicate, conducting an exploratory study meant that I could not simply replicate prior research. While the studies mentioned were an engaging starting point, the research methods that were eventually used were not the same. Coming to my methods required that I learnt from multiple approaches, and ultimately I came to my own. Perhaps the most valuable part of Klein’s work for me was his methods chapter entitled ‘Learning from Fire Fighters’. There, Klein confessed how he had made assumptions about the research process and the themes that would emerge. In the end, his participants forced him to reconsider what he thought he knew about knowledge and decision-making, as well as the methods he could use to understand them more.

My research process revealed a similar learning, and I am particularly indebted to a few generous research participants who took time to work with me to help find what I was looking for. This learning process resulted in research themes other than those I had anticipated, different methods, and a broader scope for research participation. In this way, the research model was exploratory and responsive, and was adaptive to emerging data and concepts.

The communities

As a consequence of my initial enquiries, the focus of this research became the processes by which hearing was formed, the community and broader contextual location of this knowledge.

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158 Ibid., 190.
and how it was practiced or used. Given this focus, I chose an ethnographic methodology because of its capacity to provide a rich source of data with the contextual depth to work towards understanding taken-for-granted knowledges such as hearing. This method placed me in a position where I could develop a rich appreciation of the learning process and the hearing practices of communities. A multiple case study design was chosen because it facilitated a detailed and intensive analysis of specific cases, while remaining comparative in nature. The comparative element of the project presupposed that the dynamics of social phenomena may be better understood if they were examined in relation to two or more ‘meaningfully contrasting cases or situations’. A comparative approach was particularly valuable in this case for exploring often allusive aspects of learning and practice from multiple angles. Before moving to an explanation of the methods used, the following outlines the specific communities used as case studies.

Three communities

I chose communities with specialised aural knowledges that were consciously or unconsciously employed as part of their daily practices. While scholars of the senses have argued for a multisensory approach, and I aimed to remain aware of the multisensory context, the reasoning behind this decision was a need to look more specifically at a particular knowledge, its processes, and application in order to obtain the necessary depth. In addition to the focus on the aural, a second selection criterion was that the communities contrasted in their specialised aural knowledges, contexts, institutions and processes. This criterion aimed at gaining a sense of the commonalities as well as differences across communities, and a deeper understanding of the senses as knowledge. The three communities originally selected on these grounds were musicians, adventurers, and doctors.

With a focus on aural perception and knowledge, and in light of my experience in existing networks, musicians were an obvious first choice. As I had learnt classical piano and flute, I had my own experiences of musical learning and practice that acted as what Johnson termed ‘pre-research research’. That is, these experiences were a valuable passport into ‘the music community’ in a practical and ethnographic sense, and also gave me a working understanding of community values and approaches, as far as they could be generalised. While this existing knowledge and my connections had benefits, the decision to include non-musical cases was later critical, because I took a lot of musical knowledge for granted myself. My own taken-for-

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granted knowledge of music was at times a barrier to analysing and writing up the data, because it was more of a challenge for me to both understand the dynamics of music communities, and to write up these findings without omitting critical information. Equally, interviewees who were aware of my musical background also took for granted much of the shared knowledge I had hoped to explore.

I chose not to limit the musicians who could participate in this study to a particular genre, instrument, or locality. As such, the participants were spread across three major Australian cities and two regional centres, and included those involved in classical, jazz, metal, latin, rock, contemporary, folk, and experimental musics on diverse instruments and with a variety of musical roles. Most participants had lived, studied, and worked in several places both domestically and internationally, and very rarely identified with a single musical genre, instrument, role, or sub-community. This alleviated any initial concerns that locality or musical area were points of difference. To recruit participants, I contacted major music organisations such as conservatoriums and music ensembles by telephone and email, and requested that these institutions send out my research details. Those interested in participating were then able to contact me directly and voluntarily. I also shared information about my research through my own networks, in the hope of involving musicians not affiliated with these major organisations. In the same way, some participants also shared information about my research through their own networks. A total of twenty-seven musicians were included in this case study.

In targeting elite music institutions, I had selected those who were likely to be in contact with experts. In my communications with these institutions, as well as through informal networks, I also indicated that I wanted to speak with experts. Defining expertise, however, was not that simple, and while most participants were professionals, all were not experts. This complication had advantages, however, because it gave a diversity of reflections on learning and communities, and it provided rich data on the question of expertise. One outcome of initially limiting the scope to experts was that I did not recruit many women. Even some women who were approached directly were initially unsure about their participation because they did not consider themselves 'expert'. Broadening the scope was one way that I tried to address this gender imbalance. Despite my best efforts, women were still the minority of research participants, but to compensate I searched for any gendered differences in hearing perceptions and found that this was not significant.

During my scoping of the project, I often discussed themes that I had anticipated with one of my supervisors. Frequently our conversations would turn to examples of our own learning,
practice and where sensory knowledge mattered. Through this process, the value of a comparison with one of his communities became apparent: mountaineering. One of the most evident distinctions between music and mountaineering is the object of their knowledge: sounds of the natural environment as engaged with by the adventurer, versus the production of sound by the musician, most often in dialogue with others. Similarly, where musicians, at least in some sub-communities, seek to focus on and often isolate sound, for the adventurers, hearing is always only one strand of the experience. In addition to these distinctions, a reason for including adventurers was to facilitate an exploration of hearing outside of the taken-for-granted case of music. Broadening this study beyond music promised to add to the sensory aspects of occupations that have been largely neglected.¹⁶³

Using similar recruitment methods to the musicians, I contacted key institutions within the adventurer community with assistance from my supervisor. I also contacted clubs that he did not originally identify, conscious of the need to avoid skewing the interviews towards a study of his networks. In combination, these recruitment methods attracted participants who engaged professionally and recreationally in multiple disciplines such as walking (or ‘tramping’ as it is called in New Zealand), mountaineering, cross-country skiing, and rock climbing, and held a variety of roles including guide, teacher, professional adventurer, writer, editor, photographer, ecologist, and conservationist. Like musicians, they were based across multiple locations, including two major Australian cities, several regional Australian centres, three major cities in New Zealand, and villages and towns in New Zealand along the way. As with the musicians, participants were not limited to experts, but also included adventurers at a more intermediate and advanced level. A total of thirty-one adventurers were included in this case study.

Just as the adventurers were identified as a community with a specialised aural knowledge and unique institutions and processes, the same reasoning informed the selection of a third community: doctors. With their significant formal learning processes and the governance and credentialisation of professional institutions, I anticipated that doctors would provide a contrast with the communities and experience of musicians and adventurers. Again, in recruiting participants, I did not seek to limit my scope to professional roles or localities. Participants came from one major city and three regional centres across Australia and New Zealand, and included GPs, surgeons, anaesthetists, and physicians. Recruitment involved methods similar to the previous communities, but relied more on informal networks, as it was a challenge to contact interested doctors, given issues of professionalism, ethics and time.

¹⁶³ Hockey, "'Switch On'," 478.
constraints. A total of fifteen doctors were included in this case study, all of whom had a level of skill that would be described as expert.

A chance encounter with Morse

In August of 2009, after months of defining the scope of my research and commencing interviews, I had a long weekend on the Great Ocean Road. I came to Cape Otway Lightstation, mainland Australia’s oldest surviving lighthouse. Fortunately, my visit coincided with International Lighthouse Weekend, and the site was teeming with volunteers eager to share their passions for the technologies and practices used during the lighthouse’s history. In the Cape’s old Telegraph Station, Albert and Allen were sharing their stories and demonstrating Morse to an audience of visitors. Kids were particularly impressed, thinking it quick and cool enough to rival Harry Potter’s owl Hedwig. I was very impressed with their display. Albert discreetly asked a friend I was travelling with for a personal detail, and after quickly sitting down and tapping away, Allen announced: ‘You’re from Canberra’. Like many of their visitors, I found myself looking about for the smoke and mirrors.

Allen gave me a history of Morse in Australia, and shared how he came to be an operator. I was particularly taken by his description of his training, which involved examples of how his listening skills developed with experience, and revealed tricks of the trade, such as listening to the spaces or silence, rather than the dots and dashes themselves. He had lucidly expressed many of the issues that I had been exploring for months, and I mentioned the connection with my work. Unexpectedly, at the end of our chat, Allen produced his business card, and said that he would love to talk about it further if I would like to interview him.

When I returned to Canberra, I emailed Allen and received a prompt reply. I was under the impression that I would only be speaking with him, but the wires had been hot with traffic, and I was emailed a list of fifteen interested operators, their contact details, and wives’ names. To my surprise, Morse was far from dead. These operators, and around eighty others from across Australia, maintained Morse equipment in their homes, and regularly communicated with each other using this network. Recruited through these means, Allen had assembled a list of eager Morsecodians. Most had a professional background in the Postmaster-General’s Department (PMG). There was a mix of Telegraphists (full time telegraph operators in capital city Chief Telegraph Offices or larger regional centres), and Postal Clerks (those who worked in post offices on general duties which included telegraph operating). There were also operators

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164 This comment is noted in an article regarding the 2007 International Lighthouse Weekend. See Cape Otway Lightstation, "International Lighthouse Weekend at Cape Otway Lightstation," (20th August 2007), http://www.lightstation.com/index.php?page=media&pr=20070820_IIW_post
who had worked in Antarctica, a rail operator, and one woman with a military background. In his letter he also suggested key informants within other networks that I might also be able to tap into, and operators who had experience in other states and could therefore share on the distinctions between the eastern states and, for example, Western Australia. Across three major Australian cities and four regional centres, a total of nineteen Morse operators participated in this case study.

Figure 1: Operator giving a Morse demonstration

Uninitiated in Morse, I was unaware of the professional diversity, and was overwhelmed with the contribution that Allen made both in schooling me, and facilitating research within this community. Joining the dots in retrospect, there was a prophetic link between my initial encounter with Morse, and the experiences of thousands of immigrants whose final travels were guided by the Cape Otway Lightstation. After waving goodbye to Europe many months before, Cape Otway was their first sight of land. For me, while researching Morse was not initially part of the plan, the community turned out not only to be fascinating, but consistently delivered me my first sense of solid ground during my data analysis. The two key reasons that I could make sense of the findings from this community before the others were to do with their community structures, and the nature of their significant sound. Due to the period in which their professional community emerged and the nature of their networks contemporarily, their
experiences with learning and practice were largely homogenous, and any divergences were traceable to training in a different professional context, or communicating primarily with a different group of operators. Equally, compared to the variety of sounds that were significant in other communities, the click of a Morse sounder and beep of an oscillator were relatively simple. As the sounds themselves were uncomplicated, there was a clear focus on the influence of context, learning, and expertise.

Methods

My experiences with research methods such as using aural triggers in the pilot study made me reconsider the type of information I required and how it was best accessed. However, when I commenced my fieldwork officially, I had still planned to adopt Klein’s ‘four passes’ approach. In one of my first interviews, a doctor described how he learnt within his community, before exploring how he shared knowledge with others. I found the data rewardingly rich. After I looked down to my sheet of prompting questions, I asked for some stories of special cases where his skills might have made a difference, or where he might have heard something that someone less skilled might have missed. He responded:

I use hearing diagnostically pretty much every time I see a patient, but I don’t think about it too much. I tend to think about these things more when I have a student with me, because I am sensitised to the learning needs of the student, and I am pointing things out. Can I recall a case where what I heard clenched that diagnosis for me? I probably can’t because it probably happens quite a lot and, again, I just don’t think too much of it at the time. It might be a patient’s cough, it might be auscultation of the lungs, a murmur I have picked up, and with other information – nothing happens in isolation – has been useful in making a diagnosis. But I can’t be an Oliver Sacks and come out with this classic case, because I do this stuff all the time.

I could appreciate the difficulty in identifying a specific aural indicator that was vital for a judgement. I was also sensitive to his feedback that he was most conscious of his hearing when sharing knowledge with a training doctor. In combination with a few less than fruitful attempts, this feedback forced a revision of my interviewing. Where working through an event was effective for Klein, it was not the best approach for my research. This was fortuitous, because not requesting specific cases (though many times they were eventually given all the same) also removed any issues with professional codes of conduct that were particularly relevant for the doctors. The trigger for me was asking people how they came to be a doctor,
musician, adventurer, or Morse operator, asking about their learning experiences, and then taking on the role of the eager learner.

Learning from others

Perhaps the most critical aspect of my methodology was that in most cases I took on the role of the learner. With the exception of musicians from a similar background to myself, this was a genuine role to assume. I adopted the role of the learner in an informal sense. I asked participants to share with me what they knew, and slowly I began to understand what mattered to them when it came to learning and using their senses: what places they had been; who were the significant people; what were the external forces; and what were their experiences. In this sharing mode, participants gave examples that demonstrated what they were saying so I could learn from them. This included data that directly spoke to my research questions on learning processes, the roles of communities and contexts, and their specialised hearing practices. The richest information came when generous experts spent an extended period acting as mentors. This implicitly illustrated knowledge processes, expert practices, and the conceptual frameworks of hearing and knowing. It also made me not only an interviewer, but also a participant observer in the research process.

The formal interview

Having moved away from the ‘four passes’ method, my approach came to have similarities with Problem Based Interviewing.\(^{165}\) As described by Flick, this approach is semi-structured and focuses on the participant’s knowledge of a certain area, in order to use both questions and narrative stimuli ‘to collect biographical data with regard to a certain problem’.\(^{166}\) In this method, the interview questions act as a guide, or else a fallback if the conversation flounders or moves off topic, with the participant’s narrative otherwise driving the discussion. In the case of my research, interviews focused on participants’ lives in a community, including their learning experiences and uses of hearing. I aimed to collect data on a full spectrum of learning experiences and types of knowledge, including formal, informal, and tacit. I was also interested in the role and uses of hearing in expert practice. In this way, my guiding questions worked to inform my provisional research questions: How was people’s knowledge and hearing of sound formed? What was the involvement of communities and their contexts? How was hearing used in daily life? Indicative questions for these purposes are listed in Example 1.

\(^{165}\) Uwe Flick, *An Introduction to Qualitative Research* (London, California, and New Delhi: Sage, 2002).

\(^{166}\) Ibid., 86.
Example 1: Music Community Interview Questions

What were your first experiences with music? What interested you in it?

How did your skills develop? What was the learning environment/culture like? Formal and informal? When you were learning music, what were the most important things that you needed to learn and get skilled at?

At the end of your musical training as a musician, how skilled would you say you were? What were the biggest learning curves when you started playing/composing/teaching? How did you go about overcoming these issues?

What makes a good musician? How do musicians develop this level of expertise?

Are your skills in music something you’re fully conscious of? Something you can explain to others? Is it something you ‘just know’ without being able to describe it?

How would you go about sharing your knowledge with other musicians (and vice-versa)? How do you go about teaching others?

How would you describe your involvement with the music community currently?

Interviews were conducted in a variety of locations, as selected by the participants. Given that in many cases participants were professionals, they often slotted me in to their workday. Methodologically, holding the interviews in this way was good practice, because I witnessed them in work-mode. Some interviews were conducted in small groups of two or three people, in cases where interviewees elected this as their preference. This proved successful in most cases, because participants were able to share ideas, and conversations followed a more dialogical progression. Interviews lasted between 30 and 240 minutes, with the norm being a little over an hour in duration. All interviews were recorded and later transcribed, with the consent of the participants.

These interviews were conducted in two waves, both for health and practical reasons. Unfortunately, I was involved in a serious car accident on route to one of my early interviews. While I was able to continue conducting my scheduled Australian interviews (the first sixty-four) albeit in a reduced capacity, I was unable to travel to New Zealand, particularly in light of the mountain adventures my supervisor had planned for me. After completing this first wave of Australian interviews, I had (mostly) a nine month suspension of interviews, during which
time I transcribed and analysed the data, and began to write up preliminary findings in light of the emerging themes.

In September of 2010, I travelled to New Zealand for the second wave of interviews, arriving the morning after their first devastating earthquake. The complications of this disaster coupled with New Zealand's weather for that month provided many unique opportunities as well as some limitations. My planned four-day trip into the mountains was cancelled, but it was replaced by other smaller trips. Equally, some interviews were cancelled, but others came to involve travelling around looking at earthquake damage and discussing awareness and responsiveness to the environment. I interviewed eighteen people in total while in New Zealand.

While the fieldwork schedule did not always progress as planned, on aggregate the changes were fortunate. In particular, the interruption as a result of my injury meant that I had a second chance at fieldwork after months of reviewing my data and thinking about the emerging themes. In the later interviews and participant observation I was then able to ask more targeted questions to understand the findings more clearly.

**Informal learning in the research context**

A smaller, but very important number of participants spent significantly more time with me, going far beyond answering my questions. This aspect of the methodology has a synergy with my findings, in that this more relaxed embedded interview format replicated a mentor sharing their knowledge. Common experiences included spending time talking around relevant issues and getting to know each other, often for hours. With the adventurers, this involved being taken on small trips such as walks or drives, and having relevant indicators in the environment pointed out. With musicians, I was invited to attend rehearsals and gigs/concerts. In the Morse case, I was given demonstrations and shown collections of equipment. In some cases I spoke with participants on several occasions, providing the opportunity to be mentored into the ways of the community, and share and talk through themes that were emerging in my research.

**The data**

After conducting a total of ninety-two semi-structured interviews and participant observation, I had an immense amount of data. I transcribed the interviews after my first wave of fieldwork, and again after the second, keeping an awareness of the emerging themes, before coding the
data in a more structured way. The writing process was concurrent with fieldwork, transcription, and analysis, and formed an integral aspect of the thinking process. These writings took the form of scribbles on post-it notes, countless emails to colleagues, and notes that came to form the basis of my results chapters. In the following, I will attempt to make linear the emergence of key themes and my approach to data analysis, with a final note on how the data is used throughout the findings chapters in the context of the research questions.

**Approaching the data**

After consultation with my supervisors, I made the decision not to use software for data analysis. I had conducted the interviews and transcribed them and was intimately familiar with the data. Doing thematic analysis concurrent with interviewing and transcription also gave me a clear sense of the emerging issues and how they connected together. Even though ninety-two interviews is probably at the limits of what can be managed without software, the data remained manageable and memorable because it was made up of responses from four communities in roughly two stages.

With this in mind, my data analysis strategy was two-fold. As I transcribed the interviews, I noted any thoughts, themes, or connections. Upon transcription of all the interviews, I reviewed the data a second time, highlighting the transcriptions in different colours according to the emergent themes. The themes at this stage were conceptual contexts, learning, expertise, and dynamic communities. After beginning writing up my findings chapters, which were initially very data-centric, I returned to the transcriptions, often several times, as words of the participants became intelligible and slotted into place in the chapters. Having orienting concepts such as 'learning', 'expertise' and 'communities' was useful here as they imposed 'meaningful patterns on the data in a provisional way'.

Writing up the data raised important questions about how it would be best presented in terms of findings and ultimately argument, particularly given the multiple case study design. Multiple case studies have been criticised on the grounds of the tensions between the two research designs that it combines. Dyer and Wilkins, for example, are critical of the approach due to a tendency for researchers to focus greater attention on the element of comparative analysis.

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167 During the research process I was directed to Becker's treatise on writing, which reinforced the approach of treating writing as thinking. See Howard S. Becker, *Writing for Social Scientists* (Chicago and London: The University of Chicago Press, 1986).

over the specifics of individual cases. Another criticism of this approach is that it typically necessitates or at least encourages a more structured than open-ended approach, whereas one of the strengths of the single case study model is its flexibility to explore emergent themes. Keeping these criticisms in mind, I have treated the findings almost as four single case studies to facilitate exploration of what was most important in a given case, making comparisons only when they led to further theoretical considerations.

What this approach means practically is that the first three results chapters have a dedicated analysis of the issues raised by the particular communities. Rather than seeking to look at the same aspects across communities, I have focused on what was most important and interesting in the particular case, with an awareness of how this adds value to an understanding of the research questions more broadly. Another important tool for presenting the data in this way, particularly given the pressures of managing four cases, was the use of boxed examples. This technique was inspired by Klein’s work where, as a reader, I found that detailed illustrations of a point effectively gave depth, while the discussion around these could discuss theoretical issues at a broader level. It was also important to maintain the voices of the participants. As such, their words have been used extensively throughout, and have been attributed using pseudonym first names to protect their confidentiality. Identifying references to specific events or organisations have been removed.

**Emergence of themes through the research process**

Throughout my fieldwork, and particularly through the transcribing process, clear themes began to emerge, including some that were not in focus or were absent from my initial conceptualisation. In retrospect, I now realise that I began with an over-emphasis on expertise as a result of my reading of Klein’s work. While important, it was ultimately only one of many themes. The biggest divergence was that ‘epistemic communities’, my unit of analysis, proved to be far from clearly defined, with groups and networks displaying significant variation. Aural perception was emerging as contextualised within community values, approaches, places, and technologies, but also as dynamic and diverse.

As new themes emerged, approaches to the fieldwork shifted too. This often meant a less structured approach in interviews, where I allowed respondents more scope to tell me their story and share their knowledge as ‘normally’ as possible. At the same time, I also asked some more targeted questions during the second wave of interviews, to guide participants towards

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the specific emerging issues that I needed to understand further. For example, initially I had not asked targeted questions about the negotiation of sub-communities, so as this had emerged as a theme, I explicitly explored it with participants towards the end of the fieldwork. This experience of the research process was in keeping with Layder's adaptive approach, whereby as a researcher, I was responsive to issues and themes that emerged through my reading of the literature, and through my fieldwork.

After a research process filled with some improvisation and 'off-track tramping' to use the language of my participants, the conceptual roadmap for the results chapters is as follows:

Figure 2: Thesis questions (by level of abstraction)

Figure 2 illustrates the questions that the thesis chapters address and their level of abstraction. So far this thesis has examined the question at the apex: Can the senses be examined as more than physiological phenomena? Moving on from this question, the following chapters will examine hearing processes and practice in more depth. The more concrete questions at the base of the pyramid are addressed first: What are the ideas that
underpin hearing? How is hearing learnt in communities? And what is the position of hearing in expert practice? These questions are focused on the conceptual frameworks, learning methods, and uses of hearing. From this foundation, I ask again more abstract questions: How is hearing practiced in social groups? And how do the senses contribute to understanding? These questions are concerned with variation and negotiation across communities, and reinstate hearing in its broader sensory context. In other words, they examine the senses and knowledge as they are practiced and used in daily life.

Conclusion

This chapter described how previous studies have employed methodologies that have not facilitated a deep understanding of aural knowledge and its processes, because they have not accessed either the context or the more informal and tacit aspects. The relationship between knowledge, the senses, and methodology is such that data-capturing methods, including experimental approaches and even standard qualitative interviews, tend to miss critical information about the sources and uses of aural knowledge. Approaching aural experience ethnographically provided rich data because it was in context, and the mode of engagement supported a knowledge exchange between researcher and participants.

The next five chapters work to assess aural knowledge through the findings of this research, following the themes that emerged in the research process itself: knowledge contexts, learning, expertise, dynamic communities, and multisensory awareness.
Chapter 4

Knowing contexts

The literature in Chapter 2 suggested that the senses and knowledge are shaped over time and on multiple social scales. A macro layer of influence that the literature introduced was the context of communities. Scholars such as Kuhn argued that ‘paradigms’ influenced what was knowable and perceivable in epistemic communities. This influence extended to the senses, as community knowledge and practices defined both sensory subjects and ‘previous visual-conceptual experience’ of them.\footnote{Kuhn, The Structure of Scientific Revolutions, 113.} At a more micro level, Wenger and Turnbull highlighted the ‘locatedness’ of knowledge in communities, times and places, emphasising meaning-making and practice in smaller social groups.\footnote{Turnbull, Masons, Tricksters and Cartographers; Wenger, Communities of Practice.} Overall, I concluded that my study of hearing in epistemic communities would need to take account of these conceptual contexts and the practices of communities.

This chapter empirically addresses the research question: What are the ideas that underpin hearing? (see Figure 2, Chapter 3). I address these underpinning ideas by distilling the stories research participants told of when and how they came to their activity, their mentors, the settings, and the key ideas and learnings that mattered to them. Importantly, these stories included significant sounds, and the scope of ‘good’ aural and sensory practice. In keeping with the arguments of Wenger and Turnbull, these values and practices varied with context and sub-community. I organised their responses across spectrums from more analytical to intuitive aspects. Beginning with the musicians, I examined the spectrum of foundational ideas and approaches in each community independently. In this way, the chapter captures the context of
epistemic communities' sensory knowledge, and provides background for the issues that are explored further in the following chapters.

Musicians

As I described in Chapter 3, the musicians who participated in this study came from a broad range of educational and professional backgrounds. Most participants had lived, studied, and worked in several places both domestically and internationally. They played different instruments, and were involved in genres as diverse as classical, jazz, metal, latin, rock, contemporary, folk, and experimental musics. Some musicians were involved in multiple genres, sometimes with different musical roles, while others were focused more on a single type of musical engagement. The diversity of musicians meant that there was no single conceptual approach to musical hearing, or consistent values of certain aural knowledges. Rather, hearing and musical engagement changed with context and purpose.

While musical hearing was subject to significant diversity, there were also observable trends in how it was conceptualised and practiced. These trends can be expressed in terms of a spectrum from 'analytical' to 'holistic' emphases (see Figure 3). Analytical and holistic approaches to music were expressed in descriptions of musical sounds, and definitions of musical expertise. For musicians who were more analytical in their approach, 'good ears' were defined as being skilled in the isolation of musical elements. A 'good musician', from a holistic perspective, had a 'feel' for the music, and an intuitive understanding of its culturally embedded aspects. While different ends of the spectrum tended to be emphasised in different interviews, the boundaries between them were permeable.

Figure 3: Approaches to musical hearing

<table>
<thead>
<tr>
<th>Formal learning dominant</th>
<th>Informal learning dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analytical</strong></td>
<td><strong>Holistic</strong></td>
</tr>
<tr>
<td>'Good ears' means skill in isolating musical elements</td>
<td>'Good musician' means understanding the feel or groove</td>
</tr>
</tbody>
</table>
An analytical approach to musical hearing was marked by its focus on the accurate perception of isolated musical elements such as harmony, timbre, and rhythm. This approach emphasised aspects such as notes, scales, melodies, and chords as situated in a tuning system (most often that of Equal Temperament), and its harmonic systems (major/minor, tonal/atonal). This approach was aligned with a dominance of formal learning in music, particularly at an early age, and a primary focus on one genre. Among the musicians interviewed, these patterns most commonly occurred among classically trained musicians, as it was more common for classical musicians to begin in formal music lessons, with this early learning often influencing musical hearing in other contexts.

To demonstrate the aural practices and values of musicians with an analytical approach, I will take the reflections of two musicians, Edward and Julie. They tended to describe music exclusively in terms of its elements, and described musical hearing as discriminating between sounds. Edward, a formally educated classical musician, provided an archetypal example of this approach to musical hearing. He described how there were many ways of hearing musically according to the different musical elements being isolated. He could listen for texture, instrumentation, orchestration, timbre, counterpoint, harmony, and described listening for composition (separating the performer from the work), and listening for performance (separating the composition from its performers). He stated: ‘I can actually listen to a piece of music and not hear it at all. I can hear its structure, its microcosm, and divorce myself from its surface’. Edward perceived his analytical approach and skill in isolating musical elements as a mark of distinction, and as a means to hear music in an active and complete way. This understanding of ‘good’ hearing as a capacity to isolate and assess musical elements was common to musicians with an analytical approach.

In conjunction with the focus on the aural perception of musical elements, an analytical focus also demanded their perfection. From this perspective, musical beauty and accurate execution of musical elements were closely aligned. To illustrate this connection, the musician Julie described instances when she had heard professional musicians make mistakes. Julie had undertaken extensive formal music education, and was professionally engaged in the classical music community. On one occasion, she was listening to pianist Claudio Arrau perform the Chopin Etudes live on radio, following along with the music score. She stated: ‘It got to one [etude] I didn’t know and all of a sudden there was a monumental difference between what I was hearing and what I was reading’. She initially assumed that there was something wrong with the edition, indicating that what she heard was not necessarily unmusical. Julie later

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173 Equal Temperament is the tuning system in common usage contemporarily. It is based on the division of sets of frequencies into octaves, and octaves into twelve logarithmically equal steps.
found out that Arrau had had a memory lapse. While she would never have known had she not been reading along with the score, she was concerned that he had performed with errors, however musically. This example given by Julie illustrates the value placed on the perfection of musical elements—in this case the notes—in an analytical approach to music. It also demonstrates an analytical musical hearing style aided by the visual representation of the musical elements on a score.

On the surface, the antithesis of the analytical approach was the emphasis on experiencing music as a whole and understanding its cultural meanings, emotional intentions, and context. The musical hearing spectrum represented this approach as holistic (see Figure 3). This approach was most expressed by musicians who came to music informally and were involved in music genres such as jazz and Latin. These musicians tended to be more concerned with the overall ‘feel’, ‘groove’ or ‘vibe’: the often intangible aspects that communicated culture, place, time, and community. One musician observed that this musical ‘feel’ had the power to make a listener ‘think and feel Spain in the first three seconds’. It meant a pursuit of ‘authenticity’ over perfection at all costs, with perfection perceived to starve music of creativity and life.

For musicians who emphasised a holistic approach, music was historically, socio-politically, and culturally embedded. One musician, Anthony, described reaching musical understanding through ‘knowing history’ and ‘respect’. Musical hearing and music-making, then, were less about ‘mathematics’ and more focused on musical intent. In line with these values and approaches, the teachers he most revered held the deepest knowledge of musical context, embodied its meaning, and were ‘groovy’. This idea of ‘groovy’ carried with it cultural capital, and was considered to be ‘internal’, reminiscent of Bourdieu’s notion of ‘habitus’. Another musician, Alex, explained: ‘With the subtleties in different styles, groove is one of those subtle intuitions about when something feels right. It is a kind of knowledge that defies analysis and quantification’. This holistic understanding of music and musical hearing is demonstrated in the example of the aural knowledge required to play ‘funky’ funk bass (see Example 2).

**Example 2: When funk bass is just ‘un-funky’**

Amy was self-taught with a strong aural bias, performed many roles in the music industry, was actively involved in many genres, and played around twenty instruments. For Amy, music was more than notes; it was about the ‘feel’, ‘groove’ or ‘vibe’. It involved aspects of musical

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**References**

174 The issue of authenticity in music has been of interest, particularly in the context of commercialisation. For a discussion of authenticity, see Strong, *Grunge: Music and Memory*.

175 See Bourdieu, *Distinction*.
communication that could not be notated. In her experience, musicians who were formally-
trained were 'less emotional', and more 'calculated' and 'pedagogic'. She observed that among
formally trained musicians there was a gap between meaning and understanding. The
implication of this gap was that their music sounded 'unconvincing'. For Amy, this music failed
to move her. 'Feel' could not be taught explicitly because it could not be notated or put into
words. She stated: 'You can't just understand it theoretically; you have to feel it in your soul'.

For Amy, playing funk bass was an example of the need for an understanding of 'feel'. While
an aspiration for many bass students, learning it could be a challenge: 'We get to the slapping
part but it ends up just not funky'. To work towards funkiness, 'You can talk about it and talk
about making it lazy and being right on the back of the beat, and they can hear it and imitate it
to a degree'. This was not necessarily enough though. She stated: 'Unless they feel like James
Brown, they're not going to be funky. You have to pretend what it must have been like to be
black in the 70s and on the cusp of a new music revolution. You have to feel the bravado and
the cocaine and all the things that go into the sound. You can't notate “a bit of a cocaine
feeling with too many chicks back stage and no sleep” for bar 1, and on bar 2... You need the
student to get inside the 'feel' and feel it'.

As Example 2 highlighted, for musicians with a holistic focus, the connection between hearing,
cultural knowledge, emotion, and experience were central to authentic music-making. These
descriptions of a holistic understanding of music were, at times, starkly positioned against
analytical and formally fostered approaches to music. In the example, Amy observed that she
tended to find musicians who were trained formally unconvincing. She explained that while
she could appreciate technical skills, and on occasion virtuosity could 'wow' her, technique
alone was not enough. She continued: 'For me, it is more important that someone can make
me cry with one note. That is what performance really is. It is about channelling and
connecting in some way'. Hearing a moving, authentic performance was more than hearing
the perfect execution of musical parts.

One aural knowledge that was demonstrated to be contentious in line with the spectrum of
approaches to musical hearing was 'perfect' pitch. As I explained in Chapter 3, this was the
ability to identify and name or reproduce a pitch without external reference. As is
demonstrated in Example 3, musicians with an analytical approach to musical hearing tended
to cite the possession of perfect pitch as an indicator of their superior aural capacity. For
musicians with a more holistic approach, perfect pitch was virtually meaningless.
Example 3: Is ‘perfect’ pitch the Holy Grail?

For analytical musicians, having perfect pitch was a marker of superior musicianship, with the comment he or she had ‘amazing ears’ never far behind. For musicians with a holistic approach, the idea of perfect pitch was virtually meaningless, and it was not what made a musician musical.

Julie, a formally trained classical pianist, stated she had perfect pitch from an early age. This aural capacity was identified by a piano examiner. For Julie, this capacity was a marker of superior musicianship, but not unique. On the contrary, she suggested that it was a ‘given’ for elite musicians.\(^\text{176}\) While perfect pitch was desirable, it had some negative consequences including difficulties reading scores for transposing instruments while listening to a recording. She stated it was ‘impossible to follow a part of a transposing instrument such as clarinet or trumpet’, and even now, she could ‘only follow the rhythm of the score, not the pitch’. This difficulty was accepted as the price of perfect pitch. In a teaching context, she apologised with pride that she could not follow on with students.

Lachlan, a more informally trained violinist, was critical of this focus on perfect pitch because it was ‘meaningless’ and ‘misguided’. For him, the idea of perfect pitch was conceptually flawed because of the cultural specificity of tuning systems. He stated: ‘The twelve note scale and perfect pitch? What does that mean to a Turkish or an Indian musician?’ For Lachlan, pitch recognition was a matter only of memory, which had no inherent value: ‘Some people have amazing pitch memory, just like some people are good at their times tables. It doesn’t mean you’re a good musician’.

Example 3 illustrated how some analytical musicians valued aural knowledges that were considered less important by musicians with a holistic focus. This example resonates with the themes that have emerged through the other findings. The musician with an analytical emphasis is again focused on the perception of musical elements, such as pitch and rhythm. The musician with a holistic emphasis draws attention to the cultural aspects of music.

While some musicians tended to draw clear lines between analytical and holistic musical hearing, in most cases, participants expressed approaches to music that were between these two extremes. For some, there was a focus on perceiving the microelements of music, with a peripheral awareness of the bigger picture. For others, music was heard and experienced as a

whole, with a transitory awareness that perception of musical elements such as harmony, articulation, and rhythm facilitated this understanding. In the middle, musical proficiency was understood to require both the perception of musical elements and a sense of ‘musical beauty’. In other words, ‘good ears’ meant both the ability to perceive musical elements such as pitch and rhythm accurately, and a deeper understanding of the musical whole.

One example of this blurring of the boundaries between analytical and holistic came from within the classical music community, where there was a sense of tension between making music, and playing perfectly. The tendency to focus on perfection over musicality among classical musicians was in keeping with Chaffin and Logan’s finding that the possibilities for creativity were limited when performers had to focus principally on technique and the sounds being made. While classical musicians almost invariably emphasised analytical approaches and the pursuit of perfection, there was also a sense that music required creativity within the scope of a piece. This dual value of perfection and creativity was captured in concert pianist Emil Gilels’s reflections on his own performance:

> When I am in top form ... it is different each time I play, and it is a process that I would say includes the mastery of the work, knowing the detail, being comfortable with it, and then adding the fantasy ... Of course the technique must be there, but the imagination must go with it ... you must remain true to the composer and yet independent as an artist.

While Gilels was a pianist in the classical tradition with a strong focus on perfection and detail, he also considered an ability to vary musical elements such as timing, timbre, and dynamics to be a reflection of his artistry and skill.

The musician Julie recognised this need to balance perfection and creativity, albeit uncomfortably. Through experience turning pages for elite pianists she was aware that they did not necessarily play all the notes on the score because music-making was ‘not about playing all the notes’. In other words, although she had an analytical bias, she was aware that the perfect reproduction of the musical elements was not to be at the cost of the complete musical experience. While in the case of contemporary classical music culture this scope for interpretation and ‘feeling’ was limited, these more holistic aspects of musicality were

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179 This reflection is in keeping with Chaffin and Logan, "Practicing Perfection," 116.
generally recognised as indispensable. This second example given by Julie demonstrates how
musicality and musical hearing were often initially expressed in terms of an extreme analytical
(or holistic) approach, but often the distinction was less stark in practice.

Common across the spectrum of approaches to musical sound was a pursuit of a musical
‘essence’. For those who leaned towards an analytical approach, this meant that the music
was reducible to its elements. It was these elements and their construction that gave it
meaning, and their isolation and interpretation that led to understanding. For those more
focused on the musical whole, the essence of music was ‘more than just notes’. Music was
about communication, meaning, emotion, and perceiving and understanding the whole, and it
was these goals that had to be fulfilled for something to be truly musical.

Morse operators

The Morse operators who participated in this study came from a more narrow range of
educational and professional backgrounds than the musicians. Most operators had been
employed in the PMG department as either full-time telegraphists or as postal clerks. These
PMG operators shared educational and professional experiences, and they presented a
reasonably consistent set of practices and values. A minority of operators applied their skills in
Antarctica, in the rail service, and in the military. Operators shared in common their
contemporary involvement in the Morsecodian fraternity. They maintained friendships over
the Morse network (which was run using modems), most participated in Morse
demonstrations at events like International Lightstation Weekend, and many attended their
annual conference conducted in Morse.

Morse operators conceptualised their role to include apparently contradictory elements, with
implications for their professional values and practices. As with the musicians, I have
conceptualised this dual context of Morse operation and its aural knowledge in terms of
emphases on ‘transmission’ and ‘message’ (see Figure 4). These aspects were expressed in
descriptions of the Morse role. Like the musicians with an analytical focus, hearing for the
purposes of transmission stressed the accurate and rapid aural perception of Morse signals. In
other words, this aspect of the role focused on the dots and dashes and their groupings to

1999). Feminist music scholars have explored this issue in terms of aesthetics and professional
development. See Citron, Gender and the Musical Canon; Macarthur, Feminist Aesthetics in Music;
McClary, Feminine Endings: Music, Gender, and Sexuality; Christine Battersby, Gender and Genius:
Towards a Feminist Aesthetics (London: The Women’s Press, 1989); Eva Rieger, ""I Recycle Sounds": Do
Women Compose Differently?,“ in Source Readings in Music History, ed. Oliver Strunk and Leo Treitler

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form Morse letters. At the same time, operators were aware that their role was not only a matter of signal transmission. Operators were also the 'listening posts' of the community. This vital role in community communications meant that the messages were not just dots and dashes. They were information to be treated sensitively.

Figure 4: Aspects of Morse operator practice

<table>
<thead>
<tr>
<th>Machine-like</th>
<th>Hearing speed and accuracy in sending and receiving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening post</td>
<td>Hearing community communications sensitively</td>
</tr>
</tbody>
</table>

Speed was core to professional practice, and was the most valued characteristic of Morse operation. All operators spoke of 'the need for speed'. This speed in operation depended on formation of the signals with the arm and Morse key, and hearing and understanding the clicks from the Morse sounder. A good speed was a functional requirement of the role, and achieving speed was a key objective and pass requirement of the training program. Operating at great speeds was not only functional. Some operators gained reputations for the volume of traffic they could handle; others wanted to build such a reputation. While some of the speeds claimed were contentious, the reputations of 'gun' operators entered into Morse legend as something to aspire to, and were a matter of pride. The greatest insult, 'put a man on the line', was received if an operator was falling behind and 'breaking' the sender (ie stopping a transmission and requiring repetition of part of a message). The value of speed and its ascension into Morse legend is demonstrated in Example 4.

Example 4: Legendary gun operators

The best operators, known as 'gun' operators, had reputations that lingered on well after their retirement. As a young operator at the Sydney Chief Telegraph Office, James recalled the fastest senders in the state: J.A.P. (Jap) O'Neil, and Callaghan, The Mountain Lion. The story goes that on a 'classic' Saturday morning, Jap O'Neil and The Mountain Lion were working the
line from Sydney to Katoomba. On this Saturday, there were more weddings than usual, so the typically busy line was pushed to its limit. James recalled: ‘I think they did five hundred telegrams one morning in Morse, and Jap got a standing ovation from the boys in Sydney’. Critically, while these stories worked to influence and inspire James, he did not know the operators personally. He stated: ‘Jap was just about retiring when I started, and I can only remember him vaguely’. Of The Mountain Lion, James stated: ‘I saw him once, but I didn’t actually meet him’.

As Example 4 demonstrates, speed of operation was the stuff of legend and served as an inspiration to those in the Morse community. Accuracy was equally valued, though it tended to be more implicit. The value of accuracy entered the collective memory of the community in the form of cautionary tales of great mistakes. One such story of a message that was misheard recounted an operator who was sent an order for two dozen pies, but mistook it for twenty dozen. Accuracy was as vital for sending as for receiving. Another story illustrated the gibberish produced when sending was inaccurate. The protagonist of this story was an older operator put on the lines after returning from the war. He was known to shorten his dashes, making them dots. This inaccuracy represented both an error in signal formation, and an inability to detect this error aurally. When a receiving operator was confused by this error, the unaware and frustrated sender sent down the line ‘what’s the matter’. Unfortunately, because he had shortened his dashes, ‘rits the nitter’ was received. He had been known as ‘Old Rits the Nitter’ ever since.

In some contexts, accuracy in sending was of special importance, as operators could be aurally identified through idiosyncrasies in their cadence. In a military context, Morse operators were stationed with a regiment, and there were cases where troop movements were tracked on the basis of the sending style of the Morse operator posted. In other words, while ideally all operators were trained to form Morse signals in the same way, operators got into ‘bad habits’. One Morse operator, Charles, commented that Morse style was ‘an extension of a person’s characteristics’. Those who were ‘flat out’ in life would be ‘flat out’ in their sending, ignoring the conditions and ‘going like the clappers’. These personal idiosyncrasies were like an aural signature, and had the potential to divulge military secrets.

These values of speed and accuracy represented Morse operation as a machine-like practice that was efficient and had a desired impersonal security. These values and practices were entrenched into the training program, and were both functional and social requirements of the role. One operator recalled the unforgiving margin for error at examinations: ‘You couldn’t
afford to make a mistake'. At the same time, there was an acknowledgement that while operators were to be machine-like, they were people who served their community's communication needs. In other words, there was a human element in the Morse role. In interviews, operators employed during war-time sombrely recalled receiving lists of the war dead. This privileged and sensitive role as the 'listening posts' of the community meant that the focus ceased to be on the speed of transmission.

Morse operators were regarded as conduits for communications in and out of the community. In many towns, Morse was a primary means of communication, and had a substantial social impact in terms of its ability to shrink space for those with access. As Charles described:

In the early days of Morse they went to work in a Bowler hat, waistcoat and a walking stick. They were pretty important people. When I was growing up the postmaster, bank manager, and the policeman were the three pillars of the community. In terms of its impact at the time, Morse was much bigger than the Internet.\(^{161}\)

The post office would collect and transmit the weather reports, receive news, and personal and official communications. With the important role of the Morse lines for community communications, the Morse operator held a unique and trusted position as the mediator of this information. Example 5 captures how this role in community communications sometimes involved contravening official professional practices.

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**Example 5: Listening posts and the secrecy declaration**

Passionate about the old Morse days, for Allen the post office was the 'communication centre of the town' and 'a community forum'. Allen recalled that people would come to the post office and send and receive communications via post and telegram and, equally, they would talk with friends while they were there. In this cultural, social and technological context, the Morse operator was a 'listening post'. Allen described that operators 'were aware of everything that went on' and, as a result, were party to a secrecy declaration: 'Anything you saw or heard pertaining to the post office could not be divulged'. This secrecy declaration was taken very seriously by operators. The information heard over the wire was sacrosanct, and yet, the role of the Morse operators and telephonists was such that there were cases in which divulging information was necessary. Allen explained: 'Someone might ring in and say "There is

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a fire out here” and the telephonist might plug in to four party lines, which might cover say twenty properties, and when they pick up, they might say “There is a fire at Joe Blow’s”.

Example 5 demonstrates that there were rules governing how a Morse operator was to treat information that passed through the post office. These rules emphasised that operators were to treat information with the upmost secrecy, at threat of having their position terminated. However, as ‘listening posts’ and members of the community, sometimes the rules were disregarded. While Morse has been presented as an end to personally mediated communication, this aspect of the operators’ values and practices emphasises the human element. There were times when operators’ judgement deemed that they could not ignore the message that was heard.

Morse operators communicated a reasonably consistent vision of their ideal practices and capacities. This is attributable to their common educational and professional backgrounds. The values and practices of Morse were centred around two divergent conceptual contexts: signal transmission and sensitive treatment of a message. Operators were subject to the secrecy declaration, becoming machine-like conduits for Morse signals to aurally and physically pass through. In a sense, Morse was to be heard but not listened to. Equally, however, operators were ‘listening posts’ for the community. They heard these messages and in some cases formed judgements about a course of action. Like most musicians, operators ideally balanced these two opposing aspects in their practice. Successful Morse operation required speed and accuracy, but it was still practiced by people.

Adventurers

Adventurers who participated in this study came from a broad range of backgrounds. They were engaged professionally and recreationally in multiple disciplines such as walking (‘tramping’), mountaineering, cross-country skiing, canyoning, and rock climbing. Most adventurers engaged in multiple disciplines. They held a variety of roles professionally including guide, writer, and ecologist. They were based across multiple locations in Australia and New Zealand, and had had adventurering experiences globally. Like the musicians, this diversity meant that there was no single conceptual approach to hearing among adventurers. Rather, just as there were diverse reasons that adventurers went into the outdoors, different

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contexts and disciplines produced different experiences, and clubs fostered their own values and practices.

While adventurering and hearing in this context were subject to significant diversity, there were also observable trends in how they were conceptualised and practiced. These trends can be expressed in terms of a spectrum from the pursuit of ‘achievement’ to ‘attunement’ (see Figure 5). These approaches to the environment were captured in descriptions of how adventurers came to their discipline, their reasons for going out, the sounds in their environments, and their use of audio devices. For adventurers who were more achievement focused, their dominant values and practices emphasised speed, difficulty, and survival against the odds. Within this approach, hearing and other sensory elements were either left out or conceptualised as cues that were directly functional for decision-making. For adventurers who emphasised an approach of attunement, their dominant values and practices were expressed in terms of disconnection from the social world, connectedness to the environment, physical isolation, self-reflection, clarity of perception, and solitude. As with the musicians, while different ends of this spectrum tended to be emphasised in interviews, often adventurers expressed aspects of both, or had changed emphasis over time.

![Figure 5: Adventurer approaches to the environment](image)

As with the musicians, there were common tales among adventurers of how they began, of wonder, of achievement, and sometimes of epic failure. Many started going out into the bush at a young age, often with family. Others were involved later as part of a school program. But common among them was a sense of gaining inspiration from great feats. One adventurer,

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183 This understanding of attunement is aligned with Philip Koch's writings on solitude. See Philip Koch, *Solitude: A Philosophical Encounter* (Chicago and La Salle, Illinois: Open Court, 1994).
Andrew, shared that even as a child he was ‘interested in reading books about heroes out in the world discovering new places or climbing steep mountains’. For others it was witnessing or achieving greatness, whether through climbing a peak, a rock face, or walking off-track through difficult terrain.

Captured in these recollections was a vision of adventure in which difficulty, speed, achievement and survival against the odds were most valued. This approach was articulated by one adventurer, Louise, who stated: ‘Often I will take a harder route knowing there is an easier way because I want to prove that I can do something harder’. She considered herself to be competitive, and participated in groups that were also ‘trying to push the boundaries’. Most accounts in popular culture about the adventurer community reflect similar values and practices. A well-known example of this approach was given in Touching the Void, which recounted Joe Simpson and Simon Yates’s near-fatal ascent of Suíla Grande. Another well-known example is 127 Hours, which tells the story of canyoneer Aron Ralston, who became trapped by a boulder and was forced to amputate his own arm to get free. With this value of the extreme came a fascination with journeys not going to plan. As Storer explained: ‘the longer the fall, the more excruciating the pain, the greater spillage of blood, the more salivating relished the tale’.

Within these dominant narratives, descriptions of the senses were largely left out, with the exception of comments on the beauty or scale of the landscape, feelings of pain, and sensory cues that were directly functional for decision-making. Inclusion of the senses when functional is in keeping with Classen’s argument that in Western societies ‘we are accustomed to thinking of perception as a physical rather than cultural act.’ For example, one of the few references to the senses in Touching the Void was Joe Simpson gauging whether his ice axe had gone far enough into the ice by the sound that it made. Similarly, in an interview with Louise, she stated that she listened for the distinction between soft snow and ice. She described that ice had ‘a very loud scraping sound where you struggle to put your edge in’. As a result of hearing this sound, whilst cross-country skiing Louise adjusted her technique, pushing the edge of her ski further into the surface, leaning in, and using her poles.

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184 Kevin MacDonald, "Touching the Void," (United Kingdom: Pathe, IFC, and MGM, 2003).
185 Sean Penn, "127 Hours," (USA: Twentieth Century Fox Film Corporation 2011).
187 Classen, Worlds of Sense, 1.
While this emphasis on achievement represented a starting point for many adventurers, most came to be critical of it. In other words, adventurers tended to find pursuing ‘achievement’ a step in the learning process. Daniel, for example, polarised ‘mountaineers who walk up a glacier with a Walkman in their ears’ and ‘others that notice things’. Brian, too, was critical of what he termed ‘the standard wilderness adventure’ based on the Western view, where the wilderness was an adversary: ‘you are battling against it and you finally win or lose’. For Emil, while climbing the east face of Mount Geryon helped inspire him early on, he was critical of those for whom mountaineering was a matter of technique and achieving the most difficult goals, particularly on the grounds that they missed key parts of the experience and lacked necessary understanding. He stated: ‘They are so focused on the really hard stuff that they can’t be bothered spending time in the mountains and getting used to the mountain environment’. Adventurers who had an absolute focus on achievement were seen as not being attuned to the conditions or context.

This concept of attunement was most commonly expressed in terms of a connection with and understanding of the environment. One adventurer with this approach, Sophie, stated that being in the bush was a ‘deep, innate feeling of nature’. Another adventurer, Brian, expressed this approach when he stated: ‘You don’t go in shouting or tearing things off plants’. This attunement came with a knowledge and understanding of a specific place. Hearing and the senses were important strands of this experience, and were fostered through a ‘gentle exploring’ of the bush. Adventurers who emphasised attunement did not conceptualise hearing sound in terms of information. Rather, hearing and the senses were an element of a holistic connectedness to an environment and were often a source of pleasure.

For adventurers who championed attunement, aural experience of the bush was to be guarded. Negative responses to audio technologies in a bush context are indicative of the value placed on hearing the environment (see Example 6).

Example 6: The problem of the iPod

For George, taking an iPod into the bush was ‘unethical’. Towards the end of a difficult solo journey through Lady Northcote Canyon in the Snowy Mountains, George described sitting on a boulder in a creek bed, boiling a cup of tea, and listening to the bubbling water of the creek. The sound of the bubbling water was his favourite sound. A Mahler symphony or Mozart’s Requiem could not come close to its perfection. George was also a musician. He played and listened to music continually when not in the bush. But here, he never took his iPod: ‘It would be like going to a play and watching YouTube on your phone! You have got such a beautiful
symphony in front of you!' The problem of the iPod was that it altered the soundscape, which for George meant missing the ‘natural’ and beautiful sounds of the environment that were the reward for an arduous journey.

Other out of place sounds were equally concerning, as the sounds of the environment facilitated or disrupted his attunement. When leading a group, George banned iPods and was agitated when an inexperienced walker failed to turn off their phone. When they came within range of a mobile tower, the symphony of nature was replaced with a chorus of SMS beeps. Similarly, he recalled that over the summer track work was done up in the Snowy Mountains, filling the soundscape with trucks and helicopters. These sounds threw him ‘back to reality’ and the experience was ruined. George stated: ‘I don’t know why we insist on it so much, because it’s not my ears that are listening to it, it is their ears. Maybe we’re trying to educate them to understand what it is about, or at least what we find appealing about it’. Inevitably, what was at stake was the very way of being in the bush.

Example 6 illustrates how aural experiences of the environment were particularly valued by some adventurers and clubs, to the extent that devices such as iPods were ‘banned’ on trips. For these adventurers, the value of hearing was framed in terms of pleasure, and connection to place. It was not framed as functional, or a source of information as it was for adventurers who emphasised achievement. The greatest concern was that an iPod seemed ‘very out of place’, and ‘really unnecessary’.

Like the musicians’ reflections on ‘perfect’ pitch, the use of audio devices emerged as an issue that captured the spectrum of values and approaches among adventurers. While Example 6 demonstrated an extreme position on audio devices such as iPods, many adventurers with a value of attunement found some use for them, or had used them in the past. Grant, for example, described his personal journey from attempting great feats to pursuing connectedness in terms of his position on audio devices. Previously, he would take a Walkman skiing and walking because it was perceived to enhance performance: ‘If you are listening to the music you are detaching your brain from your body, so you go better’. However, his approach had shifted and so had the contents of his backpack: ‘Nowadays I don’t take anything because I prefer to listen to the sounds of the bush, and don’t want any electronic interference’. As Grant’s reflections demonstrate, the use and rejection of audio devices occurred concurrent with the values and practices he aligned himself with.

Perrot presents a similar directive to leave audio technologies behind in favour of sensory engagement, see Maina Perrot, "Sensing the Wild," Wilderness December 2009, 34.
Like the musicians, the boundaries between ‘achievement’ and ‘attunement’ were permeable, and these attributes were not mutually exclusive. For some adventurers, using audio devices was dependent on the context, and the balance of performance, pleasure, and connectedness. Vincent, for example, used an iPod when a part of a journey was ‘just mindless plodding’, or when he was trying to avoid a conversation. He observed, however, that while ‘really cool in some circumstances’ they were not safe all the time: ‘I do see young guys wearing iPods doing quite dangerous stuff and I don’t think that is right. I think you need to be able to hear what is going on around you’. Similarly, Belinda chose to both use and not use an iPod based on whether she needed the distraction it offered or the experiential aspects that she enjoyed and benefited from without it. Belinda reflected: ‘The choice of listening or not listening changes your connection to the space around you. When I don’t want to be connected, that is when I put it on. When I do want to be connected, I turn it off’. Simon, an adventurer whose approach emphasised attunement, suggested the iPod was at times an enhancement to the bush.
soundscape. For Simon, lying in the sun high up in a basin listening to Chopin added ‘another strand of enjoyment’. In his experience, fellow travellers also found pleasure in the addition of some beautiful music, with the biggest challenge getting them to try it: ‘I was on the south coast on some easy tracks with a friend once, and I had to offer him my iPod several times before he would take it, but I had to wrestle him to get it back’. Importantly, Simon’s iPod use was selective, and its volume was always low enough that he could hear the bellbirds. As these examples demonstrate, there were times for achievement, times when things were hard, but equally, safety and enjoyment often relied on attunement to the environment. Whether audio devices were a help or hindrance depended on context.

For some adventurers, silence was most desired. Silence meant neither noiselessness nor passive calm, but was a state of social and urban disengagement. This understanding of silence was reflected in Koch’s description of solitude in the landscape: ‘Think of John Muir alone, high in the California Siennas, running whooping down a great moraine of glacier-strewn boulders, feeling the music of their placement in his feet.’¹⁸⁹ In this context, silence was the ‘sensory equivalent of solitude’, and worked to heighten awareness. As Emil observed: ‘The absence of sound makes the sound that does occur more acute, more conscious’. A similar idea was expressed by Brian, who described silence as ‘a deeper sense of meditation’ facilitated by the peace of the bush and the absence of ‘noises’ from the social world. Silence was also a practice of humility. As Belinda explained: ‘I am always aware that I am a bit of an imposition generally, so I like for me to be as silent and as unobtrusive as possible’.

Silence was often achieved through solo adventuring. Going with others meant that an adventurer could be ‘tuned in’ to other group members, taking focus from the environment. As Belinda explained: ‘Going alone takes that out of it. There is more time to observe, and see things’. Going solo also meant that more subtle sounds could be heard, as illustrated in Example 7. For experts, it also meant that more challenging terrain could be covered safely.

Example 7: Silence and safety

For Emil, going alone into the mountains could bring with it some powerful advantages, including less social distraction, and greater focus on the environment. Going along brought with it ‘silence’ which heightened the senses. It meant that more could be perceived, particularly ‘subtle cues’ that, as Emil explained, ‘you might miss entirely if you’re walking along and talking to somebody’. He continued: ‘The sounds and perceptions that you are able

¹⁸⁹ Koch, Solitude, 20.
to pick up when you’re there by yourself in a solitary manner tend to be fairly subtle, otherwise you wouldn’t need to be there on your own’.

The ability to perceive more when alone expanded the boundaries of what could be understood in the environment. When there was a capacity to respond to this knowledge, it increased what could be done safely. Being sensitive to the different textures and qualities of ice, and its changes from one step to the next, required this level of attunement. Staying safe required an awareness of how far the points of the crampons had gone in, and different types of ice. Green ice, for example, was the hardest, and required much more careful attention when it came to foot placement and the purchase of a crampon. Going alone facilitated more accurate judgements to avoid or safely and efficiently climb in such conditions.

In Example 7, Emil, an expert mountaineer, described how in going alone there was more ‘silence’, which had the impact of heightening the senses. This facilitated the perception of subtle cues such as the texture of ice, and the purchase of a crampon. While for experts such as Emil these solo journeys were desired, for most others, going alone demonstrated their comfortable limits of social disconnection. Luke, for instance, stated that in times of extended stress, solitude and silence could be ‘oppressive’. For Vincent, while going solo allowed more challenging routes to be traversed safely, he did not always find it pleasurable, and on one occasion found himself running his stove in an effort to curb the silence and loneliness.

Similarly, Belinda stated that in a context characterised by sensory deprivation such as the Antarctic, an iPod gave her ‘something’ in her head. In cases where adventurers were not in a position to use an iPod, the brain was reported to similarly fill the void. On his arduous journey down Suıla Grande, Joe Simpson heard a song in his head over and over, to the point that he declared: ‘I do not want to die to Boney Maroney’. Others have described a person appearing with them, somewhat like an imaginary friend.¹⁹⁰

Adventurers expressed values and practices that informed their approach across a spectrum from ‘achievement’ to ‘attunement’. These values and practices shaped their conceptualisation and use of their hearing and their other senses. For adventurers with an emphasis on achievement, hearing sound was identified as a source of information about the conditions, and it could have a functional implication for their practices, such as whether poles were needed when traversing terrain. For adventurers focused on attunement, sound and silence were strands of experience that gave pleasure, and facilitated connectedness to an

environment. Hearing could add to understanding and heighten awareness. As with the musicians, the lines between these approaches were not clearly defined. Rather, as the divergent positions on audio devices demonstrated, practices were often dependent on context.

**Doctors**

The doctors who participated in this study practiced in Australia and New Zealand. They held roles in general practice, surgery, anaesthetics, cardiology, and neurology. As doctors, they shared some practices and values in common. With their divergent specialities, however, there was also some variation in their focuses and knowledge. Hearing in medical practice was most readily identified as aided by a stethoscope (termed ‘auscultation’). The stethoscope was a symbol of professionalism, and an aural technology that isolated the sounds of the body for analysis and diagnosis. Doctors also heard other bodily sounds, their professional environments, and ‘listened’ to patients in consultation.

These elements of medical hearing included different aural objects and approaches to aural practice. I have conceptualised this context of medical practice and its aural knowledge in terms of emphases on ‘isolated’ and ‘inclusive’ aspects of hearing (see Figure 7). Like the musicians with an analytical focus, isolated hearing stressed the accurate aural perception of elements of a heartbeat, or the timbre of breath sounds. At the same time, doctors were aware that their hearing included an awareness and responsiveness to other sounds of the body and, like the Morse operators, considered ‘listening’ sensitively as a vital aspect of their role. In this inclusive conceptualisation of medical hearing, sounds were one strand of a doctor’s multisensory practice.

Doctors descriptions of their learning, values, and professional practices revealed a hierarchy of hearing among specialities. Auscultation, or listening aided by a stethoscope, was identified as ‘the timeless symbol of being a doctor’. It reflected values of medical hearing as ‘active’ and ‘analytical’, traits that were most symbolically achieved through the stethoscope. The stethoscope was a means to objectify and rationalise the body’s sounds. As with the adventurers who emphasised achievement, this element of medical hearing reflected an

191 For example, representative of a more nuanced understanding of practices and values in the natural environment, Perrot notes that the senses have the dual function of pleasure and risk assessment. See Perrot, "Sensing the Wild," 34.

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understanding of the senses as capacities that 'simply gather data about the world'. Using this technique, doctors' hearing and the patient's body parts were isolated to gather data and work towards a diagnosis.

Figure 7: Aspects of medical hearing

<table>
<thead>
<tr>
<th>Listening to hearts</th>
<th>Hearing the body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated</td>
<td>Inclusive</td>
</tr>
<tr>
<td>Hearing as an isolated modality</td>
<td>Hearing one strand of multisensory practice</td>
</tr>
</tbody>
</table>

While many parts of the body could be auscultated, the heart and circulatory systems were most associated with the stethoscope. Given this connection between hearing hearts and auscultation, cardiologists were often thought to have the 'best' aural acuity among doctors. They were imagined to spend their time listening attentively to the heart and its murmurs. Many doctors recalled how in decades past cardiologists would be called to consult on a patient, and as they left, would draw a diagram of what they heard. The medical students and junior medical staff would eagerly go to the patient file to see what the cardiologist had drawn, in an effort to check if they had managed to hear what the cardiologist with their superior hearing had identified. There was a sense of pride when they had got it right, and a return to the patient to try and hear what was depicted when their ears had failed. Hearing murmurs and abnormal heart sounds was what they were hoping for. While the frequency of these sounds was decreasing, and the cardiologists' diagrams were replaced with echocardiogram results, the idea persisted that cardiologists were great listeners. Cardiologists agreed. For them, the stethoscope was their calling card and, in one case, it was bought to my attention that a cardiologist had many stethoscopes.

While cardiologists were identified as occupying this privileged position, other specialities also used their ears diagnostically, posing a challenge to this audition hierarchy in medical practice. Bruce, an orthopaedic surgeon, suggested that while cardiologists spent much of their time

194 Rice, "'Beautiful Murmurs'."
hearing with stethoscopes, other specialities, such as orthopaedics, had their own specialised hearing. For Bruce, on the operating table, perceiving aural cues such as the sounds of cutting or drilling through bone were critical to the quality of the outcome. The pitch of the sound changed when a surgeon had reached the outer rim of the bone, and needed to pull the drill back to prevent damaging soft tissue.

Figure 8: Drilling through bone

The observation that doctors in specialities had their own aural knowledges that were used continuously indicates that the isolated aural modality of auscultation does not capture medical hearing in its entirety. Doctors heard the whole body. While the role of hearing in medical practice could be thought of in terms of the stethoscope and auscultation, for the doctors interviewed it was not the primary form of listening they identified, nor was it a form they were particularly comfortable with. Cameron captured this:

It is a symbol of being a doctor and professionalism, but that is in some ways discordant with the extent to which doctors can actually use it and get the most out of it, and it is discordant with the fact that the role of auscultation has possibly diminished over the last two or three decades due to technological advances.
Where auscultation was once elevated as a skilled means to diagnosis, technologies such as echocardiography were more reliable for an accurate and detailed assessment of heart and circulatory system function. The impact of this technology was enhanced by its influence on training:

Doctors are going through their training not properly learning how to use a stethoscope, not knowing how it can truly help you, and not knowing what the limitations of auscultation actually are. We are facing a lot of technology that can help us to make a diagnosis, and people are bypassing auscultation and are just moving straight on to technology-driven opportunities.

These observations both capture the changing uses of hearing in medical practice, as well as the enduring value of auscultation. Deskilling in medicine as a result of technological developments was of concern, because auscultation was a valuable tool for decision-making. However, increasingly the view has been that clinical techniques such as auscultation are ineffective (at a minimum due to the limited skills that are being developed in this area), and that they are out-dated. Given technological developments, it has been argued that emphasis should move towards technology-driven diagnosis (using tools such as hand-held echocardiography), and training to ensure its efficacy. The changing position of auscultation is captured in Example 8.

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196 This issue is also noted in Edgar Burns, "Positioning a Post-Professional Approach to Studying Professions," New Zealand Sociology 22, no. 1 (2007): 75-76.


Example 8: The death of auscultation

After fifty years in the medical profession, Joshua referred to medicine as it was initially taught to him as 'the bad old days'. Medical practice was more reliant on sensory judgements, and less on the screening tests now available. In his basic training, examining a patient involved 'palpating, listening, observing, and taking the history of the patient'. However, hearing some sounds, particularly quiet heart murmurs, was 'controversial'. He explained: 'Auscultation of the heart is a pretty inexact science, particularly in the light of today's investigations'. Given the inexact outcomes of auscultation, Joshua reported that now some professionals 'hardly bother to put a stethoscope on a chest' because the technique 'doesn't tell you all that much in light of all the information you can find out using other methods'.

While Joshua was critical of clinical methods such as auscultation, upon deeper questioning, a 'good' physical examination was considered critical to effective and efficient medical practice. Auscultation was a 'simple screening test' that he used routinely. One example of Joshua's use of a physical examination was in a pre-operative context. Prior to anaesthetising a patient, Joshua listened to their chest because it gave 'basic information' that had 'a bearing on the health of the patient and their suitability for the procedure without having to go to the expense of more sophisticated tests'. He continued that the more expensive tests 'might give you more information' but in most cases, were 'not necessary'.

Despite his initial criticism of auscultation's effectiveness, Joshua was critical of professionals that did not use their clinical skills. He stated: 'I think the tendency these days, unfortunately, is to screen patients using tests not physical examination, and I think that is unnecessary, expensive, and possibly even dangerous. The best test is eyeballing the patient and giving them a general physical examination, there is no question about that'.

As Example 8 illustrates, clinical methods reliant on sensory judgements were met with discomfort and even condemnation in a contemporary medical context. This awkward relationship to auscultation was in the context of a decline in the skill, and the technological developments that provided greater information and a more accurate diagnosis. However, the continued application of auscultation points to this skill being more reliable than immediately credited. The observations in Example 8 also highlight the more inclusive use of the senses in medical practice. Forming clinical judgements was not only the product of isolated, analytical auscultation of the heart. Doctors palpated (felt), observed, listened, and spoke to the patient about their medical history. Through 'eyeballing' and a 'general physical examination' doctors
took in a multitude of information about a patient’s health, with these strands of information all contributing to an efficient and effective assessment.

Taking the patient’s history was the most emphasised use of hearing in medical practice. To emphasise the centrality of speaking with patients, one doctor described how in the early days of the medical profession, this was often all that a doctor could do due to the limited medical knowledge. Yet, he still considered their practice successful because ‘they communicated with people and they did what they could well’. While auscultation was treated with some trepidation as a diagnostic tool, communicating with patients was identified as one of its continued applications. Another doctor, Matthew, stated that using his clinical skills had the dual function of assessing the health of a patient, while reassuring them that they were in safe hands: ‘One of the important parts is to put the patient at ease. Just by putting a hand on them you can get a lot of information, and the patient thinks that you’re being kind and gentle’. Similarly, Patrick described how listening to babies’ hearts both told him that the baby was alive and, concurrently, was ‘very reassuring’ for the mother. These examples highlight that communicating with a patient orally/aurally, and using a stethoscope could be aspects of an inclusive sensory strategy for patient care.

Like the adventurers, this broadened conceptualisation and application of hearing was observed to develop with time and experience. Many adventurers observed a shift from their focus on ‘achievement’ to ‘attunement’. With this came a reconceptualisation of the role of the senses from a source of information to a means to connectedness and pleasure. Doctors reported similar changes. As one doctor, Phillip, explained: ‘Listening early on was about getting information. Over the years I have learnt there are two people in a conversation’. This broadening of sensory awareness meant that a doctor’s hearing became part of a communication, giving it a dual role of gathering information and assuring a patient.

Some doctors, however, were uneasy about their hearing in the patient consultation, as it was often not approached with the same level of conscious attention and analysis as auscultation. In other words, the value of ‘active’ attention implicit in auscultation extended to other aspects of the patient exam. However, a doctor’s hearing practices were not always active. Because the value of active listening in patient examination was often more of an ideal, its practice required the creation of an illusion. As Patrick confessed:

"Medicine is pretty boring for some people, because you sit here all day and the same thing comes through the door, and you have to pretend that it is the first time that that condition has come through the door that day, and they are really special and important."
The repetitiveness of medical practice meant that often doctors were not actively engaged. While aural practice was still effective, some doctors expressed discomfort due to a sense that due diligence was not done without active listening. As Patrick emphasised, it had the potential to 'ruin everything'. Reminiscent of the spectrum of approaches among musicians, this example highlights the incongruence between aural values and practices that coexisted sometimes uncomfortably within medicine.

Doctors' aural knowledges had their own values and practices. 'Active' listening with a stethoscope was a symbol of their professionalism, yet it did not reflect all of the ways they heard in practice. Auscultation was a form of medical hearing that was isolated and analytical. It reflected the medical knowledge and practice as rational and objective. At the same time, less expertise and credence was being given to it contemporarily. More inclusive aspects of hearing, such as listening to patients and the sounds of drilling through bones, captured more accurately the majority of hearing. These more 'general' and potentially less conscious aspects of medical hearing had the potential to be at odds with the values of medical practice. Along with auscultation, they were nonetheless identified as vital aspects of an inclusive, holistic patient care strategy.

Conclusion

Epistemic communities have values and practices that influence their approaches to hearing sound. These values and practices can be conflicting or multiple, depending on the context. The musicians and adventurers demonstrated a spectrum of approaches to hearing. Some musicians emphasised an analytical approach to hearing, in which 'good ears' isolated musical elements. Others were more holistic in their conception of music and musical hearing, and focused on its 'feel' and culturally-embedded aspects. Similarly, some adventurers emphasised achievement – speed, difficulty, and survival – and conceived of sound as information that could be useful to these goals. Other adventurers emphasised attunement to themselves and the environment, and described sound and silence as strands of their experience. While in both of these cases, communities expressed conflicting values and practices, often interviewees expressed aspects from across these spectrums, or had changed their emphasis over time. Variation across communities was linked to the diverse reasons why people engaged in a particular occupation, their precise focus (instrument, genre, discipline), and their experiences encountered over a lifetime.

Morse operators and doctors, as professional communities, expressed less variation in their aural practices and values. However, they described multiple and distinct applications of their
hearing. Like the musicians, Morse operators had an analytical side to their hearing that served accuracy and speed in transmission. At the same time, operators were also the 'listening posts' of the community. Particularly when there were significant implications for their community, such as a list of the war dead, a message was not just dots and dashes. Similarly, doctors described an analytical focus, where they actively isolated aural elements such as the sounds of a heartbeat. There was also a more holistic context. Doctors heard other sounds of the body and conversations with patients. This more inclusive conceptualisation of medical hearing captured sound and sensory subjects more generally as strands of a doctor's practice that supported a holistic patient care strategy.

These values and practices within communities were a foundational knowledge that influenced aural engagement. For example, among adventurers, conceiving of audio devices as 'unethical' facilitated a particular form of sensory engagement and communicated an understanding of the relationship between urban life and the non-urban environment. Similarly, the stethoscope's position as a symbol of medical professionalism reinforced the value of 'active' listening, and led some doctors to be uneasy with the less active aspects of their practice.

This chapter has introduced the communities in this research in terms of their approaches to hearing, and the social location of their values and practices. Moving on, the coming chapter explores the hearing of communities in terms of the learning processes that support their development.
Chapter 5

Learning

In the previous chapter, the ideas that underpin aural practice were examined both within and across epistemic communities. I showed how each community has a conceptual, environmental, and institutional context in which it hears sound. While this hearing context was specific to communities, it also varied within them in line with the diversity of experience as well as the sub-communities and networks individuals were involved with.

This chapter builds on that foundation by examining the research question: How is hearing learnt within communities? (See Figure 2, Chapter 3). This question includes an examination of the areas of knowledge included in a beginner’s learning, the methods epistemic communities used to build aural acuity, and the interaction of different knowledge sources and types. First looking at the musicians, I examine the process and concept of learning what is ‘normal’ sound in a given context. The case of the Morse operators builds on this by demonstrating the distinctions between learning outcomes of these sub-communities, and the implications they have for hearing. The learning processes of the adventurers then highlight the importance of mentors in communities, shared norms, and experience. Finally, the medical community demonstrates the value of multiple knowledge sources for learning their specialised aural skills.

Musicians

There are many types of music specific to communities and their contexts. Their sounds can be as wildly distinct as classical piano and Mongolian throat singing, or much more subtle, such as the precise tuning of an ensemble. With such musical diversity, musicians interviewed showed
an interest in the music that came to be identified as ‘normal’, and the processes by which this occurred. Two common paths to musical knowledge (and a musical ‘normal’) were formal lessons and experience. These learning paths tended to follow sub-community lines. To be classically trained implied undertaking formal lessons, and progression through a syllabus of recognised musical theory and practice. For musicians in non-classical traditions such as jazz, latin, and metal, coming to hear certain musical sounds as ‘normal’ was often through listening with family and friends, playing in groups, and ‘figuring it out’ as needed. These two paths to musical knowledge, however, were not clearly distinct. Many musicians came to be involved with multiple sub-communities, networks, and types of music over their careers. Equally, musicians who proceeded through an exam system were apprenticed by a teacher with their idiosyncratic ideas and ways, just as those who came to music more informally often took lessons at some point. The blurring of boundaries within learning methods and music contexts meant that the musical ‘normal’ could be challenged or revised, just as it could be fostered through many channels.

**Learning ‘normal’**

For the musicians interviewed, learning what constituted ‘normal’ music was a critical first step before music could be made. Developing this sense of ‘normal’ was generally understood as a process of learning musical frameworks, patterns and rules. As Levitin suggested, people very quickly learn the pitch, harmonies, rhythms, timbres, and styles of ‘our’ music, with types of music outside this coming to sound ‘strange’ because they are not in line with ‘what we have learned to call music’.  

Musicians often implicitly pointed to what is musical and unmusical through descriptions of their own preferences and values. The implications of normal were also more explicitly indicated through experiences of musical confusion (see Example 9), and musicians’ identifications of unmusical sound (see Example 10).

For musicians who had taken formal lessons, pitch and harmony were most often brought to mind when asked about their musical knowledge and ear training. Musicians described the content and process of formal music lessons in terms of first learning each note, before moving to scales, and later intervals, chords, and complex harmonic structures. The experience of learning the first few notes was captured in Tunstall’s reflections on teaching a student the piano:

> ‘[Jenny] stares at a note on the page of music in her open book ... “A,” she whispers to herself. The seconds file slowly by, and then at last the third finger of her left hand

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199 Levitin, *This Is Your Brain on Music*, 114.
presses a key. A furtive glance at me; was it right? I nod. She nearly smiles, and then her eyes return to the page. More seconds, loud with silence. “G,” she murmurs.  

In this vignette, the young student is taken through the notes of the musical scale aurally, physically, and intellectually with the aid of a beginner music book. Many musicians considered their own similar formalised learning experiences as the beginning of their musical story.

For other musicians, coming to understand pitch and harmony was more informal. This more informal process was particularly reported by musicians from musical families. For these musicians, coming to hear ‘in tune’ from ‘out of tune’ and to identify harmonic patterns was a matter of exposure to musical sounds. 201 Hannah’s daughter, for example, implicitly developed a sense of pitch and musical ‘beauty’ through experiencing music as part of daily life. Similarly, despite a lack of ‘pens and paper knowledge’, Tom’s daughter was able to transpose her pieces into any key from her exposure to certain musical tonalities and ‘working it out’. Tom stated: ‘She now knows what keys are about, they’re sets of notes that sound good together’. In both of these examples, aural knowledge of musical pitch and harmony in their contexts was developed and applied as a result of hearing their parents perform, and experimenting with this music themselves.

Classical musicians who undertook formal lessons considered learning musical intervals (the relation between two notes in a harmonic system) as a critical and challenging aspect of their ‘ear training’. In the classical tradition, there are standard musical intervals that are assigned names and perform particular roles. For example, a perfect fifth traditionally resolves to its root note at the end of a section, movement, or work (a perfect cadence), and gives the listener the experience of suspension and closure. 202 An augmented fourth, also known as a tritone, is a semitone (a single step on a keyboard) lower than the perfect fifth, and is perceived as dissonant and as such typically avoided, to the extent that from at least the baroque period it was described as *diabolus est in musica*. 203 While the meanings of these
intervals were later experienced as ‘natural’, learning them could be difficult and musicians used tricks to make the task manageable.

Two common systems for training the ear and aural memory to identify the community’s musical intervals were associations with well-known songs, and the Tonic Sol-fa method. The technique of associating intervals with well-known songs was described by Emily:

> At the Conservatorium, you have to be able to identify all intervals, and you have to be able to recall them instantly. The way a lot of people, even people with great musical ears, still hear the intervals is by drawing on knowledge of *Somewhere over the Rainbow* which starts with an octave, *Advance Australia Fair* which is a perfect fourth, or *My Bonny lies over the Ocean*, which is a sixth.

As Emily indicated, this system was particularly used within conservatoriums and their ‘musicianship’ lessons. The Tonic Sol-fa method was another technique some musicians used that applies solfège syllables (*do, reh, mi, fa, so, la, te* as heard in Rodgers and Hammerstein’s *The Sound of Music*, and perhaps less tunefully but with more vigour by Scotland’s football supporters). These syllables were used in conjunction with hand gestures for each note, and were also connected with emotions. The major third, *mi*, was considered a ‘steady or calm tone’ represented by a hand gesture with the palm towards the ground, fingers extended and horizontal, in line with the sign for ‘calm down’ used in Western culture more broadly. In both cases, these contextually embedded ear training tools illustrate the complex and highly acquired nature of the perception of pitch and harmony.

Musicians’ concepts of ‘normal’ pitch and harmony, whether developed formally or more informally, fundamentally influenced judgements of musicality and music-making practices. For many pianists, pitch and harmony were understood explicitly and inflexibly in terms of the Equal Temperament harmonic system, with Concert A tuned to a frequency of 440 hertz (A440). For non-musicians, this is the standard tuning applied to an Australian piano. The advanced and elite pianists interviewed were very sensitive to the frequencies of each note on a piano, as well as relations between the frequencies. Due to the nature of the instrument, pianists were often exposed to the same version of the notes for their hours of daily practice, and came to a static aural knowledge of pitch and the feel of playing. 205 While for some, this sense of normal pitch and harmony on a piano could be revised, it was not without its

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challenges. Example 9 demonstrates this finding through the reflections of three classical pianists.

**Example 9: Tuning confusion**

Alex had ‘perfect’ pitch from a young age, based on an Equal Temperament tuning at A440. At university, he took up the harpsichord and was required to play at Baroque pitch, which was around a semitone flatter than standard piano tuning. For Alex, this change was very challenging, because it required a reconsideration of his sense of ‘normal’ pitch and harmony. He explained: ‘Obviously, if I started playing a piece in C major, I would hear it as B major, and of course that would completely unset the associations with the mode of production, so my hands would keep shifting to correct the wrong note that I was hearing’. In order to respond to the confusion, Alex had to ‘unlearn’ his perfect pitch: ‘It took six months before I could sit down at a harpsichord without it making my brain churn’. To Alex’s surprise, after this time, he was ‘happy to accept’ the new harmonic system. Alex could then ‘flip back and forth’, though his perfect pitch was not as reliable as it once was.

Two other pianists who had played keyboards tuned to different pitches also reported this experience, though it was addressed with less success. Tom recalled performing at a recital where the wrong piano (not tuned to A440) had been put on the stage, rendering him confused for the whole performance: ‘I kept having to really look at the music because what I was reading and what I was hearing just weren’t matching up in the way that they always had before. It was just one of the most uncomfortable playing experiences I have had because there was a miss-match between what I was doing, which was the same as usual, and what I was hearing, which was not’. Tom was able to continue playing for the duration of the concert, but it required him to ignore what he was hearing and trust his hands.

Julie had similar experiences playing out-of-tune instruments and harpsichords. For her, however, it was impossible to overcome: ‘You can’t play. I imagine there wouldn’t be a good pianist around who wouldn’t say that they need a piano that is tuned to A440, and not because you’re accompanying an instrument that is also tuned to A440, but because you can’t hear otherwise’.

For the pianists in Example 9, Equal Temperament at least began as the ‘normal’ aural context of music. Critically, however, while Julie suggests all pianists need a piano tuned to A440, temperament and concert pitch are historically and culturally specific, with different sub-
communities privileging alternative harmonic systems, and rejecting others. Walser expressed this when he wrote: 'a C major chord has no intrinsic meaning', but rather is particular to discourses, contexts, and sociohistorical locations.\textsuperscript{206} The harpsichord and other precursors to the modern piano, for example, used Pythagorean or Meantone tuning, which are based on the ratios between notes and cycles of perfect fifths (as opposed to the equal and consistent frequencies between notes in Equal Temperament). Contemporarily, some musicians, particularly those interested in playing medieval and renaissance music on period instruments, remain ardently against Equal Temperament, on the grounds that its thirds are ‘awful’ and fifths lack ‘acoustic purity’.\textsuperscript{207} Conversely, just as Julie claimed she could not hear when the frequency of a note moved outside the boundaries of her tempered piano, Isacoff expressed an unsettledness to tuning other than Equal Temperament: ‘Playing a piano ... would be like playing a game of chess in which the rules changed from moment to moment.’\textsuperscript{208} These variations in aural perception of pitch and tonality illustrate both that musical sounds are contested between groups, and further, that the music that comes to be ‘normal’ can circumscribe the boundaries of what can be heard and understood.

Timbre, or tone colour, is another aspect of the musical ‘normal’ that is specific to times, places, and communities, and can influence how pitch and musicality are heard. In the West, classical and metal are often presented as extremes of musical sound, with classical music listeners tending to consider metal as the antithesis of the classical canon.\textsuperscript{209} While cultural criticisms and studies of metal frequently focus on lyrics and imagery, primary barriers to hearing metal as musical are its use of distortion, volume, and the qualities of its vocals.\textsuperscript{210} The use of distorted guitars is perhaps the most readily identifiable aural signifier of the metal genre, and is the basis of much criticism. Where to those within the metal community, distortion gives the music ‘extreme power and intense expression’,\textsuperscript{211} to outsiders it is more frequently perceived as ‘primitive and noisy’,\textsuperscript{212} and as is captured in Example 10, as ‘out of tune’.

\textsuperscript{206} Walser, \textit{Running with the Devil}, 27.
\textsuperscript{207} For an example of these arguments, see Ross W. Duffin, \textit{How Equal Temperament Ruined Harmony (and Why You Should Care)} (New York and London: W.W. Norton & Company, 2007), 27.
\textsuperscript{209} Walser argues that this distinction between two musics is only held up by the dominant classical community. See Robert Walser, "Heavy Metal Appropriations of Classical Virtuosity," \textit{Popular Music} 11, no. 3 (1992): 304.
\textsuperscript{210} For a review of the aural signifiers of the metal genre, see Walser, \textit{Running with the Devil}, 41-51.
\textsuperscript{211} Ibid., 42.
\textsuperscript{212} Walser, "Heavy Metal Appropriations of Classical Virtuosity," 301.
All the metal musicians who participated in this research acknowledged that metal had a ‘harder entry step’ than other musics, because of its markedly different understanding of musicality to the music most people are exposed to. As Nathan observed, an appreciation of metal ‘requires a different headspace and interpretation of everything’. The voice, for example, was understood as having a role of ‘rhythm’ and ‘power’, not necessarily melody. Hearing the vocals ‘not as melodies but as another instrument’ was identified as a significant challenge because it was acknowledged as being at odds with the music most people would consider ‘normal’. As Cooper explained: ‘When you listen to stuff on the radio forever, the music you hear there is focused on the vocals. You listen to the vocals and the backing is just the backing. With a lot of metal, you have to have a different perspective’. For people who had not reconsidered music aesthetics as a result of different musical experiences, this stark juxtaposition rendered the virtuosity of metal musicians invisible or ‘dismissed as “pyrotechnics”’. Example 10 demonstrates the distinct experiences of metal music through the reflections of two musicians with a different musical ‘normal’. It also demonstrates the process by which a musical ‘normal’ can be revised.

Example 10: Seeing the wood for the trees

Michael considered himself to have broad interests in music and ‘good ears’. This appreciation of musical sound, however, did not extend to metal. Far from music, for Michael, metal was: ‘The sound of thrashing an out of tune electric guitar and squealing’. He assumed that metal musicians knew their music was out of tune, and must appreciate this attribute or find it in some way meaningful.

Metal musicians were acutely aware of perceptions that their music was out of tune, musically simplistic noise. It was also something that they contested. In response to negative claims about metal, Jack, a guitarist and singer, stated: ‘In terms of tuning, metal musicians are no different to any others. When they go into a studio or go to perform a professional concert they tune up, and they tune to the same exact standards as anyone else’. For Jack, musicians and music listeners outside the genre just ‘can’t see the wood for the trees’. Metal’s heavy use of distortion meant that there were more overtones than ‘normal’, and pitches had a broader spectrum: ‘What I suspect is classically trained musicians need that peak, they need

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213 Ibid., 301.
214 This professionalism and musicianship of metal is also claimed by Considine, who challenges critics who claim metal is ‘total ear-splitting, blood-curdling noise without any definition or point.’ See J. D. Considine, “Purity and Power,” Musician 71 (1984): 48.
that very narrow band of noise to be able to pick up the note. Whereas with a metal musician, you can throw all sorts of noise in there, and they can hear the note that is intended'.

Hearing metal as musical was also perceived to be an issue of tonality. Jack explained that often metal lead guitar made extensive use of chromatic scales, which affected the overall harmony. For musicians in the genre, this was 'normal', and was part of the metal sound. Jack claimed that while metal timbre and harmony were normal for him, for others the 'certain scales that they are trained in all their life would be natural for them'. Due to this difference of a musical 'normal', Jack suggested that when a non-metal musician heard 'out-of-scale notes' they thought the musician was 'out of tune'.

For Jack, coming to hear metal as normal and in tune was a process. Previously he thought of screaming and guttural vocals as out of tune (he grew up with the distortion of rock music in the house from a young age, so the distortion was never an issue). He recalled: 'I would listen to Pantera and I'd think it sounded awful because Phil Anselmo isn't singing in tune, he's just screaming whatever he feels like. Over time, I realised that that is not the case'. Coming to hear metal vocals as in tune required an understanding of the vocals in the context of the music, an appreciation of the singing style as skilled, and experiencing pitch within the guttural or screaming timbre.

The suggestion in Example 10 that timbre affects pitch recognition was also reflected more generally in musicians' ability to accurately identify pitch on instruments they did not play. Alex, for example, explained that he had 'instant' pitch recognition on the flute and piano, his dominant instruments. He was also able to instantly identify his coffee machine, which 'hums at a G'. However, his pitch recognition was less accurate and automatic with unfamiliar instruments such as clarinet and trumpet (and inanimate, non-coffee producing objects). As such, if he was transposing a melody for trumpet, he listened a couple of times and imagined it on flute or piano before transferring the pitch back to the original timbre. Alex's experience of the timbre of pitch was consistent with Lockhead and Byrd, who found that perfect pitch relied on more than a note's frequency and, as such, pitch recognition could drop from ninety-nine to fifty-eight percent correct with changes to a note's timbre.215 This significant role of timbre in pitch recognition reinforces the role of context and experience for aural knowledge and hearing.

These examples of hearing illustrate the concept of a musical ‘normal’ that most musicians interviewed were conscious of. Pitch, harmony, and timbre – all foundational musical elements – were not automatically heard as ‘music’ but came to be considered as such through a learning process. This ‘normal’ defined what was perceived as musical, and in this way could impact on a musician’s performance. It was also contextually located, and specific to sub-communities.

Normalising musical practices

As illustrated in the previous section, a concept of the musical ‘normal’ was built over an extended period, and could involve formal lessons, informal mentoring, and experience of the ‘right’ sounds. While this learning was multifaceted, gaining and maintaining this sense of normal was most often achieved with others: sharing information and techniques between peers (at times, with a healthy dose of ‘peer pressure’), and listening and playing with family, friends, colleagues, and named teachers. Under the guidance of mentors, and through experience, experimentation, and practice, musicians came to know ‘in tune’ from ‘out of tune’, and music from noise. As Berger put it: ‘The act of perception is where the rubber of sound meets the road of social life.’

That is, in keeping with Turnbull’s argument that knowledge is contextually located, it is in epistemic communities that meaning is negotiated, music validated, and hearing attuned. In this way, sensitivities to musical sounds were fostered, with nuances of pitch, harmony, and timbre coming to be specified and ingrained.

Most musicians highlighted playing with others as critical for developing aural skills and musicality because it encouraged engaged hearing, and informed the sounds that a musician made. For Mark, group performance required that a musician ‘adjust to what other people are doing’. As a trombonist, he spent most of his time listening to how other members of the ensemble were treating the music to apply it to his own playing. He explained:

You’re listening because somewhere along the line you will have to play something that the violins or the woodwinds have just played, and you will have to play it the same way. You can’t just go off on a tangent and play it a different way. You have to play in the same style, so if you’re not listening, you’re not doing your job.

In this way, playing with a group is essentially an aurally normative process, where ‘normal’ music and aural practices are defined. To draw on Mead’s notion of the self here, individual

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217 Turnbull, Masons, Tricksters and Cartographers.
experience is in a sense indirect, because it takes account of the views of other people in the
group (in Mark’s case, the violins and woodwinds), and the social group as a whole (the
classical music community). Perceiving, then, is not direct, but a practice of ‘taking part in
one’s own conversation with others’. In other words, the group makes music, and what is
musical is constructed and reconstructed through the social interaction of the ensemble as
well as their audience and the norms of the community as a whole.

This negotiation of musical meaning was not only a question of musical style, but also a
musician’s timbre, or what was termed by some as a ‘sound concept’. Some musicians
described a need to surround themselves with ‘good sound’ in a non-performance context in
order to develop and reinforce it both perceptually and technically. Developing this sound was
a process of listening to the elite performers in their sub-community for hundreds of hours. As
Scott recalled: ‘Being able to hear a sound and wanting to recreate that tone quality is about
listening to it, hearing it in your head, working out what you do to create that, and then doing
it consistently’. An attribute of Scott’s trombone timbre or sound concept was a ‘really fat’
bottom register. Not all trombonists developed this sound, but for Scott, it came from ‘hearing
the sound’ until it was ‘ingrained’.

Similarly, Mark’s sound was based on the two ‘best’ bass trombone players in the world at the
time of his training, and came from constant listening to recordings of these performers. His
sound concept was a combination of the two timbres, so he did not sound exactly like either of
the performers, but he was part of the tradition. Critically, the ‘normal’ sound of these
musicians was never complete, but rather was the subject of a continuous dialogue. For Mark,
this could be a problem in a teaching context. He stated: ‘You listen so hard to what the
student is doing that you end up sounding like them. If you’re teaching five or six hours in one
day, you will sound like crap because you absorb what they’re doing’. This reflection
demonstrates how even after playing at an elite level for forty years, a musician’s ‘normal’
sound can still be fragile, because it evolves in response to others.

While social context is always critical for the scope of the ‘normal’ music a musician forms,
singing is unique in its demands for feedback, because the sound perceived by the singer
differs to what an audience hears. For the singers who participated in this research, feedback

218 George Herbert Mead, Mind, Self, and Society: From the Standpoint of a Social Behaviorist (Chicago
219 Ibid., 140.
220 This suggestion that the question of a musician’s timbre is best solved through engaging with the
others is in line with Wiggins’s findings on the performance of students writing a piece. See Jacqueline H.
Wiggins, "The Nature of Shared Musical Understanding and Its Role in Empowering Independent
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or direction from others with expertise was critical to reconfigure their experience of their sound, and to retrain their bodies and ears to produce a ‘normal’ vocal quality. In this context, ‘normal’ singing referred to the timbre of the vocal quality, as well as the technical practices of vocal production. These ‘normal’ methods and sounds varied across sub-communities, and their development was the responsibility of more advanced performers in given contexts. In a choir, the choral director was critical in ensuring that the desired timbre was being produced, and that the sound was ‘blended’. In a lesson environment, it was the role of the teacher to critique and shape the student’s sound. Example 11 demonstrates this concept of ‘normal’ vocal quality and practices, and its revision in a lesson context.

Example 11: Singing in the shower is not ‘normal’ singing

Madeleine, a professional singer and teacher, stated that relearning ‘normal’ vocal quality and singing practice was the first task when a student began lessons. She explained that more than any other instrument, people often performed for a long time before beginning lessons. The implication of this was that ‘they have already set up preconceived ideas and muscle memories’. In other words, from all those hours singing in the shower or along with the radio, the budding singer had developed a sense of his or her sound, and methods for producing that sound. When it came to lessons, then, Madeleine explained that ‘you have to retrain their idea of what normal singing is’ because through this process of singing alone or mimicking others without feedback, they may have ‘imposed an unnatural way of producing sound’.

Not surprisingly, it could be very difficult to convince a student that the way they had been singing their whole life was not ‘normal’ or ‘natural’. In order to retrain singers, there was a focus on sensation and forming new associations to what was heard. Madeleine explained that some vocal techniques might sound ‘awful in your head but quite fantastic to everybody else’. Having the confidence to sing in a way that was apparently awful required both hearing recordings of the sound being produced and ‘having the positive reinforcement of someone else saying it was good’. When relearning her own singing, she observed: ‘It took quite a while, and there was a lot of questioning – “Are you sure this is acceptable?” – then having confirmation that the sound was acceptable gives you permission to accept the sensation and make the sound’.

Example 11 highlights both this notion of a musical ‘normal’, and the role of communities and mentors in building this concept. Madeleine captured how musicians came to an
understanding of ‘normal’ vocal production and tone through their own experiences with music, whether with family, church groups, school choirs, or at home with their radio. While Madeleine suggested this knowledge and way of singing could be ‘unnatural’, this reveals the social context of ‘normal’. The specificity of the musical ‘normal’ to sub-communities is also captured in a rock musician’s observations of her own learning in Finnegans’s ethnography of Milton Keynes. For this musician, while she had some music classes at school, she considered herself as self-taught, because the classical music she learnt more formally ‘seemed quite separate from [her] own music’. Madeleine’s students highlight a similar gap between two different notions of ‘normal’ music. For these students, coming to classical singing from a non-classical background highlighted distinct singing knowledges, ultimately requiring ‘retraining’ or the development of a second musical ‘normal’ in the context of their new social group.

Learning normal is a socially-embedded, practical business that can vary between being explicit or implicit, but is in most if not all cases developed in conversation with others. It acts as a foundation for a musician’s practice within the community, including understandings and skills for perceiving and producing central aspects of music such as pitch, harmony, rhythm, timbre, and an overall sense of style. As will be later highlighted, this notion of learning ‘normal’ also arose among the Morse operators, adventurers, and doctors, giving experts what one doctor described as ‘a basis to work upon’. Critical to decision-making, whether in a live music performance or in surgery, the normal became tacit, facilitating practice on a daily basis. This suggestion of ‘normal’ as a baseline from which experts operate will be explored further in the next chapter. First, however, the following section explores further the social specificities of aural knowledge through looking at the uniqueness of the learning and outcomes of Morse sub-communities.

Morse operators

Learning to hear Morse, like music, was a mixture of the technical and theoretical, the practical and perceptual, and included some formal learning, some informal learning, and much practice. Through these processes, seemingly arbitrary aural experiences were transformed into ‘significant symbols’. Like musicians, the Morse operators’ sounds and techniques within their community contexts became ‘normal’. Most Morse operators interviewed shared a PMG background, with similar experiences, and a common approach to learning and using

222 Mead, Mind, Self, and Society.
Morse. These operators began as telegram messengers, trained informally through post office networks, and completed a formal qualification at The Postal Training School. Their learning was the product of repetition, application, concentration, and the gradual building of speed. Those who learnt Morse through different channels, such as military and rail, reported dissimilar Morse experiences. Learning for these operators followed the methods and required outcomes of their organisations, and resulted in distinct aural knowledges. The Morse case builds on the findings from the musicians, demonstrating the link between community learning content and methods, and the aural knowledges and skills that operators developed.

**Learning Morse the PMG way**

For PMG operators, enhancing the ear for the role of community communications required significant formal training, as well as more informal mentoring, and much professional experience. Most operators interviewed described similar experiences, values and approaches due to their shared professional background. These operators all started as telegram messengers (Walter described it as a ‘closed shop’), and were exposed to Morse in their workplace prior to beginning more formal learning. After this initial exposure, operators took ‘under their wing’ those junior staff members who showed inclination and promise. In rural areas, this took the form of some basic directions to learn the code and opportunities for practice afterhours. In the cities slightly more organised mentoring programs fulfilled a similar role. Tricks of the trade such as translating advertisements, street signs, and number plates into Morse to ‘get it in’ were passed on in this way, practices that had often stayed with operators well after their retirement. As Walter recalled: ‘You would just get better by watching the more experienced blokes’.

For PMG operators, this informal knowledge exchange was complimented by a more formal training program, which certified operators’ competence for service. Upon reaching twelve words per minute under the direction of their informally appointed mentors, trainees were eligible for entry into The Postal Training School for a year of formal study. Those accepted were segregated into telegraphist and postal clerk streams, with the more specialised telegraphists being trained to a higher speed. In both streams, three hours a day were spent sending and receiving both plain English and cipher using drills from a textbook. Classes in the remaining hours covered technical and professional areas, including Morse circuits and traffic procedures. The most dominant aspect of this training program was the acquisition of speed. For Albert, learning Morse was as simple as ‘start off slowly and get faster’. To achieve this goal, sending and receiving speeds were increased, and monthly tests determined whether a student could progress, with a number of training Morse operators being left behind at each
waypoint. In this way, the institutionalised goal and value of speed was embedded in and achieved through formal training, with a final matriculation speed of 22.5 words per minute for telegraphists and 20 words per minute for postal clerks.

Accuracy was also a key learning outcome in the PMG system, though in practice it tended to be sacrificed in the pursuit of speed. Training for accuracy meant knowing the code, the procedures, and how to precisely produce sounds and receive them. Accuracy in sending was included in the Postal Training School program, though much of these lessons ‘went out the window’ in practice. Training operators were drilled in plain English, not ‘cut up’ (abbreviated) language used on live PMG lines. In these drills, often words were sent that were similar but different to common words that might have been anticipated to catch out operators who were sitting ahead. As Allen described:

> When you were still doing your course, you would try and anticipate the word, but the instructors would try and stop you doing that by doing things differently. Flinders Naval Depot was a common one, and if in the message you got NAV you’d think NAVY, but then it would be SEND NAVAL ORANGES. They did all those sorts of things to make sure you didn’t anticipate and you got into the habit of sitting a word or two behind.

Just as speed was an examinable skill, so was accuracy, with a maximum of only four corrected errors and two uncorrected errors allowed in the final exam.

Sending the code with the right cadence was also a critical skill, because slight variation produced different letters and therefore different words. James explained: 'C is a dash dot dash dot, but you can’t send it like that because it sounds like two Ns. You have to send dah di dah dit. You can sing Morse, if you like'. Learning to send Morse with the correct cadence typically occurred informally, with a more experienced operator pulling a trainee aside and singing them the correct rhythm of the signals. James continued: 'You can say, “that’s not the way you do a C, it’s like this”'. Operators gave the impression that this aspect of learning Morse, while highly important, was slightly peripheral to the formal training program, because it was nuanced and more difficult to communicate than the signals in each letter, or correct hand position. This idea reinforces Lam’s argument that organisational forms with a reliance on formal education systems and procedures have a limited capacity, at least officially, to build and support tacit knowledge.\(^\text{223}\)

With largely consistent learning experiences, PMG Morse operators reported and displayed very similar knowledge and skills, almost to the point where as an interviewer, I could predict

\(^{223}\) Lam, "Tacit Knowledge, Organizational Learning and Societal Institutions."
their story. While the PMG operators were reasonably cohesive as a community, there was some variation between localities, individuals and cliques. Among the PMG, variation was mostly limited to the abbreviations or ‘cut up’ language operators used. As Walter observed: ‘The Western Australians would always say WUD for WOULD, where we would say WLD’. Just as different localities had their own abbreviations, they also had distinct operating methods as a result of the conditions in their context. For example, expert operators in Western Australia sent slowly and deliberately, because the lines were long rendering the Morse signals more challenging to correctly receive. Less Morse traffic in Western Australia also reduced the imperative for the great speeds worked towards in the eastern states. Equally, while operators were trained to send ‘perfect’ Morse with an ideal space between characters, most operators developed their own style.224 Charles, for example, said he could identify one operator because he did not put spaces between the words and had ‘flat dashes’.

There was one case of significant variation in PMG Morse learning experience, as a result of an operator growing up at a post office. While William worked for the PMG, he learnt Morse almost entirely outside the formal system, and described a learning process much more closely akin to a musician from a musical family than a Morse operator. William was surrounded by the sound of Morse from a young age, as his father was Postmaster and they lived at the post office. He listened through the post office wall to the Morse coming in, and made up his own Morse code to communicate through the bedroom wall with his sister. Noting William’s interest in Morse, his father let him come into the post office and try to understand the telegrams from the age of nine. William later started working as a telegram messenger, and then in the post office. These more professional experiences complemented and continued his previous learning, but were not identified as major knowledge sources. William did go through The Postal Training School in a class on the technical and theoretical aspects of Morse much later to fill any gaps and formalise his skills, but did not undertake Morse training because he was already competent.

With these differences in learning, William described unique experiences of Morse sound, and values incongruent with the broader PMG community. For example, where most PMG operators described live traffic as a big learning curve, William operated confidently from the beginning because he had been exposed to the environment over a long period previously, and its sounds were ‘normal’. Equally, while William could send and receive Morse quickly and

224 Bryan and Harter’s analysis of the transmissions of sixteen operators found variation from the ideal, and further these were not random, but rather individual operators consistently deviated from the ideal in the same way. See Willima Lowe Bryan and Noble Harter, "Studies in the Physiology and Psychology of the Telegraphic Language," The Psychological Review 4, no. 1 (1897).
recognised it as a way the community identified skill, he placed significantly less value on speed in and of itself.

These descriptions of Morse learning experiences and outcomes in the PMG case illustrate methods for training the ear for telegraphy duties, such as rote learning the code, learning technical knowledge, mentoring, and experience. It demonstrates how the values of speed and accuracy could be embedded in training programs (see Chapter 4). With the general congruence of telegraphists and postal clerk skills, the PMG case also shows the relationship between learning methods, community knowledge, and aural outcomes. The cases of slight variation as a result of different networks and learning experiences reinforce this connection.

**Variation between sub-communities**

While most operators shared a PMG background, this did not reflect the learning experiences or aural capacities achieved by all operators. Rather, just as there was variation between localities and learning methods, different organisations also developed operators with distinct skills. In other words, while they were all theoretically trained in the same Morse code, operators developed aural knowledge specific to their sounds, language, and procedures. The distinctions between PMG, military and rail Morse operation were notable, with communication across sub-communities proving challenging.

Elliott was a railway telegraphist, and like many PMG operators, he began by learning Morse after-hours at a small informally run class at the railway. Rather than joining a formal training program, Elliott gradually built skills at sending messages using plain English and the rail code, until his instructor considered him proficient enough to be appointed as a rail telegraphist. His final examination was sat while he was working, without him even knowing about it. While an expert rail operator, Elliott was conscious of the differences between himself and the PMG operators. Specifically, as he did not learn or use abbreviations in his Morse operation, he struggled to understand their 'cut up' language. This difference created a barrier for Elliott in engaging with the contemporary Morsecodian community, because in addition to not sharing similar professional experiences or friendships from Morse days, he also did not share an understanding of PMG language.
Similarly, military operators shared their own learning objectives and professional standards, which produced distinct aural capacities. Cecilia, for example, taught herself Morse by ‘singing’ the code to herself with the aim of contributing to the war effort. She trained on an oscillator, the technology used by the military, which produced a tone for each dot and dash (as opposed to the clicks of the sounder used by the PMG and railways). As a result of training for the oscillator, she was unable to understand a sounder. Cecilia also trained specifically in cipher rather than plain English. As with Elliott, because of the dominance of training and practice in cipher, she was less confident with plain English, and could not understand the abbreviations commonly used by PMG operators, including her husband (fortunately, they could communicate with one another well enough that when Gary climbed onto the roof and promptly sent his ladder adrift, he was able to get assistance by tapping SOS to Cecilia through their roof). The struggles between PMG and military operators were not isolated to this one case, and during World War II this forced a reconsideration of the policy of telegraphists as a protected industry (see Example 12).

225 This is in keeping with the findings of both Tulloss and Biegel, who determined that students trained only in cipher/nonsense material were able to receive it at a higher rate than meaningful sentences, and vice versa. See Donald W. Taylor, “Learning Telegraphic Code,” Psychological Bulletin 40, no. 7 (1943): 465.
Example 12: Clash on the wires

During the war, vital communications were to be sent between military operators in Darwin and PMG operators in Adelaide. This plan, however, was less than successful, as messages were not getting through, and arguments over the wires were breaking out. Military operators were trained to use an oscillator, while PMG operators used a sounder. The military and PMG had a different set of transmission procedures. Their use of language also differed, with military operators sending primarily in cipher, and PMG operators having more experience with 'cut up' plain English. As James recalled, military operators 'would write everything down in little groups of five, and then they would go through and take two letters here and put a stroke through to make a word'. He continued: 'You couldn't talk to them in Morse like we talk'. These sub-community distinctions caused clashes over operational technique, which extended to a question of ownership of the line: 'The Army was sending messages to the PMG saying “we’ve taken over the line” and the PMG were sending messages back saying, “hell you have, it’s still ours!”'. As a result, six PMG telegraphists were then given uniforms, shown how to salute and carry a rifle, and sent to their post in Darwin: ‘Finally PMG blokes were talking to PMG blokes and they were all one big happy family. They were trained in sounder working, they were trained in PMG procedures, so you had like working with like’.

As Example 12 illustrates, while Morse operators have a shared knowledge, there is significant variation between sub-communities that restricts communication, and can generate thinly veiled hostilities. These sub-communities corresponded with localities and professional affiliations and roles; that is, whether an operator was PMG, military, rail, or from Melbourne or Perth. Given the only significant distinction in the Morse sound is whether a sounder or oscillator is used, these examples highlight the impacts of formal learning methods on perceptual outcomes, as well as the idiosyncrasies that particular networks can develop. In the cases of music and Morse, communities and their contexts have been shown as primary influences on the specialised aural knowledges that beginners develop. As the musicians revealed, epistemic communities and sub-communities have their own hearing practices and 'normal' sounds that frame the music that they engaged with. The Morse operators further demonstrated this finding, showing the link between community priorities and learning methods, and the aural outcomes operators achieved.
Adventurers

As with the musicians and Morse operators, adventurers’ learning included formal, informal, and experiential aspects. Formal learning took place in high school outdoor recreation programs, and short- and medium-length courses through clubs, commercial providers, and technical colleges. While many interviewees had participated in such programs, they were not the dominant knowledge source. Rather, most knowledge was attributed to informal mentoring, which was often, at least initially, in the context of clubs. Most agreed that going out with more experienced adventurers offered a ‘pathway’ into the outdoors, and accelerated the learning process, providing that the mentor was competent. Learning in this way took place through listening, watching and doing, supplemented with more explicit directions, answers to questions, the odd comment highlighting something, and discussion with others. There was also a strong emphasis on experience: being in the environment, learning through doing, preferably not through fatal mistakes, and gradually fostering an understanding to a point where nature became ‘natural’.

The adventurers’ focus on the value of stories and learning through experience gives an opportunity to explore in depth some aspects of learning that are particularly vital in the case of developing sensory acuity. While these learning methods were identified as vital for building aural and other sensory knowledges, this section often does not directly focus on it. This is because the adventurers found it difficult to separate out this aspect of their practice. Speaking of hearing alone was contrary to the multimodal notion of connectedness, and was often overlooked by those focused on achievement (see Chapter 4). As a result, this part of the chapter describes learning in general terms, because this is how it was discussed. These learning methods and issues are understood to include both learning to hear and sensory knowledge more generally.

Strong communities and the power of storytelling

Strong informal networks emerged as critical facilitators of knowledge sharing among adventurers. More than the other communities, adventurers were reliant on informal networks such as mountaineering clubs, which were organisations that all interviewees had been involved with. Informal networks were also critical for learning music and Morse, as was demonstrated in the previous sections. As will be explored in the following section, even doctors highlighted one or two key mentors who were responsible for their learning, despite a formalised program of study. However, as learning the mountains or bush was based almost
exclusively on these more informal relationships, they highlighted how community norms and shared activities allowed knowledge sharing to take place.

Clubs provided informal training courses, mentoring, friendships, and opportunities for experience. Sydney University Bush Walkers (SUBW), Melbourne University Mountaineering Club (MUMC), and the New Zealand Alpine Club (NZAC) were held up as clubs with immense collective expertise and strong frameworks for skill and knowledge development. Sophie described how MUMC had a group of very keen rock climbers, bushwalkers, and paddlers who ran courses specifically to teach beginners. At a club level, leadership training was also offered early in members' experience, with most club members participating in this course after only four or five trips. These courses were all in-house, informal in their delivery, and were considered critical for individual and collective skill development. Stressing their importance, Sophie recalled that while she and her sister both grew up bushwalking as children, her sister did not go further in the outdoors because she did not have the opportunity to be involved with a club. She reflected: ‘You can’t learn to climb on your own. You can’t learn to do any of these things unless you learn from someone. You could pay for courses to an extent, but unless you know someone, you can’t really keep up those skills’. Sophie’s reflections emphasise the significance of clubs for learning, and draw attention to the importance of personal relationships. She makes a connection between developing and maintaining skills and informal networks, rather than groups she belongs to.

Successful knowledge sharing in clubs was reliant on the participation of skilled people who were motivated to share what they knew. They also had informal mechanisms for identifying expertise. At SUBW, there was a canyoner who was considered as most experienced. George learnt much of what he knew about ropes, navigation, and route finding from going out with this more experienced canyoner: ‘To put it in perspective, he is thirty years older than me. It’s like it has its own little social system. There is a definite hierarchy there with all the young ones listening to the older ones as they impart their knowledge’. Such skilled people were identified through their time spent in a club and their expertise as witnessed by others. While an effective means of identifying potential mentors, their reliance on history in the club sometimes made leadership exclusive. Sophie, for example, expressed frustration that holding a leadership position in one club did not mean that the same level of responsibility could be assumed in another club. Coming to a new club, she was not a beginner, but also not having matriculated through the new club’s social system, there was not the trust to identify her as a leader.
These illustrations of learning and expertise in clubs highlight the importance of the skills of mentors, as well as group motivation and cohesion. Shared ideas, approaches, and experiences were particularly critical for effective learning. In the case of MUMC, the club had a designated space with each discipline possessing its own room, where members would all meet and socialise in this space on a daily basis: they knew each other well, and they were friends. These friendships, shared meals, and the culminating trips, were identified by club members as what made the club special, and supported its strong learning culture. This finding is congruent with Wenger’s argument that learning is a process of social participation with learners ‘being active participants in the practices of social communities’. Such practices can be an important element of learning within organisations that also have formalised procedures and training requirements and opportunities (as is the case for musicians, Morse operators, and doctors). In the adventurer case, however, social participation (such as described in the MUMC case) was critical because of the strong reliance on informal mechanisms. The impacts of the presence and absence of these shared norms and practices for learning are illustrated in Example 13.

Example 13: Norms of the campfire

Andrew recently went on two trips: one with a group of experienced peers, and the other with a school group of novices. The weather was poor on the trip with the experienced adventurers, but invaluable for Andrew was the opportunity to sit around telling stories of the trips they had done in the past. He described sitting, listening, sharing, disconnected from the urban world and its technologies, ‘going back to primitive man’. He stated: ‘The stories become part of the lore of the tribe, or the experiences that we share’.

Around the same time, Andrew went out with some younger, much less experienced people. He was appalled that they cooked their meals on individual stoves, and sat alone with their iPods. It was Andrew’s experience that prior to these technologies, ‘people would sit around the campfire at night singing songs together and saying limericks’. For Andrew, these practices ‘really bonded people together’. Cooking and singing together were not about food and entertainment, but the atmosphere that it produced and the sense of community and camaraderie it facilitated. He continued: ‘I think that when you start singing together and acting silly together you develop a better camaraderie. You are much more open to talking and have broken down the fences’.

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226 Wenger, Communities of Practice, 4.
Andrew observed that learning from stories was possible with shared norms and a sense of community. He stated, with free communication ‘people will open up and say things or request things’. Out of these informal conversations, whether with beginners or experienced peers, useful stories were shared: ‘Where to go, inspiration, or it might be “wow that sounds pretty desperate, how did you get out of it?”’. In this way, knowledge was ‘picked up’ through the experiences of others: ‘By telling you what they have done, you are picking things up from their treasure trove of experience and building up your own database of experiences, so you’re becoming more acquainted with what is happening. A lot of that is just through sitting and having a chat’.

Example 13 described a collective ‘database’ of knowledge that could be accessed through storytelling under the right conditions. This means of sharing knowledge within communities was not only between mentors and beginners, but was an ongoing strategy for learning among adventurers. From the perspective of the learner, Anna described learning a lot through going on trips, hearing her father’s stories, and being able to apply this knowledge later. She observed:

You hear these stories about people getting cold and wet and needing to change into dry clothes, so when you start to get cold and wet, you remember these stories, and you know what you need to do. You don’t need to have all of these experiences yourself, although that helps. You hear them in context and internalise them.

In Anna’s account, the knowledge inside stories was so effective that it could be drawn on almost as if the experiences were her own. This idea was reflected in Hokari’s description of the knowing of the Gurindji community. Information is ‘pooled and maintained as a bundle of possibilities’ and ‘one chooses a story from the pooled possibilities according to the context.’

What Example 13 explicitly draws to our attention though is that this knowledge sharing occurs only when there is a sense of community – a shared set of principles, approaches, and practices – and is limited when these are not in place. Equally, storytelling can be dependent on the context, such as the campfire or the club house.

While Anna’s example highlighted a more generalisable lesson, more commonly stories captured lessons that were valuable because of the unique place, time, conditions, and people that they described. This resonates with Legat’s finding that the knowledge in stories is not
In New Zealand, backcountry huts were warmly regarded places where much valuable knowledge was shared through stories, either written or spoken. With a network of more than 950 Department of Conservation-managed huts around New Zealand, they were often focal points of a trip (with people ‘collecting’ huts the same way as Lorimer and Lund described walkers ‘collecting’ peaks in Scotland), providing a strong link to place, community, and history (see Figure 10). In addition to face-to-face conversations in huts, hut books were a valued resource about specific routes and conditions. These hut books could be as humble as an old exercise book, but as Luke shared: ‘People will open the door and go to the hut book. It is the first thing they do because it might talk about somewhere they’re heading tomorrow’. He continued: ‘It’s the link between all the people who have been in the hut, this kind of thread that connects people’. This example of New Zealand’s hut books highlights the importance of stories for adventurers’ knowledge of a place, and also illustrates the sense of community that underpins and is maintained through them.

Figure 10: Lake Angelas Hut, New Zealand

228 Alice Legat, "Walking Stories; Leaving Footprints," in Ways of Walking: Ethnography and Practice on Foot, ed. Tim Ingold and Jo Lee Vergunst (Surrey: Ashgate, 2008), 36.
Just as hearing stories was a source of knowledge within the adventurer community, processing events and strengthening understanding also came through their telling. Anna observed that becoming the story teller was part of experiencing things herself and learning from them. After going bushwalking or tramping with her father and hearing his stories, learning then involved going on easy trips herself and reflecting on them in a social context. As she recalled: 'I had picked up a huge amount as a kid and I felt I knew almost intuitively. Then it was doing a tramping trip and talking about my experiences later with my friends and parents. I guess in that way I learnt the skills I have now'. Legat also described this process of moving from audience to storyteller:

Adults constantly tell stories, including to young children, so that they can grow from the place they call home, eventually travelling trails and walking locales where they can experience the stories themselves ... Tchop individuals, then, are forever listening to stories whose truth is subsequently validated through experience. Retelling the story in light of his experience, the teller builds on the original by incorporating her or his own occurrences and happenings.230

This suggestion, that in hearing and telling stories events are processed and learnings are stored, was also found by Klein. He suggested that stories contain lessons, preserve values, and as Anna and Andrew observed, they introduced newcomers to an environment.231 For experts and those working towards mastery, good stories also have the power to clearly and memorably draw together different elements,232 capture 'tricks of the trade', and crystallise experiences into expertise.233 Stories are not just a matter of passing time around a campfire but are critical for learning to make sound decisions, particularly where large volumes of 'implication-rich information' needs to be processed.234

These examples of storytelling imply a fluid relationship between telling and doing. Adventurers learnt about routes, conditions, and safe practice from hearing and telling stories during and between their own experiences. Stories also captured something of the sensory aspects of experience. Whether wet socks or river sounds (an example that is discussed in the following chapter), the importance of paying attention to details while walking was often a latent message. As Legat argued, stories provide 'an understanding of the importance of

231 Klein, Sources of Power, 179.
232 Ibid., 181.
233 Ibid., 183.
walking and observing ... they are to think about what they smell, see, [and] feel'. In other words, stories had the capacity to include aural and sensory knowledges of particular contexts, but they also engendered an awareness of these sensory indicators and their role in adventurer practice.

Learning through experience

Adventurers valued experience above all other potential knowledge sources, and it was unanimously understood as key to gaining expertise. Learning through experience was also identified as a primary means to knowledge in the music and Morse cases. Musicians came to a sense of ‘normal’ music through hearing it, just as Morse operators learnt the subtleties of signal formation from colleagues on the job. When I asked the adventurer Simon if he did any courses, he responded facetiously: ‘Yeah, every weekend!’ This supreme value of experience was, at least initially, under the guidance of skilled others and may have followed a more structured short course on basic techniques and equipment. However, being in the environment from the outset was critical, because so much of what there was to know — including the sounds, sights, and feel of the environment — was context specific and not readily articulated. As Simon observed: ‘Learning can be very structured or unstructured’ and while formal courses could initially play a useful role, the ‘real learning is in the experiences which you can’t necessarily set up easily and are a very poor second compared to just doing it’. This perspective on formalised learning opportunities was also reflected by Michael, a jazz and latin musician: ‘Formal training is like primary school. You’re set up for what is going to happen, but it ends early’.

An experiential mode of learning was considered particularly necessary for building sensory knowledge. Louise, for example, stated that aural knowledge acquisition was a process of building associations through experience. Similarly, Belinda talked about learning what the wind felt like ‘through travelling and working it out’. For Veronica, central kinaesthetic lessons such as knowing how to move on unstable ground came from going out frequently, watching how others moved, and coming to an understanding of how to move in different contexts.

For adventurers, a central aspect of learning from experience was spending time in an environment, in different places, slowly developing understanding and comfort with the peculiarities and variables of different contexts. It implied that adventuring was more than

236 Tuck-Po describes a similar process of needing to learn how to control her body in the context of the ecology of the Malaysian forest. See Lye Tuck-Po, "Before a Step Too Far: Walking with Batek Hunter-Gatherers in the Forests of Pahang, Malaysia," in Ways of Walking: Ethnography and Practice on Foot, ed. Tim Ingold and Jo Lee Vergunst (Surrey: Ashgate, 2008).
climbing a face. It was contextual, and involved a great range of skills that were not simply acquired by being shown or told once. Vervoorn noted that learning from experience was critical because this variability was a central part of adventurer practice: 'Knowledge from experience is not obtained under laboratory conditions; it is never a case of repeating an experiment, controlling all the variables until we get consistent results. Each journey, even through the same terrain, is a new exercise.'\(^{237}\) This represents an acknowledgement that differences in weather can render journeys utterly dissimilar. Equally, the time of day, proximity to a meal, and a host of other factors that influence individual perceptions moment by moment will effect whether a journey seems arduous or pleasant. For hearing, this variation means that sounds are highly variable with place and conditions. Building aural knowledge in this context, then, requires broad and deep experience, and developing the aural acuity to respond to these subtleties.

Experience was valued as a means of understanding to the extent that gaps in experience were equated with gaps in knowledge. Andrew, for example, voiced concerns over the safety of canyoneers from younger generations after learning only in drought conditions. Linking back to learning 'normal', Andrew observed that with the drought: 'People have learnt that normal is a low water level in a canyon'. The implications of this learning were that the schemas and skills for canyoning places where there was more water were not in place: 'They think it is okay and keep going, where people who have been doing it for thirty or forty years know that when the water level is up you have to be careful'. While he acknowledged that in more extreme conditions identifying a dangerous water level should be possible even for those with limited experience, cases that were more borderline may prove less perceivable.

Similarly, Veronica observed that people who only had climbing experience in New Zealand failed in the Himalayas because they did not have experience climbing mountains on such a large scale:

> They just can’t perform when they get there. If you haven’t been to the Himalayas before, there is no point going there and attempting something the best climbers in the world have failed on because you’re not going to get off the ground. Over there everything is bigger and climbers go over and under rate it. They can’t work out the scale, and they can’t pick out that that white is ice and hard to climb. They don’t realise that you’re there for two weeks and you need a big pack, and they don’t know about altitude. They’re not reading the whole thing.

Gaining the necessary knowledge – including a capacity to form sensory judgements about the environment – required spending a lot of time in a place, even for someone with expertise in another context. After eleven expeditions to Pakistan, Veronica could 'look at a slope and know if it's safe or not'.

Figure 11: Waterfall in Claustral Canyon, Blue Mountains Australia

For some adventurers, there was not only a sense that learning through doing was the most effective approach, but also that experiencing nature directly was the only way of reaching understanding. Learning, then, was not a matter of consciously or unconsciously learning skills or facts, but needed to take place in an unmediated way. An advocate of this approach, Brian described coming to walking through family holidays and as such always thinking of it as 'fairly
normal'. However, when he began reading and more formally learning about the bush in clubs he found that his experiences did not match the Western view of nature. He stated: 'What I was experiencing was outside the paradigm'. He found that people considered nature as dumb and 'over thought' their approach, instead of simply being in nature and being receptive to its teachings. For Brian, developing wisdom in the environment was a process of 'incremental submersion' and came from years of walking, listening and learning from the wilderness. The words 'listening' and 'learning' were used almost synonymously. This suggestion of Brian's experience as outside the paradigm harks back to the distinction between 'natural' and 'unnatural' approaches to singing. In both the case of singing and bushwalking, to equate 'normal' as 'natural' blurs the issue. Rather than some sub-communities being mistaken in their approach, these terms alert us to the potentially divergent ideas and approaches that epistemic communities can foster around activities that can be easily taken for granted.

Not only is the idea of 'natural', unmediated engagement with 'nature' misleading, it had the potential to be dangerous because so much learning took place within communities. In the New Zealand Southern Alps, Emil had discovered potential climbing routes by observing the Thar (an introduced species of Himalayan goat). He observed: 'You can actually learn a lot from them because they're so good at moving around. Where they go, you know there is a way through, because they're not going to waste their time'. While there was respect for their knowledge, following their lead may not have been well advised from a human point of view, as they may have taken a more avalanche-prone route. The consequences of an almost absolute reliance on learning from experience and from nature alone were told in Jon Krakauer's *Into the Wild.* In this account, Christopher McCandless starved to death after hitchhiking to the Alaskan wilderness with limited equipment, supplies, and expertise, and the goal of living in solitude. These examples of the limits of learning directly from the environment and its fauna are not to say that experience and observation are not powerful means to developing knowledge, but that learning is most effective and safest under the guidance of mentors, particularly in the earlier stages of the process.

For some adventurers, particularly those reflecting on early dangerous experiences, the potential for fatalities had resulted in too much resistance to learning from experience. Many adventurers said they undertook trips early on that were 'crazy' considering their skill level, and while retrospectively they would not take such risks now, they identified them as valuable learning experiences. Luke, for example, recalled one of his first long trips which ended with the party being pulled out by a helicopter because they were overdue. They had navigation

issues, he was washed down stream, and lost the sole of one boot on the first day. When this meant that on the second day he walked a stretch of snow in a frozen sock before resorting to bare foot, he commented: ‘We certainly learnt a lot in a very short period’. He continued:

I worry that we’re becoming so risk averse that we don’t let people learn by making mistakes. It’s just such a fast feedback mechanism, and obviously you don’t want people to go and kill themselves or get seriously injured, but if there is too much cotton wool around people’s experience then they can’t get the feedback.

Critically in this case, the party had a certain amount of luck (like finding a pair of boots in a hut that were the right size), and enough collective experience to help them survive. These examples of how things can go wrong indicate that while valuable, learning through experience, and even some mistakes, is safest when built on a strong foundation of collective knowledge.

The adventurers demonstrate the role of informal networks and mentoring in communities for learning their practice. Experience and storytelling were particularly valuable for knowledges such as hearing and the senses, because they captured the value of these subtle indicators, and provided a means for them to be made meaningful. In other words, experience was important because the sounds, sights, and tactile aspects could be heard, seen, and felt. While most musicians and adventurers were sceptical of formal programs because of the liability that knowledge could become limited to the theoretical, there were also those who observed the successful relations between the theoretical and practical, and formal and informal. These different knowledges successfully work together in the medical community, as is discussed in the following.

**Doctors**

Of all of the communities studied, doctors were the most reliant on formal learning, requiring completion of a four to six year undergraduate program and many more years of informal learning and examinations for professional practice. However, while the formal elements of learning were essential both for knowledge transmission and professional certification, medicine was still considered as an apprenticeship, with practical and perceptual knowledge being learnt through mentoring and experience from an undergraduate level onwards. While lectures and textbooks had a place, much learning happened during ‘rounds’, with senior doctors going through ‘the dance of the exam’ on the wards. The learning culture was one of continual knowledge exchange following a ‘see one, do one, teach one’ principle. Learning was seen as continuous and more web-like than linear. Professionals moved through a mix of
formal and informal learning and picked things up, weaving their way through an immense body of knowledge, networks, and experience that culminated in a medical expertise that necessarily included specialised sensory knowledges.

Ways of learning the body

As with the other communities in this study, learning medicine was a process that involved formal, informal, and experiential learning methods over the course of a career. Through such channels, roughly two knowledges emerged as particularly critical for informing sensory perception. The first was the biomedical, which was defined by its strong focus on the underlying biological processes of health and disease. The second field of knowledge was termed clinical, and referred to the practical capacity to perceive these biomedical indicators in patients, sometimes with the aid of tools such as a stethoscope. However, while these knowledges could perhaps be crudely distinguished, they were ultimately interdependent.

Learning the body in biomedical terms primarily took place during the formalised aspects of medical training, and was largely theoretical. During undergraduate degrees in medicine and surgery, for example, a training doctor continued their education in science, with a focus particularly on the systems and organs of the body. During this phase of education, students were first taught the internal workings of a healthy human body (what could be termed a physiological ‘normal’). This type of knowledge was captured in the following description of a deceptively complex heartbeat:

The first heart sound is generated by the mitral and tricuspid valves closing. During systole, where the heart contracts and expels blood from the left and right ventricles, that [sound] is associated with the closing of what are called the mitral and tricuspid valves, which stop blood flowing into the ventricles at the same time from the atria. As they close that causes “lub”, and blood is expelled from the heart, and then at the end of systole or the contraction of the ventricles, the aortic and pulmonary valves close, and that gives the “dub”.

This example was shared in the context of teaching me about hearing the heart, and was deemed the first thing I needed to learn in order to understand hearts, their sounds, and how health and pathology were perceived through hearing. In this example of a beating heart, the connection between a biomedical understanding of the systems and organs of the body and clinical indicators is already emerging. Valves open and close, the heart muscle contracts, blood is pumped, and this process causes perceivable sounds.
The function of other body parts was also expressed in theoretical and clinical terms. A description of arthritis began with a biomedical understanding that joints could wear away the layer of cartilage that allowed for frictionless movement. With the absence of this layer, the joint 'creaks' and 'grates'. Bruce stated: 'That is basically the auditory manifestation of the fact that the joint has lost its lining layer of cartilage. As soon as I hear or feel that, I know that the person has a problem'. Similarly, pleural effusion was framed in terms of a physiological understanding that, like the heart, the lungs were encased by a membrane. In cases of pathology, water built up between these layers and if a doctor 'percussed' the chest cavity, the sound would be 'dull' in the presence of fluid (see Example 14 for further examples).

Figure 12: Auscultation of the heart

Where biomedical knowledges were easily found in textbooks and lecture theatres, clinical sources were more diverse and creative. In the previous example of the function of a heart, the description used the onomatopoeic signifiers of 'lub' and 'dub' to represent the sounds that occurred when a normal, healthy heart pumped blood. As well as forming part of the theoretical description, these signifiers were a lexicon that was used and made meaningful during rounds, as students' attention was directed to the lub and dub, and the heart came to be known in these terms. While a similar onomatopoeic language was used to describe other sounds of the heart, to further explain abnormality and make these sounds perceptible,
common knowledge was drawn on to promote understanding. The third heart sound, ‘lub-dldub’, was described as either ‘like the spinnaker on a yacht’ in cases where the extra heart sound was due to a strong and athletic heart, or ‘like my mother’s breasts’ which, we were told, ‘flop down like a tennis ball in a sock’ in cases where the heart muscle was weak. As these divergent similes connote, the third heart sound can be present in both weak and strong hearts, and the use of such metaphors works to make lessons memorable, but also, as Lakoff and Johnson argued, to structure understanding. 239

Clinical knowledge of the body is therefore not only limited to words, but also asks students to imagine and make sounds to facilitate experience and direct attention. Normal lung sounds, I was told more than once, sound ‘a bit like what you would expect them to sound like’. It was suggested I may have heard normal lung sounds on a medical drama or would just know if I could imagine what air passing through something would sound like. Less was left to chance with pathologies of the lungs. Mentors helped students to produce the sounds and demonstrate them in order to direct attention before many examples were pointed out in a hospital context. Pulmonary oedema, for example, is a condition where there is fluid on the lung inside the air cells. The presence of this fluid means that when air moves through, air cells pop open. Through a stethoscope, a doctor could hear ‘crackles’ or ‘pops’, a sound that could be replicated by ‘wetting your fingers [index finger and thumb] with a bit of saliva and just [put fingers to ear together and pull them apart] and you hear a little popping noise as they open up’. As was the case in the adventurer community, the acquisition of particularly sensory knowledge required at least some experience, a challenge that was in part creatively negotiated in the medical context.

Much clinical learning was on the wards. Matthew described one particularly memorable experience, where he was introduced to a ‘seagull murmur’ during ‘rounds’:

They would tell you what you were supposed to be hearing. They would say: “This patient has what you would call a ‘seagull’ murmur – it is high pitched and sounds exactly like a seagull flying along in a high wind – see if you can pick it”. And sure enough, after some time, you could believe that it did possibly sound like a seagull.

This same directed process of meaning making was pointed to by Joshua, who stated: ‘It is very difficult to explain to somebody what something sounds like, you just have to experience it for yourself, then when you are told what it is, you can put it in the memory bank, so next

Example 14: Understanding clinical examination through aural signifiers and theory

<table>
<thead>
<tr>
<th>Condition</th>
<th>Theoretical knowledge</th>
<th>Description of aural signifier</th>
<th>Role of aural signifier in diagnosis</th>
<th>Knowledge source (aural)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>'The joint has lost its lining layer of cartilage that allows for free, frictionless movement'; cartilage is not displayed on x-rays</td>
<td>'Creaks' and 'grates'; 'it sounds like wheels that need oil'</td>
<td>Arthritis not shown on x-ray; diagnosis dependent on feel and sound</td>
<td>Experience; 'picked it up'</td>
</tr>
<tr>
<td>Orthopaedic surgical context</td>
<td>'Bone is a cylinder in most cases. When you drill from one side to the next, you will go through bone, and then reach a hollow area in the middle before you reach the outer area. If you’re drilling not a diameter but a tangent, then instead of plunging into the middle, you will continuously go into the hard bone.'</td>
<td>Pitch changes when outer layer of bone reached; when metal of implants has reached bone it the sound 'bottoms out' and becomes 'dull'.</td>
<td>Indicates the surgeon has reached the other side of the bone and needs to pull the drill of saw back to prevent damaging soft tissue; Lack of sound indicates the bone is being penetrated in wrong direction</td>
<td>Surgical mentor directed attention; 'listen for the drill... listen, listen.... hear that change?'</td>
</tr>
<tr>
<td>Pulmonary oedema</td>
<td>Pulmonary oedema is when there is fluid on the lung inside air cells. Fluid in airways means that when air moves in air cells pop open.</td>
<td>'Crackles' or 'pops'; sound is replicated by 'wetting your fingers [index finger and thumb] with a bit of saliva and just [puts fingers to ear together and pulls them apart] and you hear a little popping noise as they open up like that'</td>
<td>Fluid generates a sound that can be heard with a stethoscope for a diagnosis</td>
<td>Learnt during rounds</td>
</tr>
<tr>
<td>Condition</td>
<td>Theoretical knowledge</td>
<td>Description of aural signifier</td>
<td>Role of aural signifier in diagnosis</td>
<td>Knowledge source (aural)</td>
</tr>
<tr>
<td>-------------------------</td>
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<tr>
<td>Normal heart sound</td>
<td>'The first heart sound is generated by the mitral and tricuspid valves closing. During systole, where the heart contracts and expels blood from the left and right ventricles, that [sound] is associated with the closing of what are called the mitral and tricuspid valves, which stop blood flowing into the ventricles at the same time from the atria. As they close that causes “lub”, and blood is expelled from the heart, and then at the end of what is called systole or the contraction of the ventricles the aortic and pulmonary valves then close, and that gives the “dub”.'</td>
<td>'Lub-dub'; 'boom-boom'</td>
<td>Used as a screening tool to distinguish between normal and abnormal; hearing normal heart sounds indicate no further investigation is required</td>
<td>Learnt during rounds; heard in a simulated environment; correlating heard sounds with cardiograph; heard on medical dramas</td>
</tr>
<tr>
<td>Third heart sound</td>
<td>Third heart sound can be normal or a sign of pathology, particularly heart failure. The third heart sound is the product of turbulent blood flow. These heart sounds are commonly referred to as 'murmurs'. A third heart sound is due to a regurgitant valve, which causes turbulence.</td>
<td>'Ten-ne-see'; 'lub-di-dub'; 'boom-boom'; described as either 'like the spinnaker on a yacht' in cases where the heart muscle is strong and dynamic, or 'like my mother’s breasts, which flop down like a tennis ball in a sock' in cases where the heart muscle is weak</td>
<td>Used as a screening tool to distinguish between normal and abnormal; in context of patient history, indicates where further tests are required</td>
<td>Learnt during rounds; heard in a simulated environment; correlating heard sounds with cardiograph</td>
</tr>
<tr>
<td>Condition</td>
<td>Theoretical knowledge</td>
<td>Description of aural signifier</td>
<td>Role of aural signifier in diagnosis</td>
<td>Knowledge source (aural)</td>
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</tr>
<tr>
<td>Fourth heart sound</td>
<td>Fourth heart sound relates to blood flow and is always an indicator of pathology. Pathology is indicated by the placement of the murmur. In the case of aortic stenosis, blood flow is obstructed through a stenosed or blocked valve, which causes turbulence. In the case of hypertension, the heart is thickened so the blood makes a noise as it hits against rigid muscle.</td>
<td>‘Ken-tuc-ky’; ‘bo-boom-boom’; ‘like a hose directly hitting against a bucket... it makes a “ding” noise as it hits the wall’</td>
<td>Hearing a fourth heart sound is always an indicator of pathology, and as such requires an echocardiogram and further tests</td>
<td>Learnt during rounds; heard in a simulated environment; correlating heard sounds with cardiograph</td>
</tr>
<tr>
<td>Pericarditis</td>
<td>The two layers of the membrane that encases the heart becomes inflamed and do not pass smoothly over each other when the heart beats</td>
<td>‘Grates’ or ‘scratches’; described as a ‘rub’ sound imitated by rubbing hands together, as if to get warm</td>
<td>Inflamed membranes generate a sound that can be heard with a stethoscope</td>
<td>Learnt during rounds</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>Like the heart, the lungs are encased in a membrane. Water can build up between these layers (particularly in aged people).</td>
<td>Lungs compared to a water tank that you can ‘tap’ to establish the water level, below the water level sounds ‘dull’, and above sounds ‘resonant’ or ‘hollow’; ‘hollow, hollow, hollow, bomp’</td>
<td>Diagnosis can be achieved by ‘percussing’ the lung (the left hand is placed on the chest wall, and the ring hand taps with the middle finger in a ‘hammer-like fashion, just like you would with a water tank’; technique used in general practice and hospitals in lieu of technology-based tests</td>
<td>Learnt during rounds</td>
</tr>
</tbody>
</table>
time you hear it, at least you will consider it as a possibility'. In both of these examples, training doctors came to experience sounds in the context of their stated metaphors and meanings. The last phrase of Matthew's description is perhaps the most telling. Learning to understand the body's sounds took time, signifiers aided it, and these came to be akin to the sound that was perceived. In other words, aural learning was not only a matter of describing sounds in a certain way, rather with repetition and guidance, it was almost as if the heart sound and the seagull were perceived and understood as all but identical.

This combination of biomedical and clinical knowledge made the medical body aurally perceivable, an approach that extended to the other senses. David, for example, described that where normal tissue was soft, malignancies were hard. While David knew this theoretically, making these distinctions in an operating theatre was dependent on feel, and in David's experience, cutting through breast cancer could be best equated with 'cutting an unripe pear'. In similar terms, he described the stools of someone with cholera as visually 'like rice water'. Critically, without these frames of reference, which, to use David's words, made conditions 'tangible' and allowed them to be 'pictured', the theoretical knowledge remained meaningless. These examples demonstrate Mills's claim that we 'live in second-hand worlds', with our experience of phenomena always mediated.240

An example of the limits of knowledge without experience were given by Bruce, who recalled that despite five years of medical training, he was unable to identify a jaundiced patient when it was first encountered. While Bruce knew that jaundice was an indicator of pancreatic cancer and knew its presentation was a yellowing of skin tone, he had not yet learnt to perceive yellow. He continued: you can learn about certain pathologies and their indicators formally, but it is 'on the wards that you start to acquire an understanding of what a “flushed face” means, or whether someone is “blue”'. This finding is in keeping with Lakoff and Johnson's argument that: 'No metaphor can ever be comprehended or even adequately represented independently of its experiential basis'.241 Metaphors such as rice water, pear cutting, and the colour blue may be useful conceptually, but without experience of what these mean in practice, they are only a first step for the acquisition of sensory knowledge. As Leder put it: 'A skill is finally and fully learned when something that once was extrinsic, grasped only through explicit rules or examples, now comes to pervade my own corporeality'.242 That is, knowing is dependent on experience.

241 Lakoff and Johnson, Metaphors We Live By, 19.

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This last example of misunderstanding without experience is not meant to indicate superiority of experiential learning in the medical community, but rather the interdependence of knowledges and learning methods. Biomedical knowledge and clinical signifiers were discussed together because they were mutually dependent and equally valuable. As Nelson explained: ‘Knowing simplistically what generates the sound gives you a bit of a feel for why a sound happens’. Some musicians expressed a similar application of technical knowledge to aid hearing. For example, Alex stated:

Reed instruments tend to be sharp when they are soft, where flutes tend to be flat. If I am playing and I am not in tune, there is an expectation that because I am playing a middle octave E it is going to be flat. I can predict that with technical knowledge almost faster than I can hear it.

This example shows how technical knowledge of the flute could facilitate a prediction of what could be happening with tuning. Equally, however, without learning the signifiers and experiencing what they mean, theoretical knowledge was useless. This interdependence of knowledges challenges claims that different kinds of knowledge operate independently ‘like radio stations operating at different frequencies and unable to listen in on each other.’ It also challenges arguments that some knowledges are more valuable, or more worthy of the term (as opposed to ‘skills’ or ‘know-how’) than others.

The case of the doctors demonstrates how multiple knowledge types and learning modes can be combined to build specialised aural skills. Formal education plays a direct role in a doctor’s aural learning through structuring understanding and directing attention. Experience in the broadest sense is also vital to make sounds perceivable. This multimodal approach to learning and the interaction of knowledges indicates that, in practice, ‘formal’ and ‘informal’ are not discrete, but can combine in response to available learning opportunities, and the learner’s needs. The health care environment demands more than a lay understanding of medical practice. As such, a doctor’s learning begins with significant formalised and largely theoretical knowledge. Angus put it well when he described the medical degree is a ‘licence to experience’. For doctors, however, this theoretical knowledge cannot be the end of the learning process, because medicine is as much a ‘trade’ as a profession. As Wenger argued, if we think knowledge consists of explicit information, then its succinct articulation in a formal setting makes sense. If, however, we understand that this is not all of knowledge, or even the

243 Vervoorn, Re Orient, 255.
244 Ibid., 257.
majority, then it does not makes sense to only use these methods. Ultimately, it is just as easy to discount formal learning methods for building aural knowledge as it is to undervalue or ignore the informal and experiential. Yet as the doctors demonstrated, learning methods are frequently interdependent, and mastery demands both.

Conclusion

Despite their diverse practices and areas of interest, there were common elements of sensory learning across the communities. The first of these was a concern with developing an understanding of what was ‘normal’. Whether with reference to musical harmony, water levels in a canyon, or the sounds of healthy airways, this notion of ‘normal’ was developed through experience in a social context, and acted as a foundation for all other understanding and practice. A by-product of the critical role of social groups in forming this sense of ‘normal’ was that it tended to vary enormously. The Morse case demonstrated the least variation, where differences in practices, skills, and values were more directly linked to an education provider, professional background, and locality. For musicians, adventurers, and doctors, however, variation was the rule rather than the exception, and while this idea of ‘normal’ was common, what was normal was largely the property of the individual.

An emerging finding through each of the communities is that while institutions (whether organisations or a more informal set of ‘rules’) can privilege some approaches to learning over others, multiple modes tend to come together and interact to inform the understanding of a learner. For the doctors, formal learning was almost invariably a first and highly valued step in a professional’s education. Yet this more theoretical knowledge interacted with and was necessarily reliant on informal or experiential learning methods, particularly when it came to sensory knowledges. Being able to examine a patient was the culmination of years of learning. Formalised, theoretical knowledge acted as a foundation to guide understanding, but being able to make judgements of health and illness also depended on learning to hear a murmur, or see jaundice. Equally, even for the musician or Morse operator with the best of informal mentoring and experiential learning, formal learning still played a role in shaping understanding.

Building expertise requires all three modes of learning (formal, informal, and experiential), but how much of each, and in which sequence, depends on the types of skills being mastered, as well as the context. For many musicians, being surrounded by music and developing an

246 Wenger, Communities of Practice, 9-10.

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intuitive understanding first produced the best results, where the converse was generally thought to be true for Morse operators and doctors, at a minimum because the opportunities for this mode of early learning were highly limited. For those working towards mastery, this learning process tends to be life-long, with individuals building their understanding through their professional roles, friendships, the places they go, the cases they encounter, and the organisations that may regulate them. The following chapter builds on these findings in the context of expertise.
In the previous chapter, the processes and structures that support elementary and intermediate aural learning were examined. I showed how social networks, formal knowledge frameworks, and practical mentoring are each critical for learning to assign meaning to sound and ultimately, to develop understanding. These processes and structures, however, represent the beginning rather than the end of learning and practice. For experts, learning never ends. Expertise requires that foundational knowledge be revised and refined continually, and in some cases left behind entirely.

This chapter examines definitions and elements of expert practice, how it is arrived at, and what it makes possible. It addresses the research question: What is the position of hearing in expert practice? (see Figure 2, Chapter 3). Throughout the chapter, I focus on the role of aural knowledges in expertise. Beginning with musicians, I examine the issue of identifying experts, and reaching fluency. Looking then to the Morse community, I illustrate how expertise can be narrowly conceived in terms of competencies, but expertise is often more nuanced, and exceeds the skills and levels of competence spelled out in a job description. Through the case of the adventurers, I look at the dangers or limits of trying to articulate knowledge at an expert level, and problems of formalisation. Finally, with the doctors, I examine the problem of perception and legitimacy for sensory knowledges.

Musicians

Music is a diverse field with many different measures of excellence. It varies across context, community, style, and instrument, and expertise often brings greater specialisation.
aspect of music was considered by most to be a part of the charm and value of music. As one musician reflected: 'It is all part of why we find music interesting and meaningful'. While this diversity was a valued aspect of the fabric of musical life, it introduced some complications for defining and locating expertise. For classical musicians, there was an emphasis on perfection, as reflected in the time-consuming, repetitive practice methods encouraged in students and used also by the elite to memorise works and expunge the appearance of errors. For rock musicians, this kind of rehearsal expunged musicality. While these distinctions seem stark, there was agreement that expertise in music demanded aural acuity, and a capacity to make music with more direction, finesse, control, and beauty than most others. Expert musicians made music as if it was their native language. While for musicians, the sound of music and its perception was most vital, audiences were observed to have a more multisensory appreciation. This distinction between expertise and lay sensory knowledges emerged as an issue for professional musicians, as success often required practices that played to both of these understandings.

Communicating expertise

A question that emerged in my discussions with musicians was: What is 'good' listening? To speak of a universal expert aural acuity was often thought tantamount to missing the point. Rather, good listening was dependent on factors such as context, musical style, and purpose. As Lachlan explained, good listening could only be 'a question of good for what?' An issue that emerged through this debate was the distinction between the experiences and values of lay music lovers, and the performing elite. This distinction was stronger for some musicians. For some musicians, especially those aligned with an analytical approach (see Chapter 4), the aural acuity of an elite was substantially more attuned than that of a lay hearer. Expert musicians could hear more, were more knowledgeable and, by extension, their judgements were more valid. Other musicians, those aligned with a more holistic approach, did not draw such a strong distinction between audience and elite. As one musician representative of this holistic perspective stated: 'Awesome listening is someone who doesn’t know anything hearing something and thinking, “I feel something because I listened”. That is as valid as someone saying, “I see what they are doing with that dominant substitution”. While their aural sense was attuned to technical aspects of musical sound, there was equal focus on the ultimate communication of meaning between an artist and an audience.

247 For a detailed analysis of this process at an elite level, see Chaffin and Logan, "Practicing Perfection."
These different perspectives on the meaning of ‘good’ listening had implications for how music was performed by experts, as well as the level of credence paid to audience opinions. This issue of musical expertise and audience communication has emerged as pertinent for classical musicians, as it has recently become ‘cool again’.\textsuperscript{248} Violinists Richard Tognetti and Nigel Kennedy spoke on the future of classical music in the context of this renewed interest. Tognetti, the Artistic Director of the Australian Chamber Orchestra, was very resistant to attempts to make classical music ‘palatable’, and stated that ‘cool’ was a ‘dirty word’ because ‘art should transcend such things’.\textsuperscript{249} Attempts to make classical music more accessible were viewed at the cost of ‘artistry’. These comments were directed against performers such as Bond, a ‘leggy’ string quartet who have been successful in entertaining audiences with well-known classics. From Tognetti’s perspective, classical music should not have to be dressed up. He stated: it ‘transcends relevance ... and irrelevance’, and would be better off ‘banned’ and sent ‘underground’.\textsuperscript{250} His classical music had inherent value that should speak for itself and, as such, it was performed with limited direct engagement with the audience. All the performers wore plain black outfits, and focused on one another and their sound.

Kennedy adopted a different stance to Tognetti, arguing this separatist approach spelt musical death. He stated: ‘when I started there were people who seemed to regard the arts as their private club. Selling records was like inviting the riff-raff in.’\textsuperscript{251} He continued: ‘The manner in which you play is really important now. If you’re a violinist and you’re playing as if there’s a sheet of glass between you and the audience, that is an alienating effect, particularly on young audiences. They expect much more direct communication.’\textsuperscript{252} Kennedy’s reflections highlight the importance of communication for professional success, and how this communication might require tools that are considered to be peripheral by other experts. Aware of these non-musical aspects of performance, Kennedy sports a distinctive haircut, tells his audiences stories, and even throws a football around. Example 15 illustrates this same issue, emphasising the potential for this gap in musical understanding and expectations to extend the scope of how musical expertise is practiced.

\textsuperscript{248} Elissa Blake, “Prelude to a Hit,” \textit{Sydney Morning Herald} 27 February 2010.
\textsuperscript{249} Ibid., 6.
\textsuperscript{250} Ibid., 6.
\textsuperscript{251} Ibid., 6.
\textsuperscript{252} Ibid., 6.
Example 15: The Good, the Bad, and the Ugly

For Michael, a Latin musician, there was a big gap between the ‘good’ bands as identified by audiences, and those likely to be considered more skilled by experts. In his experience, audiences were more concerned with non-aural elements such as the dancing and the visual presence of the band, rather than the technical expertise and nuances of musicality. A challenge for Michael as a musician, then, was learning to communicate with his audience in a language it appreciated.

Michael spoke to some people in the audience, and was surprised to discover their interest in aspects he had considered totally irrelevant, such as his clothes: ‘People look, and what they see is very important. Now I am performing regular concerts with people who often come on a Thursday, Friday, Saturday, and Sunday. You need to find a way to make your music interesting for these people, because that’s what it is all about, and things like wearing different clothes make a huge difference’. This came as a revelation: ‘We have a really performer-centric approach, we’re on the stage and hanging around the conservatoriums talking about what we’re doing, when we really need to understand things from the perspective of the audience’.

Example 15 highlights a tension between experts, audiences, and their competing sensory prerogatives. In this example, Michael observed that musicians could focus exclusively on the sounds of music and its aural perception. Through his professional experience, however, he came to conceive of his role as a musician to include non-aural aspects. Hugh, an elite violinist, made a similar observation: ‘We don’t train performers to communicate with audiences with their body, their gestures, their stagecraft, their smile. It is about this pure experience. If the audience is part of it, it becomes a synthesis, a communication’. As with Kennedy, Hugh equated musical communication with multisensory engagement. The analytical focus only on sound was recognised as potentially isolating.

The discussions over the status of classical music and its engagement introduce the question of whether facilitating musical accessibility precludes expert musicality. Collins and Evans examined competence to assess expertise, and argued that despite recent trends towards giving significant legitimacy to ‘upward judgements’, assessments were only unassailable when made by other experts in the field who had more expertise than the person judged.253 Musicians such as Tognetti would likely welcome such a perspective, because it minimises the credence given to lay audience judgements. However, in the context of waning audiences,

such a separatist approach may not be sensible. While lay and expert knowledges represent
different kinds of expertise, music lovers are experts in their own musical preferences. For
professional musicians, particularly those directly reliant on attendance for their livelihood, it
does not make sense to ignore audience judgements.

Figure 13: Engaging an audience

Equally, such a sharp line between expert music and audiences need not be drawn. For
musicians Michael, Hugh, and Kennedy, their expert practice was not seen as exclusive to
having an audience. Each of these experts acknowledged that an audience may have
preferences and expectations that some musicians might consider extra-musical. As Kennedy
pointed out, the social understanding of music common today is that it should somehow
'communicate' directly. However, communicating with an audience in terms that might be
regarded as extra-musical by experts need not imply that musical expertise is reduced to
showmanship. As these musicians demonstrated through their own practice, audiences could
be engaged while professional integrity was maintained.

See Berger, Metal, Rock, and Jazz; DeNora, Music in Everyday Life.
Achieving musical fluency

A metaphor of ‘fluency’ was often used to express musical expertise. This terminology aligned music-making with communication through language. It implied that a musician spoke music in more than ‘phonemes, syllables, words, phrases, sentences, and paragraphs’. It meant an ability to communicate ‘in whole structures’, or to speak as a native. In other words, musical fluency was more than competence. Within their music, fluent musicians could make fine discriminations, they discerned patterns and details, they were responsive to context, and they communicated meaningfully. As the musician Lachlan reflected: ‘Knowing jazz or salsa is like speaking French. If you don’t know any words, you can’t make phrases. If you can’t make phrases, you can’t make a paragraph. The question then is whether you have anything worth saying!’

A central aspect of this fluency was its specificity to a sub-community and context. For example, one musician was an expert in flute and contemporary composition, and found the Indian folk style with its distinct harmonic system ‘almost incomprehensible’. The same was said for ancient Greek and Kurdish folk music. The identified reasons for this lack of comprehension were that his theoretical knowledge of music was not easily transferred, and he lacked the broader cultural understanding. He knew that Ancient Greek music used quarter-tones, and while he experienced them as ‘expressive sounds’, he could not notate them. Kurdish music was heard as ‘tragic wailing and despair’, though he had started to doubt whether for musicians in this tradition it was experienced as such. He stated: ‘Perhaps it was a happy piece’. These aspects of musical expertise hark back to the analytical and holistic spectrum of practices and values (see Chapter 4). Musical fluency required aural knowledge of both.

This issue of aural knowledge as context specific was also raised by jazz musicians, who had observed that musicians who came to jazz from other traditions often misunderstood it. This misunderstanding occurred even when musicians had expertise in traditions other than jazz. For example, Trevor observed classically trained musicians ‘with incredibly good ears’ would hear jazz as frenetic or meaningless, even if they could aurally perceive every note. In other words, hearing analytically they could perceive the pitches and harmonic structures, but that did not necessarily translate into an appreciation of musical meaning. He stated:

They will be comparing to things that they have heard and know that have some sort of social meaning for them but they still won’t get it. Whereas someone who has spent

255 This alignment of music and language has an affinity with Finnegan’s suggestion that the line between them can be difficult to maintain in absolute terms. See Finnegan, Communicating, 73.
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years and years listening and playing and talking about jazz will understand these little musical words, sentences, phrases: they acquire specific meanings.

The context-specific nature of musical fluency is demonstrated in these observations. The analytical aspects of musical expertise were valuable, because this aural knowledge facilitated the identification of the musical elements. However, without the holistic aspects of aural knowledge – what Trevor described as the ‘social meaning’ of musical words, sentences, and phrases – musicians did not understand. That is, hearing pitch and harmony did not equate with fluency. Great listening and musicianship was more than perceiving and reproducing musical elements perfectly. It was also perceiving and knowing the language and the cultural references intimately.

This requirement for both analytical and holistic aspects hints towards fluency as more than competence. This attribute was demonstrated in the recollections of one singer. Tom described attending the performance of a Tchaikovsky opera in Britain. The singers had been ‘immaculately coached’ in Russian, and as a performer and teacher himself, he was very impressed. However, when a performer entered the stage who was a native speaker, he stated that the difference was immediately perceivable, despite being a non-Russian speaker himself. The Russian began to sing, and Tom thought ‘they’re on dial-up and she has ethernet’. For Tom, this was as if someone had ‘just wiped the fog off the windscreen’. He continued: ‘I didn’t have a clue what she was singing about, but I knew that she knew what she was singing about’. After their immaculate coaching, the non-native singers were competent performers of the opera, convincing to even a trained ear. Yet, when compared with the expertise or fluency of a native speaker, the subtle and nuanced differences were clearly perceivable to the ear.

Fluency enabled musicians to perform at an elite level. It included sensitivity to fine aural distinctions, the technical possibilities of their instruments, a consciousness of their thought processes, and an awareness of patterns and the big picture.\(^{256}\) One expert, Edward, demonstrated such sensitivity to subtleties, as well as an awareness of the possibilities and how they may be applied. He stated that, for him, musical listening was ‘analysing the sound’ and identifying its source in the orchestra. This required ‘knowing all of the possibilities of all of the instruments’. He explained that sometimes these distinctions could be fine, such as the differences between a contra bassoon and a muted tuba. Distinctions were formed through a knowledge of how the instruments ‘subtly differ’ and a process of ‘working it out at any one moment’. These distinctions rested on technical knowledge of the instruments, and expert aural acuity. For this musician, this knowledge was useful because such distinctions led to

\(^{256}\) For a description of expertise inclusive of these traits see Klein, Sources of Power, 148-49.
judgements of how the two sounds might be used in a musical sense. He explained: 'If you have a moving line, a bass line and a melody line, how would they affect your concept of the texture?' This musical fluency captures a knowledge well-beyond the considerations of timbre of both a lay ear, and even a competent musician. It represents a deep and nuanced aural knowledge that could be dynamically applied in practice.

Fluency in a shared musical language facilitated elite ensemble performance. Professional orchestras required that the margins for stylistic and harmonic variation were almost eliminated, with an ability to 'blend' a critical factor for employment. Mark, a musician who had been performing with an orchestra for more than thirty years, commented that he had seen elite musicians audition and fail because they did not have the 'right sound' for the ensemble. He stated:

> If you get someone in who you’re trying out, if they don’t succeed, it will be for a whole variety of reasons. One is they might not listen to what is going on around them. They might tongue in a different manner, which means that they won’t fit into the way the section starts a note. If they’re tonguing in a completely different manner to the way you are, then it is not going to blend. So the main thing is about blending, and just fitting in with the orchestra. You have to know your instrument so well that playing your instrument is not a concern, the concern is how do you fit in with what is happening.

This description of the performance requirements of an elite ensemble captures the subtle differences in musical language that occur within a sub-community. Accordingly, the concern for the ensemble was not the notes, but the nuances of their style and congruence across the group. At an expert level, fluency in precisely the same musical language facilitated a cohesive performance that aurally communicated the musical meaning intended by the conductor or musical director. Achieving this fluency required that musicians were attuned to the language being used around them and could adjust their use of language accordingly.

With the subtle nuances in timbre that have been described and the kinds of discriminations that experts were able to form, the question emerged: Where is the line of professional competence? Edward, the musician who described distinguishing between a contrabassoon and a muted tuba reflected that while not many musicians heard music like him, there were also some people who heard with ‘greater finesse’. Given Edward works at the top level of the profession, should we take this observation as an indication of less expertise? In the arts, defining expertise is tricky. As demonstrated previously, musical expertise could include, but was more than audience discernment. An attribute that was also often identified was that the
expert levels of skill meant going beyond formal learning. This need to extend beyond a teacher’s lessons is captured in one musician’s observations about how she became ‘functional’ or ‘fluent’ (see Example 16).

**Example 16: Becoming fluent**

Hannah, a pianist, grew up in a nurturing musical family, and had what she described as a ‘fairly typical’ classical music education following an exam system. Hannah achieved a good standard and after high school, she began studying music at university. In this new environment, however, Hannah found that her skills as a musician were not ‘functional’ or ‘fluent’, and the patterns of practice encouraged by her new teachers were not sustainable or enjoyable. She reflected: ‘I didn’t get it. I knew that I liked music, but I didn’t want to practice for eight hours a day. My teachers had been more of the standard mould. “You have to practice properly” What is this practice properly? What do they mean? I had no idea and wasn’t in control or aware of my learning processes’.

Unsatisfied with her pedagogy, Hannah did not complete her degree in music performance, and instead started working as an accompanist. Accompanying students was an effective catalyst for building skills to cope with professional demands, because it forced her to reconsider her practice methods. She observed: ‘Just having fifteen kids coming in doing a program and having 100 pieces that you have to play in a week. The first thing you learn is that you can’t actually learn them all, and then you have to learn your survival playing: being able to learn a piece of music in a very short space of time to a coherent level and keep going, and in a way that doesn’t put the poor kid off’. Her partner was perhaps the most instructive student, because she was able to work closely and honestly with him: ‘I could snap at him and there is a buffer, so it is okay – “What do you mean there?” “No, I meant that!”’ – whereas when you’re working with other musicians, you have to be a bit more careful’.

In Hannah’s opinion, this ‘fluent’ approach was very much at odds with classical music culture, particularly in contemporary Australia. Hannah observed a tendency towards teaching knowledge beyond the level that could be applied, and in a static way: ‘It is all very well to learn an exam program, but if you can’t do anything but play that really well for two weeks? The whole musical culture is based on handing something on. Music in Australian society just isn’t a dynamic thing’. For Hannah, becoming fluent was a process of moving from rote learning to musical fluency. A central aspect of building this expertise was getting inside her own learning processes, developing practice methods that suited her, and moving past those that did not. She slowed down, developed a sense of what she was trying to achieve musically,
and became aware of what she was doing 'rather than just blindly playing'. She observed that with this mode of engagement and with time: 'You start being able to manipulate what you have learnt, rather than just handing it onto the student exactly the way it was handed on to you'.

Example 16 illustrates one musician’s process of becoming fluent. Key factors for achieving expertise were playing with others, and developing an awareness of the patterns and how they subtly differed. Through the exam system and her first years of tertiary music, Hannah achieved musical competence. However, she did not speak a music fluently. That is, she had not developed skills in quickly learning and performing pieces, or her own musical style.

Pattern recognition and a sense of musical coherence facilitated rapid learning of pieces. This is in keeping with Levitin’s argument that expert musicians can ‘scaffold’ on their knowledge of previously learnt music, and ‘just note any variations from the standard schema’. In order to progress from having skill at a particular task, to having a ‘dynamic’ understanding of music and musicianship, Hannah worked in ensembles and was mentored in this professional context towards developing practice methods that were efficient for her. Hannah became able to observe her own thought processes, developed her own understanding, and became conscious and precise in her actions.

Achieving ‘fluency’ is a continuous process. It implies going beyond a theoretical knowledge, or as one musician expressed it, from a ‘computer-generated voice’ to that of a native speaker. What this means is that fluency is more than competency. It is deep, broad, and responsive. It includes a capacity to form fine discriminations, to see patterns as well as divergent details. Fluent musicians can dynamically apply and use their aural knowledge in real time.

**Morse operators**

Defining the line between competence and expertise can be challenging, as it was in the case of the musicians. Among Morse operators this line was more easily determined because the range of what constituted expertness was much narrower than in the music community. The nature of Morse skill and its employment implied explicit criteria of professional competency,

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Levitin, *This Is Your Brain on Music*, 213. Krumhansla et al. suggest that this expertise is more than schematic expectations (an understanding of general stylistic elements), but rather expertise was associated with increased ability to correctly predict the next tone/pitch. See Carol L. Krumhansla et al., "Cross-Cultural Music Cognition: Cognitive Methodology Applied to North Sami Yoiks," *Cognition* 76, no. 1 (2000).

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highlighting the knowledge and skills that were more than ‘competent’. Expertise in Morse was primarily aural in nature, though also included a capacity to physically form and transmit signals using the right arm, right hand and a Morse key. As with the musicians, operators described Morse expertise using the metaphor of fluency: ‘A good operator doesn’t receive letter-by-letter, or word-by-word. You hear in phrases and telegrams.’ It was understood as part aptitude, part experience, part confidence, part ego, and culminated in Morse becoming ‘second nature’. It included skills recognised as necessary to get the job done, and some skills beyond an operator’s training and job description.

Conceiving expertise

In my conversations with Morse operators, there were many stories of ‘gun’ operators who were able to handle large volumes of traffic in difficult conditions with accuracy. These operators were the experts, and were most readily identified by their position, the lines that they worked, and their speed. Among PMG operators, the telegraphists who worked on interstate and commercial lines were perceived to have the greatest skill. These operators could send and receive at high speeds, could abbreviate messages, and could do so with an accuracy that largely mitigated the need for ‘breaking’ the sender, or the standard repeating of figures and uncommon words. While there were some ‘good’ operators who held positions in the post offices, it was largely agreed that the smaller number of telegrams sent and received and their more generalist training typically made them less expert.

Expertise in Morse was closely associated with speed and, often more implicitly, with accuracy. This focus is reflected in Morse communities through time and space. As Standage described: ‘Telegraph operators were members of a closed, exclusive community ... [with] their own customs and vocabulary, and a strict pecking order, based on the speed at which they could send and receive messages.’ ‘Gun’ operators, like Sydney telegraphist Jap O’Neil, were identified as experts on the basis of the volume of traffic they could send and receive (see Chapter 4). The capacity to operate at this high speed was an asset in exceptional cases such as Christmas Eve, when thousands of messages were transmitted late into the night.

258 This is in keeping with Bryan and Harter’s finding that an expert operator could use Morse with ‘automatic perfection’, able to ‘sense’ the message or give it ‘practically no attention at all’. See Willima Lowe Bryan and Noble Harter, “Studies on the Telegraphic Language: The Acquisition of a Hierarchy of Habits,” The Psychological Review 6, no. 4 (1899): 352.

259 This finding is consistent with Standage’s historical look at Morse operation. See Standage, The Victorian Internet, 129-30.

260 Ibid., 129-30.
While operating at high speed could be seen as functional, it was also surrounded by mythology. Jap O'Neil and The Mountain Lion entered the collective memory of the Sydney Morse community and served as an inspiration for what was possible; in their story, operating at great speeds got the job done. More common, however, were reports of fast operators who could not be understood as a result of their speed. As Clyde recalled: 'Top-tree operators were kings. They would send so many messages that they would get crook because they couldn’t receive them'. Most Morse operators saw this practice of sending faster than could be reasonably received as a problem of ego. While expert operators would assist and defend junior staff who were struggling to handle these rapid transmissions, they would often send equally quick messages to other offices. Regardless of its limited efficacy, fast operation was valued. As Oliver recalled:

Some just weren’t gun operators, but you would aspire to be up there ... It was a matter of pride. Getting on there for an hour, taking fifty messages and not breaking the man was one of those things, it was part of the enjoyment of the job. It was repetitious but there was friendly competition all the time.

These examples highlight how operational speeds became more than an issue of professional competence in the Morse community. Rather, speed was intimately entwined with community values (see Chapter 4), and an operator’s social standing. This issue of competition and demonstrating expertise is captured in Example 17.

Example 17: Displaying expertise

One Saturday, William was working a line between Sydney and Nyngan. There had been flooding at Nyngan, so there was a backlog of traffic. Despite the volume of telegrams, William and the operator at Nyngan (himself a ‘good operator’) were proceeding at a ‘normal pace’. It came to William’s attention that people were starting to gather at the supervisor’s office, and he guessed that they were there to assess his skills. William said to his Nyngan counterpart: ‘“Go on, get into it”’. When others then listened in, both William and the operator at Nyngan were going ‘flat out’. William then directed the Nyngan operator to ‘cut it up’. The supervisor came over and said: ‘“We heard you were good and we wanted to know how good”’.

The account in Example 17 illustrates that while the capacity to send and receive at great speeds was functional, it was also an issue of cultural capital. William confessed that the fast operation that he described could not be maintained all day. Equally, that the operators were
proceeding at a ‘normal pace’ before their colleagues listened in was also indicative that the speed and abbreviations were not necessary to address the traffic backlog. This speed, however, was important to demonstrate his expertise to his colleagues.

On the surface, expertise in Morse was conceived narrowly around the pursuit of speed. However, what was most valued and therefore considered as expertise varied according to context and community, and included skills not acknowledged in professional competencies. In a military context, for example, it was most important that the Morse signal was uniform and followed procedures stringently, because if individual operators could be identified there was a risk that the enemy could track troop movements. While in the postal system, breaking the rules per se in the pursuit of speed was justifiable, for a military operator it was a marker of incompetence.

Similarly, expert operators in Western Australia were those who could receive a barely audible message and send slowly and deliberately. For example, James stated:

The line from Perth to Wyndham was the same length as from London to Moscow, and it was primitive and slow, so there were two styles of operating. Very slow and deliberate in Western Australia, they didn’t have a lot of traffic anyway because their lines were so dreadfully poor. Whereas in the eastern states we were fairly busy but we had better quality lines, so you could go a fair bit faster. Both required their own individual skills.

Where speed was held to be paramount in the eastern states, particularly on the lines between major cities and rural centres, this was not functional in locations where the distance between receiver stations was great, and the quality of the lines poor. These examples of variation between practices and proficiencies emphasise the role of context and sub-community values in defining Morse expertise.

Working difficult lines was another way that Morse experts were identified. This capacity required knowledge of the conditions, technique, and also an ability to make an educated guess based on standard telegrams and the ‘flow’ of the English language. This required operators to make aural judgements of the intent of the message, a practice which PMG operators described as ’journalising’. As Gordon stated:

With experience you can guess a lot. On some country lines you would get a lot of interference, like leakage on the lines in wet weather. You have to work through a lot of difficulties and you can guess a lot and most of the time you’re right. A completely
inexperienced operator might not handle that. You could struggle through though if you were experienced.

Expert operators suggested that this capacity to journalise came with experience, but the practice was mentored in the workplace. Elliott, a rail telegraphist, remembered:

One operator said to me “we are here to interpret what they’re trying to say to us” and he hardly ever broke the bloke and he always got the message. I suppose that was from experience, because the type of message we were sending was in code, and you had a sixth-sense of what they were trying to send to you, and you would interpret it.

The description of this capacity as a ‘sixth-sense’ suggests the extraordinary and unexplainable, like the musician with an innate talent. Klein reported similar explanations for decision-making among fire fighters. When they reflected on difficult cases, fire fighters were more inclined to describe the source of their life-saving decision in terms of a ‘sixth sense’ or ‘ESP’.261 Klein identified that these experts had picked up subtle details and anomalies that informed their action, such as the fire being too quiet given its heat. Intuitively, it would make sense that the judgements of Morse operators in difficult contexts were also informed by subtleties and anomalies that they heard.

For experts, whether Morse operators, musicians, or fire fighters, there were times when familiarity with patterns and awareness of context were relied upon to inform decisions. Yet, this capacity to predict did not mean that experts could or should always guess. For Charles, part of being expert was the confidence not only to receive, but know when something was missed. He observed: ‘In the early times, if you got a strange or bad signal you may make a mistake or be frightened to break the person, so you might just go ahead with the mistake. When you get more experienced though, you wouldn’t hesitate to flick open the key and say “repeat”’. Part of this skill involved knowing when it was okay to guess. Oliver agreed: ‘If you are sending plain language, say for press telegrams, you can almost turn off. If there is a mistake in a middle of a word, you can more or less let it go, because you know the story. If it was a bank telegram though, you must have it right’. Expertise involved knowing the context of when to guess, as well as an awareness of limitations and dangers of guessing.

Expertise in Morse tended to be conceived narrowly in terms of speed, but also included other skills depending on context. For military operators, breaking the rules to send faster was less expert, because it introduced the possibility that military secrets were given away. Similarly, for operators in Western Australia, conditions were such that slow, deliberate sending, and a

261 See Klein, Sources of Power, 31-35.
capacity to decode a barely perceivable message were prized. Like the musicians, Morse operators agreed that with expertise in many cases there was a capacity to see patterns, and predict a message with accuracy. Aware of the conditions and the possibilities of messages, experts also knew when they needed a message repeated.

**Beyond professional requirements**

While expertise was grounded in the learning outcomes and professional standards of the Morse community, there were a number of expert aural skills that were perhaps less significant in terms of fulfilling the professional role. Skills such as being able to identify individual operators aurally from their sending style were possessed by experts, though they were only deemed functional in social interactions. For an expert, individual operators were easy to identify due to perceivable idiosyncrasies in their Morse signals. James claimed that he could tell when he was talking to one particular operator because he always put a slight pause in his ‘Y’, and as a result would send ‘N-M’ instead of ‘Y’. As a receiver, knowing and being able to perceive aurally these idiosyncrasies might have made receiving a little easier. However, operators did not tend to think of the skill as functional. Rather, detecting subtleties was mainly framed in social terms: knowing who the operator was because they were a friend, not because they needed to be identified for professional reasons.

To varying degrees, each of the identified expert aural skills represented a departure from approved practice or an extension of the levels of competence outlined in professional standards. For instance, there was a close relationship between speed and expertise. When James described the more advanced telegraphists’ skill, he stated that they were ‘trained to a slightly higher, more speed, standard’. However, as Example 17 indicated, there could be a significant difference between required speed, the speed recognised as advanced, and the speed practiced by experts. Operating Morse efficiently was part of the telegraphists’ and postal clerks’ job description. For telegraphists, the required speed was officially 22.5 words per minute, with operators who reached 25 words per minute going up a pay grade. ‘Gun’ operators, however, were distinguished by their capacity to accurately transmit and receive Morse at speeds over 35 words a minute. Although this was not part of the job description, this greater speed signified expert status and professional pride within the community of Morse operators. Example 18 provides another example of how speed was the object of professional challenges and competition, and was an area where operators extended past professional competence.

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262 Also see Standage, *The Victorian Internet*, 130.
Example 18: Exceeding the speed limit

For James, speed and competence in abbreviating words were the two crucial markers of a 'good operator'. Reaching a level of expertise in these areas was not learnt in the Postal Training School, nor was it outlined in professional guidelines. Rather, it was the product of working with good operators, and challenging one another. James described working a line with a telegraphist he was friendly with. On his first day at a new office, James challenged this operator: 'I saw this telegram addressed to the Wingecarribee Shire. I thought, "He won't know this!" So I went like the clappers; I gave him a burst. Of course he missed it. I said "What's the matter with you? Type it down".'

In the context of these professional friendships, operators would also challenge themselves and demonstrate their skills to colleagues. James described working with the same operator one evening. He was asked by his supervisor to jump on the line and receive a press telegram with greyhound race results late in the evening. James got on the line and said "Get into it!" which James described as 'a silly thing to say' because of all the dog names and race results. Proudly, he 'never missed a thing'. However, he played on the likelihood that he would have missed things, and did not acknowledge receiving the message. After exasperating his friend, he announced: 'Of course I got it, go home!' James stated: 'You had to have a bit of fun sometimes, particularly with your friends'.

Example 18 was given to me to demonstrate what was possible for expert operators. Expertise here was based around operating at high speeds. Pivotal, however, these capacities to both send and receive Morse at great speeds were not a professional requirement to get the job done. Rather, they were a competitive, social aspect of the role. This competitive culture was also captured in Moore's observations:

Armed with Morse keys, headphones, and their minds filled with symbols ... the operators face each other at a distance of sometimes three of four thousand miles ... They do not always know each other, nor do they know their counterpart’s strengths or weaknesses as operators. They will ... be engaged in a form of a competitive mind game ... They both wish to perform at their best – but strangely, unlike in other contests, neither participant wishes to win, but simply to achieve a draw ... that a
message has been successfully disposed of at one end, and correctly received at the other.\textsuperscript{263}

This recollection shows the competitive aspect of Morse operating. Like Example 17 and Example 18, it also concludes with a positive outcome. While skills such as fast operating and receiving were more than professional competencies, they were not at the cost of getting the message through.

There were also expert professional practices that sat outside the job description, either being overlooked or actively proscribed. For example, sending and receiving at great speeds was supported by transmission practices such as journalising and abbreviating, which were not in the handbook. Both using abbreviations and journalising were actively discouraged in the Postal Training School, despite being perceived as key markers of expertise and necessary to transmit large volumes of information quickly. Example 19 describes these practices, and the steps that were taken in the training school to inhibit their use.

\begin{quote}
\textbf{Example 19: ‘Cutting it up’}

One of the primary differences between the training school and the workplace was the use of abbreviations. Described as ‘cutting it up’, abbreviations were used by experts to facilitate a faster transmission of information, and to distinguish experts from non-experts. James explained how this ‘cut up’ language was typically used: ‘Invariably on the Saturday morning of Mother’s Day nine out of ten of the telegrams would start off with “Happy Mother’s Day”. If you had a good bloke at the other end you would just go “HMD”, and that really sped things up no end’. Other common abbreviations included ‘MXAHNY’ for ‘Merry Christmas and a Happy New Year’, ‘es’ for ‘and’, and the number 1 was shortened from - - - - - to - -.

Cutting it up represented a more advanced skill, and was central to what Allen described as ‘the culture and characters’. Like speed, it was something with which they would challenge each other, and went beyond the official professional requirements. James remarked: ‘I had a good friend down at Deniliquin. We would get all these weather reports with all these town names down there, and I knew he knew them, so I would abbreviate them like heck, and he’d never miss them. It added a bit of spice to the job. It’s not quite by the book, the book pretty well went out the window, I think’.
\end{quote}

\textsuperscript{263} Allan Moore, "Fifty Years of Australian Radio Communications in the Antarctic 1947 - 1997," \textit{Aurora} 1997, 32.
Transmitting and receiving abbreviated messages was not just a matter of friendly competition. The flip side of the challenge was that if an operator did not have the aural expertise to accurately receive the messages and there was a lot of traffic, they would be ‘booted off’. James recalled: ‘You could sense when a chap was struggling because he would stop you. If he did this too often when you were abbreviating you would think “well, this guy is not quite up to the mark so I won’t do that”. Sometimes if you had a really bad operator and it was Christmas Eve or something you would have to ask for the Postmaster, and say “Could you put a better man on?”.

Example 19 highlights the expertise of being able to perceive and understand the abbreviated message. It meant being able to aurally decode an abbreviated, rapidly sent message, and translate it into a written telegram. On occasions with a lot of traffic such as Mother’s Day or Christmas, it could also be functional to process the traffic backlog. However, as with speed, this skill was the subject of professional competition.

As a community, Morse operators demonstrate that expertise can be more than a matter of competently fulfilling a professional role. Rather, as was the case for musicians, expertise could come to mean a standard of aural knowing and practice well beyond professional requirements. Particularly for the telegraphists, there was a pride in operating far above the required speeds, and in a more creative, sometimes playful, way. Expertise also came to encompass aural skills such as identifying an operator based on the cadence of their transmission, and making sense of aural fragments. Just as these aural capacities were beyond the official job description, their reward too was outside professional recognition. Expertise in these areas became a matter of friendly competition, cultural capital, and personal pride. As with the musicians, Morse expertise captures the possibility that values and practices can be upheld for the community of experts only.

Adventurers

In the case of Morse, going beyond a defined professional competence was framed largely in terms of social kudos and social interaction. For adventurers, however, exceeding what might be considered to be professional competence was framed in terms of safety. As with the musicians, expert adventurers put more faith in experience than formalised knowledge to make the nuanced judgements required to avoid catastrophe. Doing things by the book, however skillfully, was problematic for adventurers because it could lead to dangerous
practices. While the question 'what is expertise' almost invariably promoted the response 'experience', probing deeper, adventurers understood expertise in terms of 'awareness', 'adaptability', 'accuracy', 'control', 'knowing intuitively', 'knowing automatically', and perceiving and understanding patterns and details. As Emil stated: ‘Becoming expert is learning to go beyond rules and generalities. It means meeting each situation on its own terms’. With their focus on experience and intuition, the adventurer case illustrates the issues with articulating expert understanding, as well as the limits of formal learning and rules.

Dangers of articulation

In the previous two chapters, a practice mentioned repeatedly by adventurers has been storytelling. Storytelling is normative, it motivates, it is a medium for knowledge sharing, and it is a means of reflection for self-knowledge.264 However, the articulation of experiences was not always conceived of as limitless in value. In the context of the adventurers, words often proved inadequate because they could not express signifiers and experience with enough detail and accuracy. Accuracy was particularly a problem for the sharing of sensory knowledge. This was the issue Macpherson had in mind in her interviews with participants in a blind walking group, when she observed that: 'It is hard to know if the touch she refers to is the same sense of touch as I have experienced as a sighted person. We have a common language of touch but potentially different embodied-cognitive experiences'.265 Expert sensory knowledge is subtle, nuanced, and often left undiscussed. In combination, as both Macpherson and the adventurers highlight, this means that its expression can be imprecise.

River crossing is a practice where sensory knowledge, including hearing, is critical for decision-making, and can be difficult to put into words. Crossing rivers was mentioned by almost all adventurers based in New Zealand as a point in a journey where disastrous decisions could be made. This preoccupation with river crossings was due to the high level of risk and fatalities associated with this practice (to the extent that in the early years of European settlement, drowning came to be known as ‘the New Zealand death’).266 The below image of Cascade River extending into the forest illustrates the potential scale of a South Westland river after a heavy night’s rain (see Figure 14). Communicating safe practice for river crossing was, however, problematic because, like many other practices, safety ultimately depended on an accurate assessment of the conditions. Organisations such as the New Zealand Mountain Safety Council

264 Brown and Duguid, "Organizational Learning and Communities of Practice: Toward a Unified View of Working, Learning, and Innovation."); Klein, Sources of Power.


(NZMSC) have produced educational pamphlets and run courses that highlight hazards, share techniques, and 'rules' of river safety. While rules, such as 'understand river dynamics', 'identify all potential hazards', and 'know where, when and how to cross', appear sensible, the perceptual expertise, including aural knowledge, required to make such judgements far exceeds that which can be imparted through a pamphlet or a training session.

Figure 14: Cascade River, South Westland New Zealand after rain

Part of this issue of expertise in river crossing was that it required the assessment of many variables that could not be captured as rules with accuracy. Words like 'noisy', 'loud' and 'clunking' awkwardly conveyed something of the sounds of a potentially hazardous river. For expert adventurers, however, there was trepidation about communicating their aural knowledge of river hazards using these words, because their accurate use depended on shared understanding of sounds in specific environmental contexts. Some rivers 'clunk' less; not all dangerous rivers are 'loud' (see Example 20). In addition, the amount of noise a river made was only one of many sense impressions used to assess the danger of a river. As Simon explained: 'I mean, “don’t get in a river if it is loud”, that is fine, I don’t have a problem with that, but it’s just one strand and it may have validity and it may not'. Knowledge of geography,
geology, glaciology, and their visual representation also contributed to the judgements of experts. Discolouration, for example, was linked with flooding and was another indicator that a river was dangerous. However, making a judgement that a river was discoloured, flooded, and uncrossable was not a simple practice. Simon explained: ‘At what point does a river that drains a glacial area become flooded or not? You can’t see into the water anyway because it is all murky water. If I come to a stream like that it might be up a bit but it is likely to be murky anyway because of the glacial component’. In both of these cases, sensory knowledges played a critical role in expert decision-making, but their application was dependent on a nuanced assessment of multiple cues.

Example 20: Knowing when to stay out

With New Zealand rivers, the most fundamental decision was whether or not they should be crossed. ‘River rolling boulders’ were a major hazard and indicator of overwhelming current strength. Emil, an expert in the New Zealand Southern Alps area, explained that fragile sedimentary rock was common, and was easily broken by the force of the river and ice into gravel and boulders. After heavy rain, the current strength of the river increased, and the boulders could be heard rolling down the river. He explained: ‘It is a sort of muffled, clunking noise that you can hear above the noise of the water “clunk clunk clunk clunk” as something is knocking against other rocks’. He continued: ‘In terms of what does it mean? It means whatever you do, stay out of that river. If the river can be rolling substantial rocks, you know that you’re not going to be standing up in that’. He expressed concern that without knowing about and hearing these boulders, a person might be tempted to try crossing.

Assessing the river conditions, however, was not a matter of walking to the water’s edge, and pausing for a moment of attentive listening. Emil described traversing a river valley requiring many crossings and being able to walk straight to the right crossing point each time because observing the river and analysing its flow was a continuous process. In some cases, a river was arrived at and there was a pause or a decision not to cross at this place, but the process of integrating observations was unbroken.

While the sound of rivers was one of the indicators on which judgements were formed, sharing this aural knowledge was difficult. The word ‘loud’ was used to describe the sound of a river that was not safely crossable, but in some locations, such as in the gorges on the West Coast, the sound was amplified and always ‘loud’. Equally, quieter rivers could also be dangerous, as could be the case in deep water. The deeper the water, the greater the risk, as the speed the rivers flowed at meant water more than waist-deep was extremely dangerous: ‘If it’s in a gorge
situation where the walls and the riverbed are fairly smooth, then the water is just going to go through without making a lot of noise. Even if it is very, very deep it could be quite silent, compared particularly with where there are big shoals of gravel and big boulders. The implication of this variability was that: ‘The sound tells you different things in different sorts of settings’.

Example 20 illustrates how difficult it is to express sensory experience with any degree of accuracy. Other examples reinforced how problems of communication could be amplified when sharing the sensory subtleties perceivable only to experts. In the adventurer community, these issues with sharing expert knowledge often led, in lieu of silence, to the use of other media (such as film, photography and soundtracks) and experiential forms of communication. Belinda, for example, used images combined with audio recordings, and experiential aspects, giving the impression that neither words nor images alone were adequate. One technique Belinda used when sharing her experiences with school children was to erect a tent, and invite students to sit in it for as long as possible. The purpose of this technique was to develop shared meaning through shared experience, so students had a better understanding of being stuck in a tent in Greenland for prolonged periods due to bad weather. Belinda found these experiential and multisensory ways of sharing knowledge ‘more powerful’. Communication was limited without shared experience because, as Scharfstein argued: ‘When we try to explain unshared experience, we have no choice but to fall back on what has already in fact been shared, and ... the process of explanation is likely to be word-consuming, time-consuming and not very successful.’

In the adventurer context successful communication required a shared sensory and reflexive knowledge of environmental nuances.

Another issue with articulating knowledge raised by adventurers was its perceived capacity to structure and limit what was perceivable and knowable. As Macpherson argued: ‘Language does not simply convey tactile experience, it mediates its expression’. This capacity for language to mediate experience was observed by Emil. He stated: ‘Words have a habit of getting in the way, of coming between the knower and the subtleties of experience’. He was conscious that when describing an experience he was actually referring to a written account: ‘Instead of drawing directly on my memory of the event I’m drawing on a passage from my book that describes it, sets it in concrete, reduces and limits it. The act of articulating the experience has robbed it of its flexibility and multi-dimensional nature’. This experience of

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expression was also observed by a Morse operator, whose interview answers bore a remarkable similarity to his autobiographical article. He was telling me a story he had told before, and when I asked a question beyond its scope, there was often no answer, because it was outside the boundaries of the expressible experience. One doctor who also held an education position reflected that his answers ‘sounded like a textbook’. Again, when asked questions he was not used to answering, there was no way to capture the subtleties of his experience."269"

The adventurers’ reflections on their sensory knowledge and attempts to share it highlight its critical value, and barriers to sharing it. Communicating this sensory knowledge, whether to me as the interviewer or to another adventurer, was problematic because the perceptions that experts described were highly subtle, nuanced, and context and experience specific. Putting them into words was inherently challenging both because words proved inadequate, and because they did not reflect the myriad of sensations and knowledge that contributed to a decision in a given context. To paraphrase Polyani, expert adventurers knew more than they could tell.270 These findings highlight how the senses are used by experts, what these sensory perceptions make possible, as well as the learning methods by which they are best acquired.

Problems of formalisation

There has been a move towards formalising and certifying knowledges such as bushcraft and mountaineering that previously sat outside such governance. For adventurers in Australia, the standard required to facilitate outdoor activities with groups is a Certificate IV in Outdoor Recreation. Adventurers coming up through the ranks interested in teaching are increasingly undertaking this qualification. This requirement, however, proved frustrating for adventurers who already had expertise and had previously used that knowledge to guide school groups. Within the adventurer community, it was widely accepted that having a Certificate IV in Outdoor Recreation was no substitute for experience. While formal training gave some agreed

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269 Primo Levi made similar observations that writing can structure and limit expressible experience. In writing about the Holocaust, his role as ‘writer-witness’ meant that his books had imposed an ‘artificial memory’ on his experience. All that had been written or said about it had come between him and the reality. Equally, while he wrote as accurately and as honestly as he could, he was conscious he could not speak on behalf of others. He could not write about the death camps in Russia, as he had not experienced them, and as a survivor, he could not presume to speak on behalf of those who died. See Primo Levi, *If This Is a Man* and *The Truce*, trans. Stuart Woolf (London: Abacus, 1987).

terminology, basic competency, and was potentially a gateway into the outdoors, courses could not provide the range of skills or the awareness that defined expertise.  

The question of formalisation revisits the issue of the nature of expertise identified in the music community. Identifying experts was inherently problematic in the adventurer community due to the range of expertise, the variety of its contexts, and the skill level required to identify this level of competence. One adventurer found the certification requirements frustrating because expertise was so variable: 'It doesn't matter what club you go to, there are always different opinions'. Another recalled that before certification was introduced, certain roles implied recognition of expertise:

Being employed to do search and rescue in Mt Cook National Park implied some sort of status. It certainly meant some sort of recognition of a capacity to look after yourself and others in the mountains. In that sense, it was sort of certification of professional standing in the mountaineering world.

This comment highlights two aspects of expertise: that it is specific to disciplines and contexts, and that it is most reliably identified by other experts, in this case, someone responsible for hiring members of a search and rescue team.

Formalisation also raised the issue of the adequacy of knowledges communicated in the formal teaching context. Formal rules and courses were seen to lack the nuance of an expert’s perceptions, which responded to subtleties of conditions and context. For Vincent, the causes of avalanches provided a clear example. Vincent explained: 'That's why people have accidents, because nature is so subtle. And it might happen over days as one subtle shift'. He continued: 'You may miss a little bit of surface warming and then it snows on it and it is gone. But you may have intuitively noticed it because you had been looking for it for a long time'. Missing such subtleties could mean life or death: 'That is why the first three years of being a mountaineer are the most dangerous. Generally, you're young, ballsy, you have lots of talent but you just don't pick up on those nuances and subtleties'. To return to the example of river crossing, there were techniques such as 'linking up' that were pushed hard in courses, that experts considered unreliable or often dangerous (see Example 21).

This is in keeping with Lam’s argument that different types of knowledge are supported by different organisational forms and learning methods. See Lam, "Tacit Knowledge, Organizational Learning and Societal Institutions."
Example 21: When the rules are not enough

NZMSC promoted river crossing procedures, which stated that while no method was completely safe mutual support methods were ‘the best ways to cross a river’. Particularly in deep water or more challenging conditions, it was advised that a party ‘link up’ using waist belts or pack straps. This method was suggested to give more strength and support, in case a member of the party slipped or fell.

Expert trampers and mountaineers in areas with dangerous river conditions such as the New Zealand Southern Alps were highly critical of linking up as a river crossing method. While it was acknowledged as effective for experienced parties, in the case of mixed groups inexperienced members could pull others over. Emil told of how, at a club instruction weekend, two of the learners in the group linked up and attempted to cross the Wilberforce River. One slipped and jerked the other off his feet, and while they made it out alive, they lost some gear. More experienced at the time, Emil crossed alone and, other than being rebuked by an instructor, had no trouble.

Another identified problem with linking up was that if the conditions proved more challenging than first anticipated, it could be very difficult to retreat in formation. Having the option to retreat was one of the ways that experts stayed safe, as they continually assessed the conditions to decide how to proceed. As Simon explained: ‘The guts of it is about the decisions you make about moving into the water and whereabouts you move into the water, and what decisions you have made about where you’re coming out, and how you’re testing whether the water is doing what you thought it was doing. You have got to think about these things, you have to have already decided where the most difficult part of the crossing will be, where the most current is, where it is deepest. If you get to those places and it is not doing what you expected and is outside of the parameters you estimated, then it is time to back out and think about it’.

From Simon’s perspective, organisations like NZMSC were ‘too narrowly focused in their codes’ and misunderstood what really made things safe. He stated: ‘People can argue all they like about people never coming to grief because they’re linked up, but it is just fantasy. When people drown their bodies become limp. Sure, they may all be found separated, and someone really smart will come along afterwards and say “well, if they had stayed holding on, they would be okay,” but actually it has got nothing to do with that. They have already gone into turmoil, and they may very well have held on until they drowned’.

Example 21 highlights a gap between conventional or approved procedures and the considerations and practices of experts. As stated in the discussion of articulation, safety in rivers is a matter of assessing and responding to subtle indicators. From the perspective of expert adventurers, 'agreed' procedures often miss the point, because in a context where the situation and an adventurer's understanding of it is shifting moment to moment, it does not make sense to talk of applying rules.

Roe and Schulman also found this gap between procedures and practice among Californian electricity grid transmission staff who, in the face of electricity restructuring, had to operate in non-routine ways in order to literally keep the lights on. With changes to the system that were unforeseen and uncontrollable, maintaining a constant electricity supply would not have been possible by simply following procedures. Instead, they succeeded because staff had a 'real time' responsiveness to the countless variables they were continuously managing. As one dispatcher put it: 'It's the massive amount of multitasking, you've got to be analysing what's moving, how fast it can move, you've got to have a good overall picture of what's going on, all this simultaneously.'

This is not entirely surprising in highly unpredictable and dynamic contexts, but the limits of procedures are also apparent in more stable environments. Hayes's work with operational managers in nuclear power stations and air traffic control also showed that in even highly regulated contexts things are not always predictable, and in these environments professionals can create a 'situation-specific safe operating envelope ... based on their experience' that again means operating outside routine procedures. These two examples show the importance of responsiveness to context, even if this means bending the rules or leaving them behind. In the critical context of river crossing, this was especially true, and sensory judgements were a key means to this responsiveness.

Experience in a wide range of contexts and conditions facilitated the kinds of decision-making that experts were able to use when performing tasks such as crossing rivers. This kind of knowledge, an important aspect of which was sensory knowledge, was premised on a notion of continually remaining open to nuances of experiences as well as mistakes; that is, continually learning. This was important in the context of mountaineering, as Vincent observed:

You hear in the media all the time "they had an accident and died, but they were experts". Only four seasons ago I fell off Mount Lendenfeld and nearly died because I

put my foot in this little crack. I consider myself to be at the pinnacle of my career and I did something really stupid. You are never really expert, and I think that if you consider yourself to have reached that god-like status then you’re going to die.

A perceived risk with certification was that it may lead to a false sense of competence, and hinder this continual learning. Vincent continued: ‘There are the people who follow the paper trail and then stop learning, stop gathering knowledge. So what is the point? By getting another piece of paper they are not going to learn anymore’. Vincent captures that expertise is more than formal learning, but requires ever more experience and a commitment to doing better next time. Nyiri framed expertise in these terms, when he wrote:

One becomes an expert not simply by absorbing explicit knowledge of the type found in textbooks, but through experience, that is, through repeated trials, “failing, succeeding, wasting time and effort ... getting a feel for a problem, learning when to go by the book, and when to break the rules”.275

This process of building and refining knowledge particularly holds in the case of the senses. As the river crossing and mountaineering examples highlighted, aural and visual cues are integral components of subtle, nuanced and context-specific expert judgements. These judgements are always evolving with experience.

Doctors

While adventurers treated formalised knowledge with caution, doctors were more accepting, though they viewed it as one part of expert knowledge. What began as a structured patient examination became the ‘foot of the bed’ or the ‘hi doc’ test. This expert ability to perceive health and illness relied on the senses. As Joshua explained: ‘If you eyeball a patient from the end of the bed, you take in a whole lot of stuff subconsciously about their breathing, their colour, all of these things’. However, while professional judgements took place through both explicit learning and a developed ‘sixth sense’ for health and illness, there was friction between these ways of knowing. In the contemporary medico-legal context there was pressure to practice medicine in an explicit and defendable way. Expertise in auscultation and general clinical listening was particularly treated with caution because it was considered ‘more art than science’, and did not necessarily satisfy the burden of proof. For the doctors interviewed, what emerged in response to this context was a dual approach to medical

practice that took account of intuitive and responsive judgements, as well as the pressures to confirm these impressions through formal, provable tests.

Responsiveness

One of the first questions I asked doctors was how they examined their patients. Each speciality had its own areas of interest, yet their practices at the highest level were similar. Doctors’ medical training included explicit methods for the patient examination, though these were treated more as aids or tools than rules in practice. Doctors learnt which questions worked for them, and provided an ‘algorithm’ to guide an examination when needed. As with the adventurers, however, expertise tended to come alongside a realisation that such formal guidelines could only take analysis so far. The patient examination therefore also included elements that were more tacit, including a response to subtle sensory indicators.

A foundational aspect of responsive engagement was observing the whole situation. As Ingold argued, the ‘skilled practitioner consults the world, rather than ... rules, propositions, [or] beliefs ... for guidance on what to do next.’

This observation was illustrated by Cameron, who described the following encounter with a patient:

The patient comes in to me with a particular problem, and as soon as he starts talking to me, I can hear the resonant voice of someone with emphysema. Immediately, while I am listening to his story, I am looking at his skin, does he have the skin of a smoker, do I see the tar staining on his fingers, do I see a packet of cigarettes in his pocket. So within seconds I am not just listening to the resonant voice, but I am putting together a whole lot of other pieces of information that, before he has even told me, tells me that this guy is a smoker, and not only is he a smoker, but he also has emphysema.

In this vignette, Cameron described applying multiple modes of perception as part of an overall diagnostic strategy that happened ‘automatically’ in response to his encounter with the patient. While he was able to give a clear example of his use of his hearing, he stated: ‘Hearing is a sense where you are highly engaged, but there are also many situations where you are using hearing without thinking about it’. This idea of tacitly and continuously perceiving and processing information was also expressed by Matthew:

Just looking at a patient, touching their arm, or listening to their voice gives you details about their health. You don’t have to tick off any boxes because it all happens so

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quickly and in an integrated sort of way, just due to the experience. You are gathering information while you do other things.

In both of these examples, their expert senses are responsive to an extent that they seem to be engaged automatically.

An essential part of this expert strategy of consulting the world, or in this case, the patient, was the capacity to make fine discriminations about inputs that were being perceived. As with the musicians, forming expert aural judgements in the medical context depended not only on hearing, but also on aural discrimination and interpretation.277 One of the consulting physicians illustrated this capacity through an example of a hospital registrar who had not yet acquired this expertise. In this example, a smoker came into the emergency room with severe shortness of breath. After examining her, the registrar jumped to the conclusion that she had severe lung disease and required home oxygen, and on their first meeting told her she should stop working because she was going to die soon. When the consulting physician saw the patient the next day, he asked a few questions and quickly came to different conclusions: yes, she was a heavy smoker, and sure, she had lung disease, but up until three days ago she could do her work and tend her garden. Her current state of health was due to the added stress of a cold, and after three days she returned to her previous state of health. The physician reflected: ‘This registrar is almost fully qualified, and doesn’t know how to make fine distinctions, what value to give evidence, and doesn’t look for other possibilities, and that is our job’. In this example, the physician demonstrated both the critical role of fine discriminations for expert medical practice, as well as the time frame for their development. As a physician with an additional twenty years of experience, he was more aware of all the possibilities, and could reach more accurate conclusions. This process of consulting the patient, assessing the indicators, and making fine discriminations through the senses is captured in Example 22.

Example 22: Assessing the heart

A patient comes into Samuel’s consulting rooms. Already, unconsciously, he is assessing the patient. ‘I have pain in my heart’, the patient says’. Samuel reflects that patients may not know where their heart is but everything they say is important, so it is critical that he asks the right questions to reach the right conclusions: ‘It is an art form if you see a skilled person do it. A skilled person can get to the base of the problem with three or four questions’. After years of learning, he likens himself to a detective: ‘You’re not initially sure what in the scene has relevance, and it is only through careful inspection – palpation, auscultation – and a process

277 Finnegan, Communicating, 65.
occurs in your brain that is all automatic after the training program, that you create and give
value to each of these elements’. He has asked the right questions, and very quickly, the story
has flicked ‘switches’ and Samuel is reaching a conclusion. After all of his reading, training,
mentoring, and mistakes, the subtleties between descriptions and conditions crystallise
towards a diagnosis.

Samuel now approaches the patient for the clinical examination, and listens to their heart
‘cleverly’. Listening cleverly is about concentrating, and dividing the sounds of the heart into
segments: ‘You don’t just put a stethoscope on and hope that there is an answer. There are
different heart sounds, and there is also a large range of normal’. Because Samuel knows that
every body has a different physical structure and bodies exist in different circumstances, he
also understands that listening to a heart is more than listening for the opening and closing of
the four valves. It also involves listening for the loudness of the sounds, and their timing: ‘You
are listening both to the gap between the 1st and 2nd heart sound, and the 2nd and the 1st.
You are listening to the loudness of the first sound, especially for mitral heart disease. You’re
listening for the interval itself, what is called the split second heart sound, what the interval of
closure is for the mitral and tricuspid valve, and the closure of the aortic and the pulmonary
valve, and that can give you a hint about severity or the duration of the disease’.

In Example 22, Samuel illustrates that there are both direct and indirect indicators that
contribute to decision-making. He described processing all the information as well as forming
more explicit judgements through directed listening to heart sounds. Other doctors also made
this distinction between more direct and indirect hearing in the context of picking up the
unexpected. It was understood that some judgements fell below a conscious level, but they
could quickly return if something was picked up that was not anticipated, as well as when a
task became more difficult. Bruce, a surgeon, stated: ‘If you don’t hear what you expect to
hear, I think that is when your conscious mind kicks in and you start to work through a little
flow plan in your head of what could be going on’. Patrick similarly observed: ‘I think that you
bring things up when there is a crisis happening. It becomes much more upfront’. This shift
from more unconscious to conscious, or more indirect to direct – particularly in cases where
something abnormal was perceived – was compared with a switch being flicked, which then
engaged attention. This example highlights the many sensory aspects of medical expertise that
are often described as tacit: they are part of the large volume of information that may not
require direct, conscious attention. Nonetheless, this information, including what is heard, is a
critical aspect of decision-making, as its active engagement in challenging contexts implies.
Example 23 illustrates this idea that aural inputs can be more tacitly monitored, but a more explicit mode resumed when sounds changed.

Example 23: Hearing the change

In an operating theatre, an anaesthetists’ role is to monitor the patient’s condition, not only in terms of their anaesthetic, but also in terms of pain management, airways, circulation, and advanced life support. Patient monitoring is supported by numerous electronic machines, which display numerals and graphs, and emit a variety of beeps. As an experienced anaesthetist, Matthew’s perception of the monitoring machines was largely tacit and largely aural. Aural signals were particularly valuable, as ‘they don’t require you to be just facing the one way all the time’, allowing for multi-tasking (whether that be observing the patient visually, listening to multiple aural cues at once, or reading the paper).

Matthew described the role as ninety-five percent boredom and five percent panic. Most of the time, the operating theatre’s soundscape was filled with representations of a healthy pulse, oxygen concentration, and respiration. He stated: ‘These things beat away and they become a subliminal sound that everything is alright’. The oxygenation levels, for example, were represented by the pitch of the beep that rose and fell with the oxygen in the blood stream. After fifty years, Matthew could tell the oxygen saturation within about two percent, and most of the time, things beeped along as they should.

While Matthew’s awareness of the beeps was ‘subliminal’, if they changed or ceased, they were bought to his attention. Matthew reflected that anaesthetists relied on noticing these changes and were trained to observe them, because the consequences of not noticing could be devastating (indeed, a mentoring anaesthetist may sometimes switch off the monitors silently to check whether a registrar had noticed the change). One cause of a new sound was blood loss, which was signified by increased suction noises and large volumes of blood filling into the sucker bottle. In this case, Matthew observed that hearing the aural cue was critical, because it was possible that the surgeon was in so much trouble that they had not communicated the issue. Hearing ‘brisk bleeding’ indicated that Matthew must pay attention to a replacement blood supply. After years in the theatres, Matthew could say that while he would not rely on his ears one hundred percent, they were ‘pretty good’.

In these examples, doctors are drawing distinctions between direct or active, and ‘subliminal’ aural judgements. Such distinctions are sometimes framed in the literature in terms of tacit
and explicit knowledge. Tacit knowledge has recently come to be the object of much attention in the field of knowledge management, as organisations are increasingly interested in harnessing the knowledge of their workforce.\textsuperscript{278} For the doctors, the distinction between tacit and explicit knowledge was more relevant due to a need to maintain a decision-making paper trail in the medicolegal context. Yet in both cases, these pursuits may be misguided. While language like 'subliminal' is used to describe some of the understanding that informs judgements, it does not make sense to assume that unexpressed means not fully conscious. As Cameron, Samuel, and Matthew all demonstrated, experts concentrate, taking in the totality. If they seem (even to themselves) to do their work 'without thinking' it is perhaps more because they focus on everything at once. Some activities may seem to be 'automatic', but any blip or departure from the normal pattern is picked up straight away.\textsuperscript{279}

\textbf{Figure 15: Anaesthetist hearing in the operating theatre}

The senses are one means by which doctors assess and monitor patients and situations. As aural knowledges that can be tacit, they may be liable to be confused with practices that can be inaccurate. This is particularly the case for the less-recognised uses of hearing such as


\textsuperscript{279} See Klein, \textit{Sources of Power}.
listening to brisk bleeding (as opposed to the ‘active’ practice of auscultation). For experts, these sensory judgements, whether directed or slightly below conscious attention, are critical to precision.

**Precision in a medicolegal context**

A pressing issue in the contemporary medicolegal context was that life and death decisions should be based on something more solid than a professional’s feeling. Respondents across all communities often thought of the aural as liable to be understood as vague, because it tended to be unspoken, was perceived as ‘subliminal’, and was mostly invisible and ephemeral. Because of these traits, aural judgements often seemed to lack reasonableness and transparency. For a doctor, there was a paradox here: the trusted expert was special because they could perceive phenomena that others could not, but equally, there was the potential for mistrust.

The risk when talking about knowledge such as hearing as subliminal or unconscious is that it can imply a lack of precision. In the medical community, sensory knowledges such as auscultation were often greeted with denigration on the grounds of being imprecise and unreliable. While all professionals used such clinical skills as screening tools, there was a concern about whether this was good medicine. Patrick illustrated this tension between good medicine and ‘unconscious’ clinical skills:

> I would love to say yes, they are conscious, and I think there was a time when they were, but I have done it for so long that now it has slipped slightly under the conscious level. I still do it, but I do not have to put it in a certain spot in my mind. It is just there and unconsciously comes through.

At an expert level, processing so many pieces of information at once requires that some are able to sit in the background, and yet there is a sense of guilt or failure in the way he expressed the process. As noted in Chapter 4, a good doctor listens attentively. The contemporary medicolegal culture demanded that judgements were provable, preferably through test results. A professional’s split second assessment or unconscious ear was considered unreliable.

In *What Sport Tells Us About Life*, Ed Smith problematised this contradiction between professionalism and expert modes of decision-making. He gave the example of Charlie Wilson, one of America’s best neurosurgeons, who described his professional judgments in terms of ‘feel’ and intuition:
Sometimes during the course of an operation, there’ll be several possible ways of doing something, and I’ll size them up and, without having any conscious reason, I’ll just do one of them ... It’s sort of an invisible hand. It begins to feel almost mystical. Sometimes a resident asks “Why did you do that?” and I say, “Well, it just seemed like the right thing”.  

Smith claimed that understanding how Wilson could conduct brain surgery at such an elite level required ‘us to hold together two ideas that professionalism often presents as contradictory: expertise and instinctive decision-making.’ From Smith’s perspective, these ideas need not negate one another, but rather are interdependent. If such methods work for experts such as Charlie Wilson, then perhaps lesser mortals should accept them. However, as Example 24 demonstrates, this gap between the goals of professional risk management and intuitive decision-making is not readily closed. In practice, professional and legal pressures demand of doctors more than ‘instinct’.

**Example 24: Finding cancer in a medico-legal context**

Robert, a surgeon who specialised in breast cancer, could detect cancers using his clinical skills where they could be undetectable for less specialised doctors. Each year, Robert cared for around eighty women with breast cancer. Of these women, he was able to feel the cancer in half the women. He observed that most GPs would feel around one or two, and the general population would be unlikely to identify any. He stated: ‘I feel fairly confident that I can feel things that other people can’t. The patient says they can’t feel things, the GP can’t feel things, but I can feel things’.

During many routine examinations, Robert detected a second cancer that had not been diagnosed. He explained that a woman may have only had a mammogram or ultrasound on one breast, due to the limited services in rural Australia. He observed: ‘It is an awareness issue. Having an obvious lump in one breast can lead people to say “you have a cancer there” and then not check the other breast. It’s not that I’m super clever, it’s just experience and knowing that unfortunately you can have more than just one thing going on’.

In addition to awareness and a keen sense of touch, Robert described being directed towards a diagnosis through feelings of ‘discomfort’. He recalled occasions when he had examined a patient, had tests run, and felt that things were not quite right. He stated: ‘I suppose

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281 Ibid., 19.
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subconsciously you can be aware of things that consciously you’re not aware of’. He continued: ‘Someone says something and you think “what did you say? I don’t like the sound of that.” Often there aren’t a lot of symptoms but sometimes people will say certain words and they will make me think certain things’. For Robert, this attention was triggered when indicators sat outside ‘normal’.

While aspects of Robert’s medical practice relied on clinical skills, explicit knowledge, and his sense of phenomenon, test results were critical. Robert would not take a patient who had not had a complete set of tests, and required that all of the results and evidence were sent to him. He shared: ‘I have instituted a whole lot of things because of things that have gone wrong. One of the reasons I vet the referrals is because there have been cases where there have been issues with tests and misinterpreting results. It is a lot more work, but you can’t trust people. You have got to be pedantic’. The insistence on correct and detailed test results was particularly important for Robert because ‘it is a litigious area’.

Example 24 shows a process of intuitive decision-making similar to that described by Charlie Wilson. Robert, however, had instituted some changes in his practice as a result of professional pressures. This did not mean he no longer assessed a patient clinically, but he did insist on more tests in order to protect himself from litigation. While Robert did not suggest that these additional measures produced a less accurate diagnosis, other doctors were more critical of this trend towards tests on the grounds that the additional information was unnecessary and time-consuming. For doctors such as Joshua, clinical examinations lacked credibility in the contemporary environment, but were quick, cheap, and informative:

Unfortunately, in this medico-legal age, your clinical judgements might not be enough to satisfy a court, and therefore people tend to practice defensive medicine, where they feel that every patient needs a blood count, biochemistry, ECG, chest x-ray, blood gases, you name it! They feel that if something was to go wrong they would be asked why they didn’t do those tests, but the vast majority of them are totally useless.

In the current medical climate, doctors are not building the clinical skills that experts use because cultural expectations have led towards more test-based clinical judgements (see Chapter 4). Based on their comments, many of the doctors would likely agree with Klein’s argument that there is ‘too much emphasis on reducing errors and not enough on building
expertise'. Auscultation was identified as one knowledge that had fallen from favour, with negative implications for expertise in this aural skill.

This emphasis on reducing errors through tests is indicative of a misconception of expertise. Medical due diligence has come to be equated with tests, and particularly in the context of the increasing popularisation of medical knowledge and time-pressured consultations, patients are perhaps more disenchanted and demanding of proof. As American physician Jerome Groopman observed: 'Most lay people imagine a pathologic diagnosis to be objective and definitive. But often ... very competent pathologists can view the same specimen and arrive at different conclusions.' This variation in outcomes is due to the vital role of intuition and perception (including sensory judgements) in medical decision-making. Doing extra tests might not do harm to a patient necessarily, but it would be misleading to assume that with a complete suite of tests, medical judgements leave intuition behind. As Groopman reflected after a challenging case: 'even with all the clinical information ... the inherent variability of human biology meant judgement could not be reduced to mathematical calculation. Intuition, and luck, would still count.'

The perceptions and intuitions of expert doctors – including their response to subtle and nuanced sensory indicators – may appear vague, but the ultimate precision of many expert judgements gives cause to revisit this assumption. The shift away from expert judgements is both inefficient and inhibits professional conscientiousness. As Mintzberg argued:

'Technocratic controls do not improve professional-type work, nor can they distinguish between responsible and irresponsible behaviour – they constrain both equally.' Moves towards tests have especially negative consequences for aural and other sensory knowledges, because in response to their limited credibility, skills in this under-appreciated area are not given emphasis in formal learning.

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285 Ibid., 215.
286 Ibid., 228.
Conclusion

For all experts, perceiving patterns and details and being able to respond to these in a seamless or ‘fluent’ way were central markers of expertise. Expertise also demanded an appreciation of context. This level of understanding meant going beyond both knowledge that had been learnt in a formal context, as well as that gained more informally or through doing with others. Expertise also meant more than professional competence: playing the piano well was not akin to being an expert pianist, just as being declared ‘safe’ to practice medicine was not the same as an ability to make the judgements of a consulting physician.

A more general finding was that experts consult the world. In other words, they take a holistic approach to phenomenon. What this means for sensory knowledge is that a capacity to make expert judgements does not mean being able to hear the best per se. While lay people might hear sounds, experts hear meaning, or at least do so more often than those with less expertise. This finding speaks to the point that when experts were talking about sensory expertise in their professional practice, they were also speaking about expertise in a broader sense. Aural understanding was not a specialised area of expertise in the same way as it was considered a specialised area of learning. Rather, it was a central part of the interpretations and judgements of a situation.

While there were common traits for expertise, its practice was subject to professional standards, community expectations, and the implications of different contexts. For the musicians, this meant perceiving musical sentences and paragraphs fluently, having the musical expertise that other experts would appreciate, but also wearing an interesting shirt. Similarly for the doctors, a capacity to take in a multitude of information about a patient’s health with a simple touch was recognised as something that experts could do. At the same time, professional standards and increasing litigation also meant that experts ran tests, even if only to confirm what was already understood. In other words, doctors and musicians showed that expertise was constrained by community expectations. This constraint was of most concern given the dangers that aural and other sensory knowledges may be lost.

For doctors and particularly classical musicians, the risk of mistakes led to deliberate and repetitive actions, like the running of extra tests, or daily practice of a piece of music. In such cases, these active modes of operating were required and possible, both because in routine contexts there was time to go through such processes, and because the appearance of errors could be professionally disastrous. Morse operators also learnt in this way for the same reason. For adventurers, however, their operation in critical contexts meant that this luxury was not an option. This epistemic community generally gave a commensurate amount of
respect to the kinds of split second judgements that experts could make to, say, climb difficult terrain safely.

These variations across epistemic communities show that while there are some common traits for expertise, they do not capture expert practice generically. Context affects how pertinent some objectives are. This reinforces the argument that knowing is located.\textsuperscript{288} As I have demonstrated, one of the key elements that affects expert practice is the dynamics of epistemic communities: the relationships between experts, lay people, and community gatekeepers. Another factor for expertise has been the multisensory nature of practice. In other words, understanding of sound is never the only piece of the knowledge puzzle. In the following chapters, these two issues come into focus.

\textsuperscript{288} Turnbull, \textit{Masons, Tricksters and Cartographers.}
Chapter 7

Community knowledge, individual knowing

Throughout this research I have described learners and experts in the context of their epistemic community membership. This has included their conceptual, environmental, and organisational contexts, learning processes, and expert practices. While it has been convenient to speak of communities and their members as dedicated and contained units, communities are often fragmented and overlapping, and members engage with them in different ways, and at different levels. In other words, individuals rarely participate in a single, well-defined community, or slavishly follow their ideas and practices. In this chapter I explore the extent to which aural knowledge is socially located. This chapter addresses the research question: How is hearing practiced in social groups? (See Figure 2, Chapter 3). I examine the ways it can be cherry-picked, changed as it meets new ideas and needs, and modified through practice.

To explore the relationship between communities and knowing individuals, I look at flows of information and patterns of community engagement. This discussion includes evidence from all of the communities studied, but draws most from the musicians because they were most heterogeneous and conscious of their heterogeneity. I begin by examining the role of gatekeepers in communities, including who the gatekeepers are, how they perform their roles, and their influence on hearing. I then consider the limits of community influence, and the effects of epistemic pluralism. Through this discussion, this chapter explores how knowledge is negotiated and engaged with both inside and across epistemic communities, and its implications for hearing.
Gatekeepers

Most epistemic communities had members with a disproportionate influence on whether something fell ‘inside’ or ‘outside’ the accepted range of skills and knowledge. These ‘gatekeepers’ could owe their influence as much to the duration of their community involvement as to any expertise they may or may not have had. Gatekeepers were often most readily identified as part of peak community organisations such as artistic directors of elite ensembles and music examination bodies, office bearers in mountaineering clubs and federations and professional medical bodies, and the upper management of chief telegraph offices and the PMG. People in these positions could have a significant influence over the skills and methods used in a given activity, as well as the guiding values. However, there were also people who carried significant weight more informally through their connections and friendships, their skills in leadership, their charisma, and general consensus by a group that their views held authority. This section discusses epistemic influence and authority as it manifested in the case studies, with a focus on the implications for hearing. It begins by looking at organisational gatekeepers before turning to the role of local leadership.

Organisational influence

Participants in this research were often conscious of the influence of peak community organisations and their key decision makers. This influence was felt through the organisational values, agenda setting, dissemination of information, and standards. 289 While this influence was also more broadly conceived, peak bodies and their gatekeepers were identified as influencing hearing through the aural experiences that were made available, and the condoned community practices. Data on this organisational influence came from the perspectives of gatekeepers, as well as community members. Given this dual perspective, there was an awareness of the potential for community conflict. This discussion of organisational influence raised issues including the importance of epistemic trust, congruence between organisational messages and ‘the way we do things around here’ 290 and the value of autonomy.

289 For a review of the influences of organisations on knowledge, see Lam, "Tacit Knowledge, Organizational Learning and Societal Institutions."
290 Andrew Hopkins, Failure to Learn: The BP Texas City Refinery Disaster (Sydney: CCH Australia, 2010), 141.
Education materials such as textbooks, pamphlets and syllabi were channels for organisational influence on knowledge, including its aural aspects.\textsuperscript{291} One example of this influence at a learning stage was given by Alex, a music teacher. Alex observed that organisations such as the Australian Music Examinations Board (AMEB) had a substantial influence over a musician’s education through their syllabi and associated materials. Alex described how the AMEB set the music for study, and that while a student could learn works outside this examinable program, many teachers followed their syllabus to the letter. He clarified that these teachers were not ‘lazy’. Rather, the system provided them with ‘security and familiarity’. The implications of this deference to organisations such as the AMEB were illustrated in Alex’s reflections on how his musical learning was limited:

I remember I learnt the Mozart Sonata in C by myself in the holidays, and I just loved it, but my teacher would not accept the way that I wanted to play it. I had listened to a recording of a Russian pianist who had a very bright, brilliant approach to it, and it wasn’t AMEB orthodox. One day she slammed her hand down on the piano, pointed at the door, and said “Alex, you go out that door and don’t come back in here until you’re Alex, not Mozart”. This was my arrogance that I would not conform to this orthodoxy that had no meaning for me and made no sense to me.

In his description, Alex demonstrates how peak bodies such as the AMEB influence the musical experiences that are made available and condoned at a more micro social scale. As a student taught by a teacher who used the AMEB examination system, he was pushed towards making music (and therefore hearing music) in the condoned style. In this way, the AMEB were able to influence the musical sound that came to be experienced as ‘normal’, despite having little direct contact with the student.

The adventurers were also aware of the influence of educational materials on practices that included the senses. As discussed in the previous chapter, the NZMSC distilled and promoted ‘rules’ for river crossing in pamphlets and training packages. NZMSC promoted a ‘linking up’ procedure, particularly in deep water or more challenging conditions. From an expert perspective, this was judged to be potentially more dangerous as inexperienced members could pull others over (see Chapter 6). It also made a retreat difficult if the conditions were more challenging than first anticipated. While these rules were a site of conflict, many clubs

\textsuperscript{291} In the field of accounting, Ferguson et al argue that publications such as textbooks prioritise certain goals, and accordingly have significant ideological influence, particularly in cases where a variety of sources are not accessed by an individual, as authors ‘passively [reflect] the status quo’ in line with pressures from publishers as well as consumers. See John Ferguson et al., "The Views of 'Knowledge Gatekeepers' About the Use and Content of Accounting Textbooks," \textit{Accounting Education} 19, no. 5 (2010): 503.
promoted these practices. As Example 21 captured, ‘linking up’ practices at club instruction weekends could be prescribed to the extent that even when faced with their limitations, adventurers who crossed by other means were publicly rebuked. The promotion of river crossing methods like ‘linking up’ had indirect consequences for sensory practice, given that these methods rendered a retreat well-nigh impossible. Implicitly these procedures placed sensory judgements as being important before a river crossing, whereas experts had described their sensing as continuous and responsive.

These educational examples from the music and adventure communities illustrate organisational influence on practices and values, with consequences for sensory knowledges such as hearing. Organisational influence was also felt through the example provided by elite professional bodies, and the opportunities they presented. In the classical music community, conductors and artistic directors often held gatekeeping roles, to ensure a single ‘artistic vision’ was achieved. As Example 25 illustrates, this artistic vision could be tempered through the feedback of audiences. However, careful programming was also used to define musical sound, and manipulate aural experience.

**Example 25: Changing hearing through concert programming**

Edward, Artistic Director of a renowned performing arts organisation, had responsibility for selecting performers, and guiding their programs. These decisions were primarily based on his judgments about the quality of the performers and music, but included an awareness of the musical preferences of audiences. As Edward’s colleague Frank explained: ‘Sometimes they may want to play a particular piece, and we might say that we don’t think that it is something that our audience will engage with’. When queried on how this decision was arrived at, Edward stated: ‘Yes/no basically’.

In order to balance audience perspectives with his own, he developed a database that ‘scored’ works according to what he thought, together ‘with a kind of modification to take account of what an audience would think’. He explained: ‘It isn’t entirely just my own taste, but nor is it simply bowing to popular pressure. It is somewhere in between’. For example, when classifying a composer he typically disliked, he might hear it and think that for this composer it was ‘really rather good’. Accordingly, when assigning it a score, he gave it ‘a few extra points’ as he was conscious that much of the audience really enjoyed this composer. Ultimately, however it was ‘the Artistic Director’s choice’. Edward reflected: ‘It is nice to think that people trust our decisions. From my perspective, all I do is exercise my own judgement, because
anything else is an inferior and flawed process. But if I am true to what I think, then at least there is a single vision guiding the content’.

As Artistic Director, he had worked to include more music by Australian composers. Previously, Australian music had a ‘token’ inclusion, as if it was medicine: ‘Every concert you have to sit through this 5-minute thing and then you can get on with the music’. While initially, audiences reacted negatively to the increased importance given to Australian music, most continued to attend recitals, and came to do so largely without complaint. From Edward’s perspective, the audience was ‘smart’, and they may have complained, but they ‘opened up their listening’. Equally, however, the adventurous direction was tempered. Where early on programming was ‘fairly controversial’, they no longer ‘raise many hackles’.

This opening up of listening was identified as associated with calculated measures to shape musical preferences and modes of engagement through concert programming. As Edward stated: ‘Listening to Mozart after a contemporary work makes you listen to Mozart differently, it makes the performers play it differently, and it gives you a different aspect as an audience’. Such programming ‘stimulates your auditory analysis’. He continued: ‘If you just hear Mozart on the radio, you immediately think “that is Mozart, I don’t need to listen to that, I know how that goes”. But if you have heard something challenging first, you’re actually tuned in very actively and are able to keep listening’.

What the organisation termed ‘contextualising’ was central to the manipulation of the musical listening experience. This contextualising assumed that in order for the audience to be engaged, they needed certain ‘tools’, which were delivered through talks with experts, Q&A sessions with the musicians, and informative programs. Workshops were also run for some community members to ‘enhance their understanding of music’ by ‘engaging with music through creating it’. From the perspective of the organisation, these approaches were ‘about demystifying the process and making it own-able’. This process rendered musical listening ‘interactive’ not ‘passive’.

The support of positive listening to Australian music also required the enlistment of social norms. At selected concerts, a contemporary composer introduced their composition. As Edward explained, it was ‘the social animal’. He stated: ‘It is a good idea to work in, if you can, “I am sorry that Schubert couldn’t be here tonight to talk about his piece, but I will talk about mine”’. Just as people are generally more likely to hang up on a telemarketer than walk away from a forceful shop assistant, what was hoped for here was that the presence of the composer made the audience more receptive and, at a minimum, more polite. He continued:
'People listen to their music in a different way when they are there. It almost relaxes them into hearing it'.

Example 25 captures some methods that organisations can use to influence aural knowledge and experience. It shows how through the musical decisions of a gatekeeper, music preferences can evolve. It also captures, however, the importance of epistemic trust. In Example 25, the Artistic Director instituted changes to the definition of what was considered musical. While many lay members within the community had concerns over these changes, the majority continued to attend concerts. This outcome is in keeping with Daukas's argument that epistemic communities typically require that members 'extend to one another the presumption that they meet some threshold level of epistemic credibility'. This assumption means that lay members extend 'charity' towards those in authority, just as those making decisions prove themselves, because without both the extension of charity and the proven trait of trustworthiness the community would fail.

In addition to this issue of epistemic trust, Example 25 highlights the need for congruence between the message from a gatekeeper and lay understanding in a community. While the Artistic Director hoped that the acceptance of the musical changes were a reflection of his audiences' trust, his programming had been tempered as he took into account their preferences. This balancing of audience judgments with the vision of a gatekeeper is in keeping with Subotnik's argument that gatekeepers are not necessarily in possession of an absolute power, but can be 'powerful cultural influences'. Initially, the changes that were made represented a significant break from what the organisation's audience identified as musical, and resulted in complaints. With time, both the audience and the organisation redefined the scope of 'music' and came to a generally agreeable outcome. Through conversation and quarrel, the boundaries between 'inside' and 'outside' were renegotiated.

Those most critical of organisational gatekeepers tended to be the 'rogue' experts in the music, Morse, and adventure communities. For example, expert musicians outside peak organisations viewed classical music gatekeepers as especially restrictive, inhibitive, and culturally conservative. The AMEB were often a target of such criticisms, where it was claimed

293 Ibid., 110.
295 This idea of conflict affecting the relations and actions of both parties is raised by Simmel. See Georg Simmel, "Conflict," in Conflict/the Web of Group Affiliations (New York: The Free Press, 1950), 87.
that they sought to define not only what music was to be learnt, but how it was to be played. As one musician stated:

The things that end up on exam reports are “incorrect tempo”, not “I prefer this one faster”. What does that say to you about the range of perspectives and intellect of these people in positions of responsibility who are determining how children feel about their own musical contribution?

In keeping with this observation, Small criticised the restricted notions of musicality presented by educators and music institutions, arguing that they were ‘very destructive’ for the development of students’ musicality. \(^{296}\) This combative culture between influential organisations and rogue experts was also visible in the Morse context, with PMG operators terming their relationship to management ‘us and them’. As Walter stated: ‘We are very clannish. Once you got into the telegraph office, it was like a great big club’. However, this bond did not extend to management, as Walter discovered when he reached a senior supervisory role, only to become ‘Mr Unpopular’. This finding that those critical of community organisations were community members is in keeping with Hage’s argument that an ‘outsider is a specific mode of being an insider’. \(^{297}\)

Particularly for adventurers, going beyond community knowledge, and potentially becoming an ‘outsider’, was thought to be part of attaining a level of expertise (see Chapter 6). Many adventurers were critical of organisations and governing bodies, on the grounds of dissatisfaction with their readiness to dictate the ‘proper’ procedures. There was a sentiment that authorities promoted ‘rules’ that were not safe in all circumstances, and were contrary to expert practices. Reminiscent of the issue faced with classical music concert attendance, there was a significant gap here between the rules and community practices. Among expert adventurers, the result was hostility, as the gap was not closed. Office bearers in clubs were also seen to get involved with matters beyond their reach. As one expert adventurer reflected: ‘Clubs teach not only skills but also how large the group should be, how to interact, how to hold a conversation, what kinds of humour are appropriate et cetera, to the point where I sometimes find it a bit creepy and annoying’. While clubs were important learning pathways for adventurers, they were of limited value to experts, and were rarely considered as ideal organisations.

\(^{296}\) See Small, *Musicking*, 212.

Doctors were noticeably less combative in their relationships with their gatekeeping organisations, which can be explained in terms of the space for expert autonomy and greater alignment between procedures and professional practices. If framed in terms of organisational configurations, the medical community is an archetypal example of a professional bureaucracy. Within this model, professionals undergo extensive training and are then given ‘considerable control over their own work’, due to the complexity and specialisation of their roles. An illustration of expert doctors’ relationship to organisational influence was given by Joshua, who described formalised work processes not unlike those of the rules of river crossing. Joshua described how staff were issued cards to guide them in the appropriate course of action in an emergency. He stated: ‘We’re supposed to memorise them, and there are all sorts of acronyms’. For Joshua, these formalised processes were difficult to remember, unnecessary, and perhaps not an ‘ideal order’ in all cases, yet he avoided criticising them: ‘It is important that it is there, because you might miss something, and you can’t afford to miss something’. In this case, there was more respect of the procedures, regardless of whether they were followed. They were seen as suggestions or aids to serve the interests of the professionals and their patients. If they were not required, they were simply not used. There was also a sense that they were not substantially different from professional practices, as their potential application in an emergency implies.

Often without direct contact, peak organisations can exert influence on the aural knowledge of community members. This influence is felt through standards, encouraged practices, and available experiences. Critically, however, this influence is not left unchecked. Knowledge from gatekeepers (and experts) is only accepted when it coheres with the prior beliefs of the wider community. This finding emphasises the requirement for a level of congruence between knowledges. The hostility of some adventurers, Morse operators and musicians towards their governing bodies was due to their perceived rigidity, and a gap between formalised knowledge and expert practices. The doctors, however, did not express such hostility. This reduced hostility was attributed to their substantial medical learning, and the resulting congruence between procedures and expert practices. This congruence allowed for necessary flexibility and professional cohesion. In this way, the doctors highlighted both the limits of organisational influence, and demonstrated a positive relationship to gatekeepers as a result of supporting expert autonomy.

299 Vervoorn, Knowing.
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Local leaders

With the incongruence that could occur between organisations and lay community members, many research participants put a greater value on local leaders. This emphasis on the local is in keeping with Wenger's argument that ‘we work with and ... for a much smaller set of people and communities’. Local leaders or mentors were thought to wield an especially strong influence over sensory knowledges such as hearing, provided that learners had spent an extended period under their guidance. This observation was primarily articulated by musicians and adventurers, as they were most concerned about the limitations of formal learning models, and were most hostile to organisational influence.

Discussions on epistemic influence revealed that different knowledges were suited to different learning contexts. As one adventurer observed: 'Professional instructors obviously have an influence in terms of basic skill acquisition, but less so in the broader experiential and attitudinal sphere'. Another adventurer concurred, stating that the ‘nuts and bolts’ – for example, a basic framework, or what gear to use – were well-suited to formal instruction. However, approaches to the bush and the sensory aspects of experience were not easily conveyed through such channels. Sensory knowledge was developed through experience, and over a longer time frame than a course duration. Given sensory knowledge was developed through extensive experience not formal training, gatekeepers in the adventurer community had less influence in this area. Instead, local mentors were vital. As Example 26 demonstrates, in a close mentoring relationship, beginners and those working towards mastery learnt what to listen and look for, and the value to place on different indicators. By going on trips together, the knowledge that informed skilful practice was passed on.

Example 26: Valuing unknown experts

Simon’s time with experienced adventurers was identified as most critical to his knowledge, identity, and approach in the hills. Each weekend, trips raised new challenges, and Simon was looking at the maps with the expert, having sounds, smells, and sights pointed out, and could observe the decisions that were made and why. He regarded these mentors highly, but he reflected that ‘no one else in the country would know their names’.

One of the people that he would go out with was ‘very mellow, quite chatty, and unassuming’. Even if the weather turned bad, the trip went well, because this mentor had strong bushcraft and leadership skills. As Simon explained: ‘You would see him talking to someone, and what he

300 Wenger, Communities of Practice, 6.
would be saying would be something like “Having a bit of trouble with this, could you give me a bit of a hand?” By taking this approach, beginners were enthusiastic, and their knowledge and skills were reinforced and extended. Simon continued: ‘It was a bit of a challenge, and he would have chosen a person for a task and he knew that they would have those skills’. In Simon’s words, he was ‘leading a trip without people thinking that he was leading’.

Simon’s bushcraft skills (including his sensory knowledge) were extended through his experiences with this mentor. This was due to the mentor’s approach as well as the opportunities that this learning context presented. Simon explained: ‘Some people you just end up having a lot of respect for just from being in the mountains with them and watching things. They are not necessarily trying to show you anything, you’re just observing and seeing how they go about doing things. Just from observing their systems, and talking about it, you come to learn a lot’.

Adventurers who tended to be critical of organisational gatekeepers gave more respect to individuals who acted more informally as local leaders. Example 26 highlighted traits of local leaders that underpinned their greater respect. In this example, Simon’s mentor was described as inconspicuous, personable, and generous. This depiction is in keeping with the general sense that adventurers who mentored local people informally were less power-hungry and more community-minded, eager to share what they knew. The example also emphasised that the knowledge that was being shared was context-specific and based on the experiences of the group. The localness of this knowledge increased the likelihood of congruence between the learner’s experience and the knowledge being imparted. As was discussed previously, epistemic incongruence was a major source of hostility.

Example 26 also captured how sensory knowledge was developed through local leaders. As Simon demonstrated, central aspects of learning from the local leader were observing his methods, having sounds and sights pointed out, and discussing practices as they related to the context of the trip. In this way, sensory knowledges such as the sounds of a river in a given place and condition were made meaningful through experience. Mentoring of this type was beneficial for many aspects of an adventurer’s knowledge, but it was particularly critical for developing hearing and the other senses. Mentoring and experience were vital for sensory knowledges because they were not easily captured in formal courses, as they were subtle, nuanced, and context specific (see Chapter 6).
Morse operators also recalled that local mentors were vital for building their aural knowledge. Morse operators typically began their learning with a local mentor. At least in the PMG system, commencement of formal training required that training operators had already reached five words a minute informally. Operators recalled that during this early learning phase, mentors passed on useful learning techniques such as converting street signs to dots and dashes to 'get it in' (see Chapter 5). These techniques were useful for building aural memory. While this knowledge was perceived as a unique tip, almost everyone in the community had used this technique. In other words, sometimes local knowledge is reflective of more broadly accepted knowledge. However, there was some aural knowledge that was ill-suited to the formal learning format and was largely outside the influence of organisations. For example, learning to send Morse with an accurate cadence required informal mentoring. A more experienced
operator would pull a trainee aside and 'sing' them the correct rhythm of the signals. While vital to accuracy, this level of aural knowledge was peripheral to the formal training program, because it was nuanced and therefore difficult to communicate. As I argued in Chapter 5, this finding reinforces the argument that formal education systems and procedures can have a limited capacity to build and support tacit knowledges including hearing. 301

While research participants tended to emphasise the influence of either organisations or local leaders, most often there was a multiplicity of perspectives that shaped personal knowledge. Musicians, for example, described not only the aural influence of one teacher, but also their families, directors of ensembles, and organisations such as music examination boards. Doctors similarly described learning from key mentors as well as their formal training. This finding is in keeping with Glaser’s suggestion that knowledge is acquired and applied across a ‘career’ (and arguably a lifetime), and as such, to speak of knowledge without an awareness of this dynamic is to miss part of the picture. 302 At both macro and micro social scales, communities have a certain amount of agreed knowledge, but knowing is also a dynamic part of social life that is continuously negotiated between people and responds to contexts.

Plural communities

Musicians, Morse operators, adventurers and doctors all described numerous sub-communities that they engaged with. These sub-communities were often dynamic, constantly evolving in response to members, ideas, and contexts, and were comprised of members who did not necessarily share the same views. This variability generated a pluralism of knowledge. It was what made inevitable divisions within epistemic communities and blurring of their boundaries. This finding is in keeping with Latour’s argument that: ‘if you stop making and remaking groups, you stop having groups’. 303 Most of the time there was enough in common that people could identify a ‘musician’ or ‘doctor’, but this did not imply that all community members shared the same knowledge and practices. 304 Epistemic communities were usually open societies, as the evidence in this thesis so far has demonstrated. This variability raises how aural and sensory knowledges are negotiated in this open context.

301 Lam, "Tacit Knowledge, Organizational Learning and Societal Institutions."
302 Glaser, "Macrostructures, Careers and Knowledge Production."
304 Cultural studies of scientific knowledge have illustrated this idea with an analysis of how researchers behave in specific labs. See Knorr-Centina, Epistemic Cultures; Joseph Rouse, "What Are Cultural Studies of Scientific Knowledge?" Configurations 1, no. 2 (1993).
Conditions of homogeneity

While epistemic difference is the rule rather than the exception, there were isolated cases of relative homogeneity that are useful to explore, as they illustrate the conditions of sameness. Cohesive communities tended to be small groups of people who engaged in an ongoing and regular activity. This corresponds with Knorr-Centina’s argument that ‘Cultural specificities arise ... when domains of social life become separated from one another’. 305 They ‘thrive in internally referential systems’. 306 The cases of relative homogeneity were present within the Morse and music communities, and demonstrate the requirement of shared experience and the maintenance of a shared language.

One example of a cohesive community in my research was a jazz ensemble. The members of this jazz ensemble were interviewed together. They described a shared educational background (both formal and informal). They had also worked together exclusively for five years. As Example 27 describes, the members had a high level of aural and cultural congruence in music performance. This was attributed to shared learning and years of practice.

Example 27: Group perceiving

Max, Guy and Curtis met at university during their degree on jazz and popular music. While university music departments are often filled with musicians from diverse learning backgrounds, Max, Guy and Curtis’s pre-tertiary backgrounds were very similar. Though they played different instruments, they all majored in jazz and popular music where they learnt music in an ‘organic’ way. Since university, they had continued to play exclusively together, with the exclusivity of their musical experiences resulting in consistent ideas on sound and a common aural language. These shared aural understandings were critical for their practice as an ensemble. As Max explained: ‘I can often talk to other musicians and they will have no idea what I have just said, but when I talk with the people I have worked with a lot, they will know what I mean because of the time spent going through “Oh, what do you mean by that”. You really need to nut out your dialect, in a way, even though it is all musical language. Two musical people could still have a terrible conversation with each other’.

All of their music was committed to memory, and conceived of in terms of an aural ‘blueprint’. Songs were a collection of musical ideas or ‘discussion points’ that the band improvised with. Knowing when to move to the next discussion point was decided non-verbally. Communication

305 Knorr-Centina, Epistemic Cultures, 2.
306 Ibid., 2.
without words worked best because their music was 'built on climaxing'. As musicians with shared sensory knowledge they could 'instinctively feel' when it was the 'right time to move on to the next part'. Sometimes they knew where the music would go 'mathematically' (based on a 'natural' sequence of repetitions). The song could also be explicitly heard in terms of its blueprint. As Guy described: 'After A we don't have to go to B, we can go from anything from A to Z. So if we were playing a song and Max thought that Part 2 from this other song would go really nicely after this, and he could find a way of suggesting we go to that part of the other song (because we know it so well, he might play the melody line or something) then we could go, “Oh, Max wants to go to the bridge of this other song”'.

This capacity to communicate exclusively through sound was, in their experience, 'rare'. However, it was not without its challenges. Curtis stated: 'When you are trying to have a band like ours where much of it is improvised and unwritten, you really need to be coming from the same mind-set, and the same idea of how you want to create the music'. The importance of these shared meanings was illustrated through the addition of a new musician to the group. A couple of drummers had filled in briefly. While these drummers were very competent jazz musicians, their participation in the group was not successful, because they lacked the shared knowledge, language and meanings. In other words, the shared background in jazz was insufficient. Max commented: 'All jazz training really means is that you know what is in any chord, and you know the order of chords of a song from memory'.

In Example 27, the members of the jazz ensemble almost had what Klein described as 'the power to read minds'. Their capacity to make music without spoken language was attributed to a shared aural understanding of their music and its possibilities. They had a shared 'feel' of their music, shared musical ideas, and could work together musically with only aural cues. The congruence of their aural knowledge was attributed to their common backgrounds, as well as the time spent developing their agreed musical language. A shared formal background helped, but alone was not enough, as was indicated by Max's comment that jazz training only meant a musician knew the make-up of a chord, and could memorise their sequence.

The shared aural knowledge in this jazz ensemble was rare among musicians, and was also limited in their case. While their extensive shared practices formed a foundation for their music performance, there was not a similar knowledge congruence for their teaching.

307 Klein, Sources of Power, 215-32.
practices, an activity they did separately. In the group interview, I asked about their teaching experiences, and each described their approach. Max’s approach to teaching beginners used storytelling, visualisation and kinaesthetic techniques. Guy focused more on passing on ‘the basics’ — musical language and the notes — in addition to introducing them physically to the instrument. In the interview, there was a sense of surprise that they did things differently, as if this was not an issue typically discussed.

As a whole community, the Morse operators, particularly those employed by the PMG, showed the least variation in this research. Their community was formed at a time when there was less geographical mobility, fewer educational providers, and more employment stability, particularly for public servants. Accordingly, the learning, life experiences, and professional roles were more uniform than is normal today. Additionally, most of the Morse operators participated in the contemporary ‘Morsecodian’ community based around their love of Morse and its traditions. As such, a reasonably static set of practices and aural knowledges had developed. However, as was demonstrated in discussions of their learning methods and expertise, members of the Morse community also demonstrated some distinctions between professional roles and localities that could complicate communication. For example, Western Australian operators used the abbreviation ‘WUD’ for the word ‘would’, where operators from the eastern states used ‘WLD’ (see Chapter 5). Equally, while ideally Morse operators all sent using ‘perfect’ Morse, individual operators developed perceivable idiosyncrasies in their Morse signals (see Chapter 6).

In both the cases of Morse and the jazz ensemble, the groups had shared experiences, close working conditions, and similar learning methods and organisational contexts. This congruence of experience resulted in a greater amount of shared aural knowledge than is common. The shared musical language of the jazz ensemble made improvised music-making without words possible. The similarly shared language of Morse operators also made communication effective at high speeds, and often in an abbreviated format. These cases also both highlighted the fragility of community homogeneity. With variation in experience came variation in knowledge.

**Negotiating variability**

The level of shared understanding expressed in the Morse and jazz cases was uncommon among the other interviewed groups. More generally, knowledge was made complex by its diverse social contexts. As Glaser argued, knowledge is complicated by community specialties,
employers, educational opportunities, and work options and conditions. For example, for doctors pluralism was partly an issue of specialisation, as each discipline offered its own experiences, concerns, techniques, and governance, but was also affected by location, generation, employers, and experiences. In combination, these influences quickly became exponential.

A by-product of heterogeneity was that community knowledge and skills were not all ‘common’. In other words, there was not an absolute congruence of meaning. As Robert Ezra Park put it, cultural hybrids are ‘never completely interpenetrated and fused’. This variability of meaning was what Macpherson was referring to when she observed the potential for different ‘embodied-cognitive’ sensory experiences. Variability emerged around communication and shared meaning, not only across defined sub-communities, but also within them. To balance the vision of the jazz community given in Example 27, Example 28 illustrates the variation observed among jazz musicians, and the issues this can raise. In this example, community members had enough in common to work together, but there were usually challenges operating in communities with multiple languages, priorities and goals.

**Example 28: Knowing a dialect, participating in a tradition**

Trevor, a jazz guitarist and classical violinist, suggested it made more sense to speak of communities in terms of traditions than disciplines. In jazz, Trevor learnt his own ‘dialect’, being given ‘materials’ such as his instrument, jazz harmony and theory, and recordings and live performances of others. The musical sounds he experienced – ‘licks’ or phrases – became part of Trevor’s jazz dialect. He suggested that someone who did not understand his dialect, even if they had ‘good ears’, might not grasp the meaning: ‘They may be able to hear every single note, but it will still be like “so what?”’. Harking back to the idea of ‘fluency’, Trevor stated: ‘Someone who has spent years and years listening and playing and talking about jazz will understand these little musical words, sentences, phrases: they acquire specific meanings’.

The distinction that Trevor made was not only between non-musicians and musicians, or classically trained and jazz trained, but also within the ‘discipline’ of jazz. From Trevor’s perspective, jazz music and education globally was highly fragmented. This fragmentation occurred to the extent that, in his experience, some jazz musicians tried to avoid the word

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'jazz' altogether. He observed: 'Instead they say they are just improvising or something, but you can hear it'. Trevor disagreed with this perspective: 'I talk about a jazz tradition. It is problematic, but I find it equally difficult to avoid it'.

Across the tradition, there was an amount of shared language and vocabulary, and a hope that if a musician was in a particular context, at least some of the dialect was shared. Trevor described: 'I suppose showing up to a gig with jazz musicians there is often a musician there that you have never played with and a process happens by which you start playing a tune and you figure out what your shared language is. Hopefully there is enough! Presumably because you are both there at the gig there is enough of a base knowledge that you are able to do what you’re trying to do. If there is not, then it is less than ideal or a disaster'.

As Example 28 illustrates, epistemic fragmentation means that a critical skill for most people engaging with communities is an ability to negotiate meaning, adjust language, and manage not only variable priorities of groups, but also the realities of context, and concepts of musicality. Most professional musicians performed multiple roles, and in each new context there needed to be an agreement over aural meaning, musical approach, and even the definitions of musical notes in order to negate musical and professional failure.

Lachlan directed string session musicians, and illustrated how variation within the music community was negotiated in practice. He described the arrival of ten ‘strangers’ preparing to play on a record together:

There are so many variables about what in tune is. Everyone has their own concept. People need to develop concepts that agree, and that is what you do when you play with people. You agree that A is going to be ‘x’ for the evening, and there are some notes that everyone will have to come to an agreement about where it is, because some people might be hearing it a bit sharper than others. Sometimes you have to go “hang on, this is what it is” and then they say “okay” then everyone finds it and it is in tune. But while you have these different concepts, it sounds like a disaster.

This example shows how fundamental aspects of aural knowledge such as the precise pitch of a Concert A can vary significantly enough to be a problem in a professional performance. Managing this variation in aural knowledge required that the musicians negotiated and agreed on the location of pitches. Similar negotiations within the music community were also expressed by Peter:
When I go between these communities, there is a different language and attitude that I adopt for each of them. I have the same set of ears, but I know that I’m working to different audiences, and so my perception hasn’t changed, I just know that there is a difference in the result that I’m after.

As Peter indicated, successful engagement in groups requires awareness and a willingness to adapt to languages, priorities and goals, working towards what Klein described as a clarity of intent.\(^{311}\) In other words, community members who are engaged in a practice together need to share a sense of why they are doing something and how it will be achieved for the duration of the activity.

For musicians who played with a lot of different groups and across genres, this clarification of intent was a common experience. Musicians, however, particularly those who had spent a lot of time playing with a single group, could also get trapped in the aural norms of a sub-community. For example, Alex described playing the *Four Seasons* with a classical violinist trained in Europe. She had played this canonical work countless times, and always with Concert A tuned to 443 hertz, as was the European norm. In Australia, this work was played at A440, and the harpsichord was tuned accordingly. Despite the ensemble’s tuning in the Australian context, however, the European violinist ‘could not come down’. As they began to play, she played at A443, and while the other string instruments were able to follow her, the harpsichord, unable to be re-tuned with a slight change to finger position, was three hertz flat. This inflexibility on the behalf of the violinist resulted in a performance that, even to a lay ear, was perceived as out of tune.

The potentially disastrous implications of pluralism are present in the medical community. Klein gave an example of an operating theatre with different knowledge sets and priorities. In the given case, the surgeon made a judgement that the patient’s blood pressure needed to be lowered. He directed the anaesthetist to give the patient a drug to this effect. The anaesthetist administered the drug, and upon noting that the patient’s blood pressure went down, he gave a second drug to increase it. For the anaesthetist, this was standard practice because his role was to keep the patient’s vitals stable. The surgeon noted that the patient’s blood pressure had gone up and requested that the anaesthetist increased the dosage of the previously requested drug. The anaesthetist followed this direction, noted that the blood pressure went down, used a second drug to counteract this, and so the cycle continued until the patient died.\(^{312}\) Most of the time, medical professionals work well together, and this capacity for

\(^{311}\) Klein, *Sources of Power*, 222-25.

\(^{312}\) Ibid., 220.
professionals to negotiate different understandings and priorities is a factor that ensures successful surgical procedures. When shared intent is not established, however, the outcomes can be deadly.

Doctors observed similar pluralism of aural knowledges that had the potential for misunderstanding and ineffective medical practice. As one doctor, Phillip, stated:

> I think it is important to recognise that we come to a situation with a set of skills and assumptions. We perceive from both our macro and our micro culture. I think people get surprised when their set of normal is not everyone else’s. If people are interested in hearing, then it’s something that you really need to discuss and get down to the level of what is the meaning of sound. The human voice affects people in so many subtle ways that we don’t recognise in our training. It is just assumed. But we’re a multicultural world and society. We’re continually coming up against people with a different set of normal hearing and perception. If you want to listen you have to deal with these things.

Phillip’s reflections emphasise the learnt and variable aspects of hearing. In this case, aural knowledge was observed to affect communication and understanding between doctor and patient. Tone of voice was identified as laden with meaning, and its interpretation dependent on the ‘skills’ and the ‘assumptions’ of both parties. As with musicians, Phillip stated that while it was often taken for granted, doctors had a ‘set of normal’ sounds that they understood and responded to (see Chapter 5). In keeping with the discussion earlier in this chapter, this ‘normal’ was shaped through a doctor’s micro and macro cultural influences. Given the variability of this aural knowledge, ‘listening’ to patients, like the musicians in ensembles, required a negotiation of aural meaning. This nuanced understanding was observed to escape attention in medical training programs, but effective communication depended on it.

While using collective terms such as ‘epistemic community’ suggest cohesive knowledge groups, in practice they more refer to largely disparate people with enough in common. Epistemic communities include a diversity of conceptual, environmental, institutional, and social influences that shape practices, values, and ultimately, knowing. Sensory knowledges such as hearing are one aspect of this knowing that varies with influence. As was illustrated in the examples of jazz and medical practice, the success and failure of communities hinges on individual capacities to negotiate within and across smaller groups on a daily basis. This requires a certain shared knowledge, but also a clarification of intent: establishing language, meaning, and goals and priorities for the particular context.
Legitimacy across communities

Up to this point, knowledge has been discussed as community-based, even if within such communities there was heterogeneity. However, most people interacted with multiple communities. A Morse operator trained at the Melbourne Chief Telegraph Office had not only this professional affiliation, but was also an English-speaking member of Australian society, and may have participated in both a church community and the activities of the local speedway. Similarly, a doctor may also be a climber, and a Buddhist meditation practitioner. ‘Common’ knowledge could also inform specialised aural understanding (see Chapter 5). Doctors, for example, drew on the practice of tapping a water tank to develop an understanding of the sound of pleural effusion. Similarly, adventurers described the sound of an unsafe river in terms of rocks hitting each other because they were more likely to have been experienced in daily life than river rolling boulders. Links were also drawn to other specialised knowledges, particularly music: Morse was ‘sung’, the sounds of the bush were a symphony. The situation of understanding within broader knowledge contexts raises issues that include the application as well as interpenetration of knowledge sets.

Research participants reported that knowledge in one community context could directly inform and even enhance another. Many doctors suggested expertise in medicine’s clinical skills was enhanced with musical understanding. Samuel, a cardiologist, described how doctors with ‘a musical interest in sound and intervals’ were better at perceiving the heart, despite not being musical himself or considering his own skills wanting. Similarly, Matthew, an expert non-musical anaesthetist, described a junior musical colleague who could determine the precise oxygen saturation of a patient ‘on the basis of the note that he could hear’. For Matthew, these extra-aural capacities were prized. However, he could hear whether a patient’s oxygen saturation was high or low, and if it changed by one or two percent, a skill that was more than sufficient to do his job at an expert level. In other words, these prized musical hearing skills were not required for medical expert aural practice. In both of these cases, the suggestion that applications of one knowledge set in a new area appeared less a question of expertise, than of building status or prestige.

In the case of Morse, there was a similar suggestion that musical expertise enhanced an operator’s aural skills. Operators commented that many telegraphists were musical, and that a musician’s sense of rhythm enhanced their Morse. However, this suggestion that Morse and music were related was expressed narrowly in terms of rhythm only, the element it has in common with Morse. For example, Benjamin claimed that: ‘With two violinists, you could tell them apart by their timing, just like Morse. Tone wouldn’t be so important’. For a violinist, it is
very likely that this statement would be inaccurate. A key issue here is the distinction between expertise and what Collins and Evans termed ‘beer-mat knowledge’.\textsuperscript{313} Morse operators like Benjamin have enough knowledge of the area of music to identify some traits, just as someone might gain some facts or explanations from sources such as a beer-mat or a bottle cap, but there is not the understanding to allow them to do anything with this information.\textsuperscript{314} Rather, the Morse operators were more able to use music metaphorically to explain their practices.

While the relevance of one knowledge set in a new context may be limited by the depth of understanding, this did not prevent some seeking legitimacy from experts in other epistemic communities. Within the music community, for example, recent technological developments to the sound of the modern piano by Australian piano makers Stuart and Sons have deferred some epistemic authority to a Commonwealth Scientific and Industrial Research Organisation (CSIRO) mathematician (see Example 29).

**Example 29: Seeking legitimacy through outsiders**

The aural aspects of technologies are of key importance to our understanding and acceptance of them, in so far as users typically judge the final product partly by how it sounds.\textsuperscript{315} The importance of sound is demonstrated in the resistance to technological innovation within the tradition-bound field of classical musical instruments. Despite frequent technological developments, the instruments of the symphony orchestra have remained largely unchanged since the mid-nineteenth century. This resistance to innovation is partly as a result of the importance placed on the culture’s sense of musical style, its aesthetics, and its “frozen” ideals of sound.\textsuperscript{316} Instrument makers report that people have clear ideas on what particular instruments should sound like, and find it exceedingly difficult to accept variations to that sound.\textsuperscript{317} This preference for the traditional sound of a particular instrument is highly rigid, with any possible ‘improvements’ to the tonal quality or volume being rejected on the grounds that it does not sound ‘standard’.

\textsuperscript{313} Collins and Evans, *Rethinking Expertise*.
\textsuperscript{314} Ibid., 19.
\textsuperscript{316} Bijsterveld, "Breaking into a World of Perfection: Innovation in Today’s Classical Musical Instruments," 669.
\textsuperscript{317} Ibid., 656.
Recently, Australian instrument makers commercially launched a piano with a 'new voice'. While achieving some success, the instrument encountered resistance primarily on the grounds of sound. Successes were owed to the balancing act of tradition and innovation, and actions to give credibility to the sound including enlisting the expertise of those outside the music community. The company commissioned a study by a CSIRO mathematician, who found that the new agraffe produced a piano sound that was 'sweeter' and 'more harmonious'. However much its sweetness was 'a mathematical fact', this did not necessarily result in success, as ideas of sonic aesthetics were based in a different epistemic community. In interviews, pianists were often critical of the new piano on the grounds that they did not like its sound. When asked why, they responded: 'Because it does not sound like a Steinway'.

Supporters of the new piano did not think that changes to the piano sound were a reason to reject the innovation. Its rejection, however, indicates the extent to which sonic aesthetics are the purview of epistemic communities and their weight of tradition.

Example 29 illustrates an attempt to apply knowledge across communities, but such transfers are not necessarily effective because of their limited acceptance in the new context. A mathematician at CSIRO has some claim to epistemic authority, but even in a context in which scientific knowledge occupies a privileged position, few musicians appeared convinced by the expertise of a professional outside the community. There was a lack of epistemic trust.

In a similar way, Morse operators tended to relate their experience to everyday life, as a means to render their practices tangible and contemporary. Cecilia, for example, reported hearing car horns as Morse letters, while for Alan it was bird song: 'I have heard the birds of a morning squawking and I will name them after the letter they are calling. It hits you straight away'. Indeed, Beethoven was credited with anticipating Morse despite composing before its invention, as 'the first two bars of his well-loved Fifth Symphony sound the letter “V” — three dots and a dash'. In the context of a community whose knowledge was disappearing, there was desire to make their aural knowledge relevant. Often operators described Morse as the first internet to give legitimacy and value to a superseded technology, and its discussion in the context of Beethoven can be interpreted in the same light. If Beethoven found a place for
Morse before its invention, perhaps the contemporary community could make room for it despite its limited application in the twenty-first century.

Equally, there was an example in the medical community where music was seen to make tangible the practices of a doctor. The medical community often drew on knowledge of different fields to communicate something new that was being learnt. These phenomena being compared did not have to be alike, but they were given this relationship in order to structure understanding (see Chapter 5). Nelson, a neurologist, described how sensory discrimination happened in the car when listening to music (What instruments can you hear? What is the middle note in that chord?), and at the dinner table when eating a curry (What flavours can you taste?). He stated: ‘In my household, you have to learn the difference between an oboe and a clarinet, a single from a double reed instrument, as you are driving along’. This capability had perceived crossovers to the medical context: ‘You do the same thing work wise. You are trying to make sense of the cacophony that is there, and you’re trying to compartmentalise, but equally there is the whole feel’. Nelson was not using the comparison of musicians (and food critics) necessarily as a means of building status or legitimacy, but as a heuristic device to capture what doctors could do.

The examples given mainly showed pretensions towards proficiency in more than one domain. Building aural expertise in one domain was difficult, let alone multiple, due to the required time and focus. Michael, a musician, observed that, given the challenges for developing expertise in two musical areas, ‘fusion’ had become ‘a dirty word’:

You get these latin/jazz bands, and they’re filled with the country’s top jazz musicians, but they haven’t listened to latin music. Maybe a year, but nothing that can compete with the thirty years of experience specialising in jazz, so when they fuse them it sounds atrocious. It sounds like they don’t understand. It is absolutely laughable for musicians from Latin America, but they think it is fabulous. You can’t fuse anything unless you understand the traditions.

In the same way, when a doctor or a Morse operator drew on musical analogies, they were likely to appear less than convincing because they lacked the depth of understanding.

This is not to say that expertise in multiple aural knowledges was impossible. To continue with the music case, Frank Zappa was offered as a successful example of a musical fusion due to his genuine understanding of multiple musical styles. As Todd explained: ‘Frank Zappa grew up with an open approach to music. He saw doo-wop in the same box as Stravinsky and Varèse. He takes everything into his language and synthesized these different elements into a cohesive whole, so he can produce that music’. Musicians with this level of understanding in more than
one area were acknowledged as ‘unique’, because developing ‘fluency’ in multiple languages was labour and time intensive:

A classical musician learning jazz would be like an English speaker learning French, pretty similar, but still different. You could go to France for three months and try and give a concert in it, but it is going to sound like you have been in France for three months. But if you live in France for ten years and you can speak French and English fluently, then you can mix them, you can understand them, and you can translate ideas between them.

This notion of translation is illustrative, and again comes back to the notion of expertise as fluency. To build the required expert aural knowledge in two related areas (let alone two totally different ones) was very difficult. Yet, if this level of understanding was achieved, the results could be illuminating. In such cases, aural expertise in say music and medical practice might be of genuine benefit.

In the examples given in this section, the knowledges of diverse communities were shown to be related primarily at a metaphorical level. Often the fabrication of a relationship between knowledges was for the purpose of building legitimacy, or as a heuristic device to explain the skills of the dominant community. While successful dual expertise was prized, it was rare, even in closely related areas such as jazz and classical musical styles.

**Conclusion**

This chapter has challenged the tidy boundaries drawn around epistemic communities and their knowledges. People live in multiple worlds. The implications of this pluralism are not necessarily quantifiable or predictable, except that the end product is often unique ways of knowing specific to individual experience. Two people who are both musicians and Morse operators are not necessarily going to reach the same understanding. Rather, the balance or relative importance of different aural knowledges, learning methods, and uses will all impact on how they are engaged with and expressed in any given moment.

Offering one set of perspectives and knowledges, there are influential people and organisations that seek to influence the ‘correct’ procedures, how contexts are engaged with, and what constitutes meaningful sound. Studying gatekeepers raises questions of epistemic trust, and definitions of knowledge in communities. These issues are often problematic for experts, where there was the potential for a gap between their nuanced practice, and the rules and standards. This incongruence has the potential to encourage combative cultures as
was observed in the cases of musicians, adventurers, and Morse operators. Yet equally, where autonomy is facilitated, experts could remain ‘insiders’ in their communities.

Fragmentation of knowledge claims raises issues of the importance of communication, negotiation, and issues of legitimacy. Knowing is dynamic, with diverse experts as well as lay people engaged in an ongoing conversation over what is known and how things are done. This finding highlights the critical capacity to negotiate meaning in epistemic communities. Because learning and knowing are largely social phenomenon, social skills are important when it comes to sharing and acquiring knowledge. This presents a challenge for those who are used to being in positions where their expertise is not questioned, whether that be due to holding a position of power, or a lengthy period within a reasonably homogenous group. While miscommunications can be disastrous, this multiplicity can also be beneficial to communities and the individuals within them. As Daukas argued, ‘epistemic exclusion degrades the epistemic life of a community’. The need, then, is to foster skills in negotiation and meaning-making, and to not only tolerate difference but to see it as something valuable.

Fragmentation can also be part of a legitimacy strategy. As was seen among musicians, doctors, and Morse operators, groups can exploit the diversity of knowledges and perspectives to achieve their goals. Sometimes this may be successful, sometimes not. A doctor can be an expert physician without the aural acuity of musical practice. Musicians may hope to subvert the aural norms of the classical piano ideal by appealing to the epistemic authority of science. A Morse operator may hear Morse in the streets, but this does not mean the letters heard were the intention of drivers honking their car horns. A central issue here is that building understanding to a ‘fluent’ level in more than one area is very difficult and, as such, opportunities for the genuine application of knowledge into a new context, at least in this research, were rare, however prized the outcomes would have been.

Throughout this thesis, there has been a primary focus on the aural aspect of knowledge and their epistemic communities. This chapter has looked critically at social groups and influence, and the following reinstates hearing in its multisensory context.

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Up to this point, I have focused primarily on the aural knowledge and hearing practices of epistemic communities. However, knowing was multimodal, and as was illustrated through the holistic accounts of experts, aural cues acted as only one knowledge source. While it was useful to focus on hearing, this penultimate chapter aims to reinstate aural knowledge in its broader sensory context. It addresses the research question: How do the senses contribute to understanding? (see Figure 2, Chapter 3). I first return to the question of the conceptual location of hearing that was introduced in Chapter 4. Hearing in the current chapter is considered as a metaphor for inclusive awareness. The chapter then looks at the way the senses combine as part of a holistic knowledge. Exploring the themes that emerged in Chapter 6, I examine the problems experts experience when perception is limited to isolated sensory modes. I show how, taken out of context, hearing and sound have the potential to be meaningless, or not knowable. This further reinforces the multisensory nature of knowledge.

The listening metaphor

In Chapter 4, I explored how epistemic communities situated aural perception. In the medical case, for example, I looked at the stethoscope as a clinical tool which supported and reflected a notion of active and analytical medical professionalism. Hearing sound using a stethoscope was theoretically divorced from the other senses the moment that the doctor picked the instrument up and attentively assessed a patient’s heart. While in this example sensory perception was very narrowly conceived, there were also cases where hearing was situated in a less isolated sensory context. In Chapter 6, for example, expert musicians highlighted the multisensory aspects of the audience’s engagement with sound. Similarly, despite the narrow
vision of clinical skills implied by the stethoscope, expert doctors described taking in all the indicators, and absorbing a multitude of information while touching a patient’s arm. Expert adventurers were most articulate about the multimodal nature of perception. As Emil stated: ‘The idea of listening to the environment is nice as long as you remember that it is a metaphor as well as using the mode of hearing. Hearing is an important one, but it should involve every perception’. Listening, Emil suggested, always required not only a climber’s ears, but that all their channels to perceive the world were open.

Many people who participated in this research expressed multisensory understanding directly or indirectly, yet others persisted in isolating the senses for the purposes of active analysis. As the stethoscope example illustrated, understandings of medical auscultation were situated in a tradition of the rationalisation and objectification of sound.\(^\text{322}\) Sound was separated from the body, and the stethoscope was a tool for perceptual distance.\(^\text{323}\) Some doctors mentioned closing their eyes while listening to heart sounds (particularly earlier in their careers), as a way to focus their ears towards an exclusively aural judgment. However, with experience, it frequently came to be acknowledged that even in the example of auscultation, there were other sensory inputs that contributed to decision-making: the feel of chest vibrations; the look of the breathing body. For example, Nelson explained that when listening to lung sounds, percussing the chest gave aural as well as tactile feedback: ‘Often when you are tapping you will get the feedback from your fingers as well as your ears, and it is nice when you can combine the two modalities. You get extra feedback. You can hear, but touch helps’. This example of medical decision-making reinforces the value of multiple sensory inputs, because the additional information can support or challenge a judgment initially formed from a single sense.

Like doctors, classically trained musicians have been influenced by an ideal of rational and objective musical engagement. In the eighteenth century, Western art music (now popularly called 'classical') moved towards ‘pure’ sound, in response to anxieties about music’s impacts on the body, and its potential as an emotional obstacle to intelligence, rationality, civilisation, and transcendence. In his 1793 publication, \textit{Ueber das Pathetische}, Friedrich von Schiller wrote on modern \textit{Empfindsamkeit} music that:

\begin{quote}
Suddenly everyone becomes all ears when a sentimental passage is played. An almost animal expression of sensuality then usually appears on all the faces, the intoxicated
\end{quote}

\(^{322}\) Rice, ""Beautiful Murmurs"".

eyes swim, the open mouth is lustful, a voluptuous trembling seizes the whole body, the breath is rapid and short; soon all the symptoms of intoxication appear as a clear indication that the senses are running riot but that the spirit or principle of freedom has fallen prey to the force of sensual impressions. All these feelings, I say, are excluded from art through a noble and manly taste because they please only the feelings, with which art has nothing to do.  

Von Schiller’s caution illustrates the anxiety that surrounded sentimental music, an anxiety remedied by a music concerned only with the intellectual pursuit of sound. Chua described this aesthetic hysteria as the fear of music’s capacity to ‘emasculate the freedom of the intellect and reverse culture into the raw passions of nature’. This battle between feeling and reason extended to practices of musical engagement, with the potentially riotous multisensory mode being replaced with isolated and intellectualised hearing. As Riley’s *Musical Listening in the German Enlightenment* argued, the shift towards silent ‘attentive listening’ was the product of broader ethical priorities such as the benefits of music’s aesthetics for the soul, the distinction of ‘civilised’ and ‘uncivilised’ peoples, and the construction of an ‘expert’ approach to listening. Eisler and Adorno illustrated this distinction through their auditor hierarchy, where a ‘musical expert’ was greater than the ‘ear of the layman’. Echoing Von Schiller, in their article lay hearers were warned about their susceptibility to the irrationality, regression, drabness and prosaic nature of the entertainment industry.

This expectation of silent attentiveness and analytical listening among concert audiences is one of the most distinctive characteristics of modern classical music culture. However, this seemed to be more a conceptual point than a practical one, because musical engagement was generally thought to be more multimodal in practice. As Lachlan explained:

If you want to be a real musical purist, and only about the music from a purely music/artistic perspective, then the other sensory inputs shouldn’t matter at all. It should just be about the sound. But the reality of that is that our enjoyment from seeing a show is a lot more about the performance, how the artist moves on stage, how it is lit, the kind of room it is in, the kind of art work on the album cover, or the video clip, or that time you had with your friends when you were on a road trip and that song came on...

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324 Chua, *Absolute Music and the Construction of Meaning*, 133-34.
325 Ibid., 133.
328 Finnegan, *Communicating*, 228.
For many performing musicians, particularly those with classical training, this understanding of music as multimodal was something that they had come to appreciate later in their careers, as professional pressures often forced a reconsideration of other sensory aspects (see Chapter 6).

A multimodal approach to music was not only a matter of audience pleasure. Even Edward, a highly analytical expert musician, stated that watching chamber music live was particularly valuable, because seeing the performers play ‘reinforces the audible links’:

You can actually understand the music better when it is live. It is understanding the relationship between the performers, particularly with chamber music. If you have a canon, for instance, going between the players, you see them do it as well as hear it. If there was any doubt in your mind, or you miss something, like a less obvious relationship, you can see it as well, and it really forcefully enters your mind.

In these examples, musical experience is framed in terms of pleasure and understanding. The comment by Edward could be read as a return towards simply acknowledging a ‘better’ way to listen to music. Yet this shift towards a more multimodal form of engagement must also be understood in context. A more dominant anxiety in contemporary classical music was the rise of recorded media and the death of the recital. In this context, the virtues of a multimodal experience were stressed. As Example 30 demonstrates, this also implied a more relaxed approach to audience responses to music, in the hope of encouraging patronage.

**Example 30: On the virtues of being there**

Recently, there has been a renewed interest in multimodal musical engagement. For concert presenters interviewed, music had to be live because recordings did not give a ‘real’ musical experience: ‘What you have to look at is the alternative to music, which is radio and CDs. No matter how good the recording is, it is not the same’. While they acknowledged that the aural aspect of music in a recording may be technically ‘better’, this recorded music was still inferior ‘because it is not a shared experience and you’re not breathing the same air as the performers’.

Critically, ‘real’ musical experience was not only an issue of seeing the musicians. They explained: ‘Video is not the same either. We are social creatures. It makes a difference to us whether they are on a screen or face-to-face’. Music was communicated through the combination of sound, body language, physical engagement, the listener’s history with a work, their seat in the concert hall, where they had been before the performance, who they went with, and the broader collective experience with other audience members. All these variables...
contributed to the unique sets of interactions with live music, even if audiences fell asleep: ‘For some people, listening to music is a relaxing thing, which is why people go to sleep in concerts. It is not that they are not enjoying it. It is that their body relaxes, and their mind goes’. While audience members had apologised for nodding off, perceiving it as a faux pas, this physical reaction was no longer so disagreeable, since it was ‘their own personal experience’ of the music, despite being notably more bodily than intellectual.

This social context was critical to how music was perceived as well as how it was produced. The relationship between the performers and audience was active and ‘symbiotic’ with performers responding to the feedback: ‘They can sense the appreciation from the audience, even if it is just an intake of breath’ (and occasionally a snore). This feedback was more than audible. One concert presenter described that when the audience was at its quietest, the communication was strongest: ‘They are so engaged and the performers can feel that, that is, the good tension in the air when the audience is so drawn into the playing that they stop breathing’. This palpable silence was prized, and its perception represented ‘a special type of hearing’. Silence in this case was not ‘doing nothing’, but rather was an active form of collective engagement.

In Example 30, hearing is understood as part of a multimodal musical engagement. This mode of engagement was greatly valued by audiences, if concert attendance was to be trusted as an indicator. This growing awareness that audiences expected more direct communication correlated with increases in classical recital attendance over the last sixteen years, though some performers have proved more responsive and successful than others. Performers such as Andre Rieu have proved highly successful, filling football stadiums where symphony orchestras continue to struggle for audiences. While Rieu has been criticised for lowering the tone of classical music performance, he was thought to be successful because he engaged the audience. As Hugh, an elite violinist observed:


This looking back to the glorious candle-powered past and insisting that people sit there at attention and don’t move, don’t clap between movements and all the rest of it is not only out of step with the way that a lot of people want to go and hear music, but there is another way to perform classical music, as Andre Rieu has proven, as has Nigel Kennedy.

For some classical musicians, this can be a tough pill to swallow. As Hugh continued:

A friend of mine said, "Why aren’t they forced to come and see us and give us some respect because we’re a better group?" Well, one because you’re ugly. You can look ugly as sin as long as you sound good. And secondly because you don’t give a shit about the audience because you’re paid a public service salary regardless of whether they drop dead or no one comes. "They can do as they’re told and show some respect!" Well, guess what, it’s not the whole story.

As Hugh articulated, limiting musical engagement to hearing sound could isolate audiences. This was not easily accepted by generations of listeners socialised into a more immersive musical experience (see Chapter 6).

Example 30 also raises the effects of innovative technologies on modes of perception and the nature of sound. Amy, an audio engineer, producer, and musician, spoke extensively about the impacts of audio technologies on sound and aural knowledges. Music technologies were critical to her work, but also were an ongoing source of anxiety. Amy observed that headphones 'change the way that you listen' because they were exclusively aural or limited in sensory aspects, separated from context, alterable, and less subject to the ear's capacity to isolate significant sounds. She suggested that this had implications for how a context was engaged with and understood: 'The incessant noise that people are subjected to in everyday life reduces their ability to listen'. Additionally, this mode of aural engagement was thought to alter understandings of music and performance: 'Film scores and mp3 players change people's expectations of how things should sound, and then they might see a band live and think "Is this how it sounds? It sounded better on my iPod"'. Amy's concern was that the knowledge of what a violin sounds like may be limited to its recorded, rather than its 'real' sound. In other words, 'true' knowledge becomes a hyperreality: more 'real' than the 'real

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thing’.\textsuperscript{333} From this perspective, the process of separating sounds from their multisensory contexts changes experience and alters sensory knowledge.

An interest in ‘real’ experience and ‘deep’ understanding was an underpinning principle of the connectedness and attunement that guided the pursuits of many adventurers (see Chapter 4). This value of being receptive to one’s surroundings correlated with the value of solitude: the need to remove distractions of the social and urban world and be immersed in nature in order to understand it. Vervoorn captured the distinction between those who go in with open ears and those pursuing conquest:

Mountains are reduced to a frame for the portrait of the glorious ego, a doormat on which feet are wiped in order to enter the hall of fame. Yet when the self is projected onto the mountains the danger is acute; we become cocky, blasé, and hubris follows. The self stops listening to what the environment is saying.\textsuperscript{334}

Attunement to nature and clarity of perception were a source of enjoyment for many adventurers, but as Vervoorn observed, a multimodal awareness was also a means to stay safe. A ‘narrow’ view was linked to arrogance, while a broad view meant an awareness of and response to context in decision-making and practice.

The same language of listening was used by Simon to express multimodal expertise in the bush. Just as Vervoorn made a distinction between the arrogant adrenaline junkie and, by inference, mountaineers who went in ‘listening’, Simon felt that a great bushman or climber was distinguished from an average one by ‘how much they take out of their environment’. He stated:

Some people will miss the strands. They are watching their compass, and basically following what they have been taught in a blooming course, as opposed to seeing and hearing what is going on around them, which is the guts of bushcraft. It is listening to the bush, hearing the bush.

This observation by Simon draws together many of the findings that have emerged throughout the previous chapters. Learning through doing (with others and alone) builds understanding. Simon linked this receptive ‘listening’ with trusting sensory judgements over formalised procedures. This holistic awareness and receptive approach to the environment was critical for safe practice, and it was an approach fostered through experience and mentoring, rather than

\textsuperscript{333} Umberto Eco, \textit{Travels in Hyperreality} (London: Picador, 1987).
\textsuperscript{334} Vervoorn, \textit{Mountain Solitudes}, 115.
taking courses. The articulated and formalised knowledge promoted by organisations like NZMSC encouraged following the rules more than consulting the environment.

For the adventurers, hearing was framed in the context of communities and their values. ‘Listening’ as multisensory awareness was often conceptualised in terms of an ‘Indigenous’ approach, with many adventurers using this idea to explain their ideal mode of being in the environment. It was suggestive of a romantic or idealised way from communities lost. This approach to epistemology and ontology is reflected in the following commentary on the practices of the Gurindji of the Northern Territory:

Gurindji, especially the Elders, often sit on the ground and do nothing for a long time. I thought that they were doing nothing. If there is no ceremony or urgent meeting, they will often spend all day apparently doing nothing. It took me a while to realise that they were actually ‘seeing’, ‘listening’, and ‘feeling’. If you want to know what is happening in this world, you should stay still and pay attention to the world. Be aware of what is happening around you. Do not make your own ‘noise’ which often fogs your senses.

Giacometti, an adventurer, contrasted the Aboriginal people who he imagined would live in the places that he walked through with his own ventures. He suggested that the local Aboriginal people were hypersensitive to the nuances of their places. While Giacometti was sensitive, he was still ‘passing through ... [as] whitefellas do’. Adventurers with similar ideals did not reach a state of being akin to a universalised ‘Indigenous’ approach, though it was presented by them as best practice.

With hearing being used metaphorically to communicate a multisensory mode of ‘real’ experience, it is worth pausing to consider the attributes of hearing that lend it to this role, and what it implies about sensing and knowing more broadly. Schafer’s essay ‘Open Ears’ provides some hints, beginning: ‘We have no ear lids. We are condemned to listen. But this does not mean our ears are always open’. Ears can always receive information without direct attention if the listener chooses to be receptive and aware. Indeed, this can be a less

337 Schafer, "Open Ears," 25.
active process, as Schafer’s claim implies. For experts and those working towards mastery, this consciously receptive way of being represents an ideal. It entails an experiential mode of learning, a processing of patterns and details, and a responsiveness to context. It is a holistic, multimodal approach that facilitates ‘rich’ knowing as much as ‘rich’ experience.

**Multisensory awareness**

People perceive things with more than one sense, whether it be a mundane task such as cleaning their teeth, or a more challenging task such as ice climbing. These multisensory aspects of experience are the basis of much pleasure that is taken in activities, as argued by the concert presenters in Example 30. The pleasure of going to a gig involves the sounds and sights of the musicians, the feel of dancing and the crowd, and all of the other often intangible aspects of being there. Similarly, spending time in the natural environment is pleasurable in its multisensory aspects: the sounds of nature, but also its sights, feelings, smells, and tastes. Some Morse operators, too, reported the pleasure they experienced from the sound and the physical movements used to produce the signal. The role of the senses in pleasure has attracted attention in studies as broad as building sand castles, gardening, and car stereo bass vibrations. However, holistic sensing also transcends pleasure.

For experts, a multisensory mode was always part of their practice, and facilitated decision-making and precision, especially in challenging and critical contexts. Playing a musical instrument, for instance, involved tactile, visual and aural feedback, as was demonstrated in cases where pianists described an incongruence between the feel of the keys, the sight of their hands, and the pitch being heard (see Chapter 5). In the case of singing, this multisensory mode was vital because of the gap between what a singer heard and what was perceived by the audience. Hockey described a similarly multisensory mode of awareness in long distance runners. As he explained, safety and performance were assessed and responded to ‘using cognitive and corporeal information accrued by their senses’. These senses were ‘interlocking and mutually influential’ and acted from ‘a subcultural stock of learnt practical

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338 This is the risk that Eisler and Adorno referred to when they sought to caution the lay hearer susceptible to the irrationality, regression, drabness and prosaic nature of the entertainment industry. See Eisler and Adorno, "The Politics of Hearing," 74.

339 Tilley argues that a key reason why gardening is so inherently pleasurable is because of the multisensory dimensions. See Tilley, "The Sensory Dimensions of Gardening," 312.


techniques and meanings'. As Hockey demonstrated, these multiple sensory indicators, with their own contexts and communities, worked together to form an impression of a situation and guide practice.

This multisensory awareness was also relied on by the doctors, who observed that it was embedded in their learning, and developed further with expertise. Joshua observed that the basic techniques for patient examination included palpating, observing, and listening. These were established during formal training, and with experience combined to assist judgments. In other words, what began as isolated modalities became a genuinely multisensory approach with expertise. The adventurers also observed that their multisensory awareness increased with expertise. As Luke recalled: ‘Early on, the very physical nature of what you were doing was most important. Then you get more experience and the experience changes and deepens. You start seeing all the layers of the experience’. For Luke, these additional layers of experience included a more holistic sensory awareness. The initial physical nature of adventuring referred primarily to the tactile aspects of movement, and feelings of pain. Latter experiences also included increased and more nuanced awareness of sounds, sights, and smells in the environment. Example 31 illustrates this connection between multisensory awareness, experience, and expertise.

Example 31: Wisdom from insects

For Patrick, an obstetrician and gynaecologist with almost fifty years experience, awareness and receptiveness to all sensory inputs were the most critical aspects of his job. He shared: ‘I often think of myself as an insect; you’re sensing what is going on all the time’. These sensory inputs were inseparable. He stated: ‘I can’t separate hearing from seeing or touching necessarily, but you’re using them all to build up a picture of what is going on’.

Patrick suggested that achieving this state of awareness was a marker of expertise: ‘It is something that good practitioners have got going all the time. You’re sensing what is going on with all your senses, and it is really important, you can’t do this sort of thing in a vacuum’. Patrick could walk into a room and ‘sense when there is stress in the air’. While the stress may not be verbalised, Patrick could ‘feel’ it. This judgment was not always formed ‘actively’, but in Patrick’s experience, he thought he was usually correct. From this multisensory approach, and not just the senses that are commonly expressed, he was able to compile information to

342 Ibid., 198.
343 This finding that a multisensory awareness comes with time is reflected in Tilley’s ethnography of the sensory dimensions of gardening. See Tilley, “The Sensory Dimensions of Gardening,” 328.
defuse the situation or manage the crisis. As Patrick explained: ‘It is not just listening, it is not just seeing, it is feeling. And that is not touch. I think you’re sensing the situation all the time, and if you’re not, then you don’t make a very good doctor’.

Critically, this type of awareness was not formally learnt: ‘It is not something that you can learn from a book. You see it in other people, you’re seeing it in your colleagues while you’re in training, and then you pick it up yourself’.

Example 31 shows how multisensory awareness is central to expert practice, including both sensory judgements that could be readily identified, as well as more atypical ones that contribute to an overall sense of appreciating and understanding a situation. Decision-making was based on the overall ‘feel’. As Patrick put it: all the senses, and something else. The senses were also not always clearly defined. Another doctor, Phillip, expressed: ‘Listening involves visual cues. I listen with my eyes’. This sensory complexity was also reflected by the musician Amy: ‘There is an energy present in the live performance that is not present in the recording – a third dimension – not just listening, and not just looking, it is also feeling’. This multisensory awareness was identified as a critical and indispensable element of expert practice. As expressed by the mountaineer Vincent: ‘All of your senses are tuned in. If you’re blocking off one of those, then it just feels weird’. Vincent’s discomfort highlights how multiple inputs contribute to expert judgements, even if these inputs are not readily articulated.

While maintenance of the multisensory mode of perception was identified as critical in a crisis, keeping all the channels open could be a challenge. Emil observed that when situations got particularly difficult, his sensory perceptions had a tendency to narrow: ‘You can’t always do it, particularly if you get into a difficult situation that requires your attention like getting over a difficult piece of ground, and when you get over it, you look up and see that the sky has changed colour, the wind has picked up, and so on’. A similar idea was expressed by Tuck-Po, who conducted an ethnography of the Batek’s walking in the forest. Without the Batek’s heightened awareness, she found the tropical forest had ‘a way of changing when one is not looking’. To return to the mountaineering context, Emil described how in one particular experience his focus ‘narrowed down to zero’. Emil had been guiding two ski-mountaineers in Mount Cook National Park when an avalanche started under his feet and swept him over a fifty metre cliff. Unconscious for a short period, when he came to, he described an awareness only of pain, and it took time before a perception of more was possible. He recalled:

344 This impact on the senses in times of stress is noted in Perrot, "Sensing the Wild," 34.
I had this sense first that what I was looking at was a negative of the world, that it was all black or gray. Certainly my vision didn’t work straight away. It took a while to crank it up again. I then became aware enough to start looking around me, and I saw a crampon lying there.

Once his vision began to be engaged and he was able to move towards his crampon, he then became aware of sound: ‘It was only then that I heard my companions shouting at me. Obviously, they would have been shouting all the while’. While his senses were dampened, his capacity for effective action was also reduced. Emil claimed that getting himself out of this state was primarily an issue of mental discipline:

You could say that some people are just stronger than other people, but I think it is a mental discipline, a learning process that has gone on over an extended period of time. It does kick in unconsciously, without volition. It is not something that you have to try to switch on, but it happens, or takes over.

Emil’s observations on the effects of fear and pain are consistent with Steven Rose’s argument that a little bit of fear can heighten sensory perception, but too much distorts or destroys it.

In addition to being in a physical and mental position to process multiple inputs, accurate and safe decision-making can also be a question of having all of these sensory inputs available, an issue that is becoming increasingly pertinent in a contemporary technological context (see Example 32).

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**Example 32: The problem of Telehealth**

Telehealth is an emerging approach to healthcare delivery, which facilitates the monitoring of patients through telecommunications technologies such as videoconferencing. In Australia, this approach is being trialled in rural and remote areas where access to continuous specialist care can otherwise be limited. While Telehealth is heralded as an environmentally friendly, cost-effective approach to preventative medicine and rural and remote medical services, it...
is not without its shortcomings. Malcolm, an expert in Drug and Alcohol and a professional who uses Telehealth, expressed significant concern over his capacity to make the highly nuanced perceptual judgements that he made as an expert in his field, when the technologies limited the scope of what was perceivable. After a few years of using the technology in conjunction with face-to-face consultations, he considered that while it was ‘better than nothing’, he missed information with Telehealth. The visual and aural inputs were reduced, and other sensory experiences removed entirely.

One of the problems with Telehealth was the limited resolution of the video, and its impact on what could be visually perceived. As Malcolm explained, with the limited resolution ‘you can’t get skin textures and colours accurately’. Limited bandwidth also negatively impacted perception, as ‘the rate of change for facial expression is inadequate, and you can’t see pupillary response very well’. The net result of these attributes of the videoconference was that ‘all of these subtle things that you don’t know you’re actually looking at can’t be accessed’. He described his visual experience as ‘a bit like DVD up-scaling’. This analogy was brought to mind because he had to ‘try and upgrade to high definition by sort of filling in the gaps for this person’. This allowed ‘increased resolution of the person because you have seen them before’. For Malcolm, this was like talking to a friend on the telephone, and being able to ‘see’ them, despite the visual input. However, this could be dangerous in a context of making an assessment of a patient who was less known than a good friend and perhaps more variable.

Telehealth technologies also compressed sound, with the implication that not all the needed information was transmitted. This could mean that attributes of a person’s voice like an ‘edge’ may not be perceivable. Malcolm described a woman who used speed: ‘When you see her in the flesh, there are other tones, often higher tones, that don’t seem to come across in Telehealth’. Equally, the correction of sound levels (which aim to ensure a consistent, easily perceivable audio input), also have the impact of excluding certain critical information.

Malcolm was aware that he missed ‘little’ sounds such as sighs that could be picked up ‘when they’re in the room’. Ultimately, he had concerns about his capacity to assess correctly the health of a patient: ‘If someone was to say ‘you have made these decisions about whether someone was suitable to have take away doses of methadone based on your feeling about

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how you interacted with them” and then they go away and overdose, there would be a
question about whether you should have relied on that assessment’.

While the videoconference transmitted a picture and a spectrum of sound, other sensory
inputs were identified as omitted entirely. As Malcolm shared: ‘You don’t have smell, you
don’t have touch, you can’t listen, and also, you don’t get eye contact’. In other words,
satisfactory listening and eye contact were simply unavailable, despite the transmission of a
picture and sound. He continued: ‘With what I do you need the subtleties. They can look at
you on the screen, but you can’t get that, whatever the experience is. When someone looks at
your eyes, they are actually looking at your iris, but if they are making eye contact, they are
looking just behind, almost as if they are looking at your retina’.

In response to the problems of Telehealth, a nurse was in the room with the patient at their
end of the videoconference. After the appointment, Malcolm was able to speak with the nurse
who could ‘say whether he was really twitchy, or looked really crook, or he was uncomfortable
– stuff that I wouldn’t pick up on’. While the idea here was that Malcolm still had ‘eyes in the
room’, they were not his expert eyes or ears. Additionally, perception was also limited by this
altered social context, as patients did not relate to the absent doctor as they normally would.
As Malcolm explained: ‘There have been times where the nurse has been in the room with
them, and they will have a conversation as if I’m not there, so you’re really not part of a three­
way dialogue’. Because of these complications, he had more faith in improving the technology
than working with a team.

In addition to illustrating the critical role that sensory inputs have for expert decision-making,
Example 32 reiterates the point that there are not just five senses, but many modes of sensory
perception. While vital, they are not always conscious, and there is often no agreed language
to express them. As such, they can often be taken for granted, or we can fall back on
metaphors such as listening as a means to approximate experience.

The limitations of videoconferencing described in Example 32 were also reflected in
discussions over its use in music education. For staff that used videoconferencing for this
purpose, it was generally agreed that it was not a replacement for face-to-face teaching, and
should only be used in cases where students could not access a teacher locally. This
technology could be used with reasonable success, particularly when used by highly-skilled

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musicians to speak to experts about more ‘cerebral’ aspects of music. It also facilitated access to professionals who would be otherwise out of reach. However, as Peter observed, ‘the conference is only as good as both participants’ including their technology and know-how to use it. In the case of the music school I spoke with, they had a dedicated technician to ensure optimal microphone placement, lighting, and video transmission. This, however, was rare. While the technology was rapidly evolving, it was generally thought that it would never be ‘a substitute to being in the room’. Peter continued:

It can't be a replacement for proper interaction because it lacks the warmth of having someone in your physical presence. You can’t touch them, you can’t correct posture, and you can’t handle the instrument. There are all kinds of subtle things that you can’t perceive.

Like Malcolm, Peter said that the use of this technology was better than the alternative of not being able to access the education at all. This did not mean, however, that the education proceeded as effectively as it would through a face-to-face context. A harp teacher working with an intermediate student in a rural area over videoconferencing noted that they had problems with their technique that were not perceivable through videoconferencing. However, it was also noted that in their supplementary face-to-face lessons this was quickly corrected and this awareness was kept in mind during subsequent videoconferencing sessions.

Figure 17: Professor tutoring guitarist via videoconference

Photo courtesy of the ANU School of Music.
This issue of the potential uses and limitations of videoconferencing in music education has been the object of heated discussion at The Australian National University (ANU). In May 2012, the university executive announced that it would be moving away from a one-on-one, face-to-face teaching model, in favour of encouraging participation in community music activities and master classes. This learning model was put forward as 'financially sustainable' and 'flexible'.  

A contentious aspect of the proposed changes was the reliance on videoconferencing with the Manhattan School of Music. This decision by the university executive has been met with much resistance, due to concerns over the efficacy of videoconference teaching. An Emeritus Professor at the ANU School of Music, Larry Sitsky, described the changes as 'a withdrawal of responsibility and supervision'. He continued: 'You need a lesson every week, and ... it is not just knock on the door, have a one hour lesson, disappear. The teachers are there also for the rest of the week to consult, because it is a mentoring of a very close kind'. Without this face-to-face mentoring, Sitsky stated that the music program 'lacks any real substance'. One music student interviewed likened the learning model to what is often offered in primary schools, indicative of its inappropriate application at a tertiary level. In other words, where videoconferencing offered a viable alternative for music students at an intermediate-level when used in conjunction with face-to-face lessons, it was not seen as feasible as a principal learning method for building expertise.

A key concern about this move away from face-to-face teaching was that, as with the case of Telehealth, videoconferencing could not deliver the necessary sensory nuance and precision for expert practice. Matthew McDonald, principal bass of the Berlin Philharmonic Orchestra and a graduate of the ANU, spoke out against the changes on these grounds:

One thing has to be made clear, music can only be learned in a one to one setting ...

An understanding of musical tradition and its application to the mastery of an instrument is entirely dependent upon direct human contact. Books, notated music, and yes, even recordings, cannot fully communicate the details of this.

Piano student Adam Cook similarly emphasised the vital sensory aspects that could only be shared face-to-face:

You’re actually in physical contact with your teacher. You’re listening very intently.

They are sitting at the instrument next to you, or using their own instrument to

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353 Ibid.
354 Ibid.
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demonstrate something to you, and you’re able to get right in and have a look at exactly what’s going on, and they are able to look at things that are happening with your body, and are able to say “no, this is wrong and this is correct”, and I can guarantee you that there is absolutely no way that that will succeed ... with a TV screen and a camera in the way. No matter how good the quality of the broadcast is in terms of sound or video, it will not happen.\textsuperscript{356}

In both of these testimonies, the musicians were highly sceptical of the value of videoconferencing for tertiary music performance education, specifically because of its limited sensory aspects. William Moxey, another musician, commented: ‘The illustration ... of offering a medical degree without a practical component is perhaps the sort of language that may be understood’.\textsuperscript{357} The implication of this analogy is that the reduced sensory engagement of the videoconferencing format was akin to a lack of experience. The message in the case of tertiary music education and Telehealth is similar: such technologies can have a use when used as a supplement (not a replacement), but are more suited to some contexts than others. For cases where fine sensory discriminations are being made, they can be very ineffective.

While looking at hearing in isolation is useful methodologically, everyday experience, learning, and, perhaps most importantly, expert practice, is multisensory. Sensing in this way is not a matter of being aware of separate sounds, sights, feels, tastes and smells. Rather, the boundaries between the senses can be unclear or permeable. Together, they contribute subtle and distinct indicators that form a picture of the whole. Removing one or more sensations can reduce the appreciation, understanding, and appraisal of a situation, whether this is the result of a narrowing focus in a high stress context, or the realities of innovative technologies. For the experts interviewed in this thesis, a concern within epistemic communities should be the protection and promotion of the multisensory approach. This may include support in skill development with regards to maintaining an open awareness. It also poses a challenge to the use of videoconferencing technologies in their current manifestation, particularly in critical decision-making contexts. Lastly, it reinforces the limitations of rule-based learning.

\section*{Conclusion}

This chapter has shown how the senses are intertwined and interdependent. Their artificial separation in mental processes can cause misunderstanding and a loss of meaning. While in language, learning, and also in this research, the senses are often separated for the heuristic

\textsuperscript{356} Shirley, "Facing the Music."
\textsuperscript{357} McDonald, "Testimony: Matthew Mcdonald."
purpose of clarity, this analytical distinction can be misleading. What is critical, then, is facilitating and maintaining holistic knowing and perception as much as is possible.

Understanding can be positioned in a multisensory context from early learning, as was the case for many adventurers. Hearing can also be conceived in more narrow terms as a tool for active analysis. In these cases, though, there is an agenda, such as the pursuit of a 'pure', rational classical music, or 'active' listening in medical practice. Expert understanding is always multisensory.

Opening up awareness and holistic understanding comes with expertise. As was shown through chapters 5 and 6, this multisensory knowledge is built through experience and mentoring, rather than formal learning. It is what allows experts to do their job well. This presents a particular challenge for experts operating across vast distances through multimedia technologies. The challenge that this poses is working towards modes of operating and knowing that respond to the context, as well as the directives of expert perception and understanding.
Chapter 9

Conclusion

This research has highlighted the social aspects of hearing. In particular, it has shed light on the social production of, and uses of, specialised aural capacities in four epistemic communities. The most defining feature of this approach has been the emphasis on hearing as a form of knowledge. As noted in Chapter 2, most research on the senses has not approached hearing in these terms, and indeed my approach has challenged the types of understanding and the practices that are typically brought to mind by the word ‘knowledge’. My positioning of the senses was built on Barth’s definition of knowledge as a ‘modality of culture’, and the avenues through which worlds are engaged with.\(^\text{358}\) In using this definition, this thesis has been able to examine knowledge and learning holistically, including not only its formal parts (or knowledges that might be termed ‘objective’) but also its informal, experiential, variable, flexible, and responsive aspects. This approach has facilitated a deeper investigation into the formation of the senses, and has provided a means to rigorously work through phenomena often corralled as ‘cultural’.

To address the senses in critical terms, this thesis has worked to unravel the community-centeredness and broader social location of hearing by looking at sources of knowledge, means to knowledge development, and the practices of those operating at an expert level. This approach was in keeping with Barth’s call for an examination of ‘how different kinds of knowledge are constituted, produced, and used’.\(^\text{359}\) It also responded to DeNora and Glaser’s arguments that insufficient attention has been paid to their respective fields of music and knowledge at the level of ‘process’ (see Chapter 2). By focusing on processes and layers of

\(^{358}\) Barth, "Other Knowledge and Other Ways of Knowing," 66.

\(^{359}\) Ibid., 67.
influence in epistemic communities, as well as the different stages of understanding, this thesis provides a critical step in efforts to examine the making and location of sensory experience and knowledge.

**Key Findings**

Throughout this thesis I have argued that aural knowledge is fostered and practiced within epistemic communities. To establish this argument, I examined community values and approaches (Chapter 4, Chapter 8), their learning methods (Chapter 5), and their knowledge and practices at an expert level (Chapter 6, Chapter 8). These chapters have shown the people, contexts and processes that influence sensory knowledge from a beginner’s stage to the achievement of mastery. While communities were identified as the central stores of sensory knowledge, an inescapable theme was the diversity within these communities (Chapter 7). I argued that while we could speak of ‘epistemic communities’, this unit of analysis did not imply a uniformity of approaches, skills, preferences, or understandings. These findings can be framed in terms of three elements: the uses and limitations of rules; understanding in context; and ways of gaining expertise.

**Uses and limitations of ‘rules’**

Throughout this thesis, a uniform finding has been that epistemic communities have ‘rules’, whether formal or informal, that guide their practices. As shown in Chapter 4, these ‘rules’ can be messages captured in stories, or as the examples in Chapter 5 showed, they can be the techniques and sounds that are labelled as ‘normal’. ‘Rules’ can also be more explicit, just as they can be contested, as the river crossing example from Chapter 6 highlighted. Taken together, these examples suggest that rules inform sensory knowledge and practice, they are established through diverse channels, they tend to be multiple and competing, and finally, for experts, they can become redundant, or contrary to expert practice.

‘Rules’ are implicit in the principles and values of communities. Chapter 4 detailed the conceptual context of epistemic communities’ aural knowledge. I argued that within and across communities there were different ideas about hearing that reflected and reinforced community practices. One example that illustrated this was how people within the adventurer community used or rejected portable audio devices in line with their approach to the environment. For those pursuing solitude in the most pure of senses, portable audio devices were ‘banned’ on trips. At the opposite end of the spectrum, the same devices were recognised as tools for coping with pain and discomfort, or managing arduous tasks with...
minimal connectedness. In these cases, audio devices and their implications in terms of sensory experience were intimately entwined with the most basic principles that underpin practice in the bush or mountains.

These often informal 'rules' were not limited to hearing, but as examined in Chapter 8, they also framed the senses and perception more broadly. To continue with the adventurer example, for those pursuing solitude, at their best and most safe, open awareness of all sensory inputs was essential, reflective of an approach of humility and a desire to engage with nature. Where in this case hearing was understood as one strand of a multimodal experience, some communities and organisations promoted modes of engagement that required sensory isolation. For example, in the case of the doctors, good judgements were thought to be the result of isolated and active hearing. Accordingly, the stethoscope was an ultimate symbol of medical professionalism. Similarly, among classically trained musicians, musical listening tended to be analytical and focused on a pure aural experience, reflected in the norm of silent attention in recitals.

Existential understandings of the bush, including whether or not an audio device was allowed in an adventurer's pack, were picked up informally through the sub-communities to which beginners and even more advanced adventurers belonged. While such 'rules' were largely informal and as much implicit as explicit, there were also cases where 'rules' were formalised and articulated. In the communities studied, examples of these more formal lessons included the patient examination, and the formation and reception of Morse signals (see Chapter 5). In these cases, overt procedures were accompanied by explicit ear training to pass on both techniques and principles of professional practice, such as accuracy and speed in the Morse case.

Closely related to community 'rules' was the notion of 'normal' sounds introduced in Chapter 5. Musicians observed that they developed sensitivities to certain pitches, harmonic structures, and timbres, and came to appreciate these as 'normal' music. Some aural sensitivities were fostered through peak performing arts organisations, others through family or private lessons, but in most cases what was normal music was based on sets of rules such as systems of harmonic relationships, definitions of musical timbre, and at the most elemental level, the precise location of a pitch as measured in hertz. These sets of rules made up a musician's understanding of 'normal' music, and formed the basis of functional skills in listening and music-making. 'Normal' emerged here as a foundation for practice, giving a professional 'a basis to work upon', as one doctor put it. In Chapter 6, this sense of 'normal' was shown to be critical for decision-making, as it allowed attention to be focused on more challenging tasks. For example, an expert anaesthetist in an operating theatre was able
simultaneously to process a multitude of sensory inputs in a given situation because 'normal' inputs remained in the background until a change to 'abnormal' conditions demanded that they be attended to closely.

While hearing was conceived narrowly in some epistemic communities, the thesis also showed that such rules were often ignored, particularly by experts. In chapters 6 and 8, expertise was understood as consulting the world and being responsive. As a result, where some rules or procedures within epistemic communities were focused on sensory isolation and 'active' listening, judgements were usually based on a synthesis of multiple inputs. In the medical case, this might mean listening to patients, but also combining these inputs with visual and tactile cues, as well as the general 'sense' of a situation. I positioned this more nuanced relationship with rules in terms of a distinction between professional competence and expertise. Critically, however, I showed how in most cases, even professionals operating beyond a community's rules in practical terms were still bound by them by virtue of their professional context. For example, while doctors formed impressions of a patient's health through their senses, the medico-legal environment also required running tests to support their initial judgement.

This theme of the uses and limitations of rules has demonstrated how aural knowledges were framed within communities, but also how this acuity constantly and necessarily evolved in response to context. Specialised aural capacities were valuable to the epistemic communities studied, which was why they were given a conceptual framework and, in some cases, explicit rules. These rules guided community members in their practices, and influenced sensory judgements. Yet, these conceptual frameworks and rules did not capture every sound and potential application of the senses. Expert judgements were based on highly subtle and nuanced sensory indicators specific to contexts. As such, most experts found that they left rules behind, and instead applied their accumulated sensory knowledge in response to given conditions.

**Understanding in context**

A recurring theme throughout the thesis has been that knowledge is always located in a particular context including the social, environmental, and historical, as well as the precise role held in any given situation. This issue was the focus of Chapter 7, where I argued that individual knowledge and skills varied with the context of their understanding. By examining gatekeeping, diversity within communities, and multi-community engagement of individuals

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360 See Turnbull, *Masons, Tricksters and Cartographers*; Glaser, "Macrostructures, Careers and Knowledge Production."; Wenger, *Communities of Practice*. 220
throughout their lives, I showed how the ‘rules’ of epistemic communities rarely led to homogeneity of knowing.

Chapter 5 showed how epistemic communities play a critical role in the formation of the musical ‘normal’. Given the variation within the music community, it is intuitive that the rules would also tend to vary enormously. Certain aspects of musical knowledge such as the classical canon, standard harmony, and, to some extent, ideals of timbre were institutionalised, particularly in the case of classical music (and musics that were taught formally in a music school context). Yet, even within sub-communities that tended towards standardisation, the precise understanding that individuals developed varied across locality, networks, and the totality of an individual’s experiences.

A consequence of this diversity was that while it was heuristically convenient to consider epistemic communities as cohesive knowledge groups, it was also misleading. Communities tended to be fragmented and overlapping. The resulting heterogeneity of experience had significant implications for power and influence over shared knowledge and meaning in communities. There were influential people and organisations that shaped hearing practices and the scope of meaningful sounds. These people and organisations were influential, though this influence depended on epistemic trust as well as competition between ideas.

Because heterogeneity was found in each community this meant that some common knowledge, language, and skills in negotiation were critical for their effective functioning. With their direct focus on communication, musicians and Morse operators provided the clearest examples of how a lack of shared language could result in miscommunication. In the Morse community, for example, operators in different organisations and sometimes in different localities were trained on different technologies, and had their own operating procedures. While there was one Morse code, its interpretation and use was contingent on the aural knowledge held by particular operators in their working contexts. The success of collective practices such as transmitting a Morse message, or presenting a cohesive music performance, required a certain shared knowledge basis. It necessitated the establishment of a shared language, as well as a clear understanding of the goals and priorities in a given context.

The discussion of musical ‘fluency’ in Chapter 6 emphasised the context-specific nature of expertise. It showed how expert musicians’ aural knowledge was limited to their music. However expert, a flautist and Australian composer could hear Indian folk music and find it meaningless. Similarly, an elite violinist or trombonist may fail to earn a spot in one orchestra because their sound was not congruent with the ensemble. For the musicians, and also the doctors, lay members also formed an influential part of the community context, as practice
was subject to professional standards, community expectations, and the implications of different contexts. A music audience could influence a musician’s expert practice by responding to the quality of their dress. Similarly for the doctors, tests were sometimes run due to the growing societal expectation that they were definitive. Generally, this aspect of an expert’s context was easily integrated with their other practices, though there was concern that they could compromise expertise.

Expertise itself was framed as responsiveness to a given context. As I expressed in Chapter 6, experts consult the world. Aural expertise, then, was not the ‘best’ hearing. Rather, it was a capacity to continuously take in all of the indicators and form accurate judgements about a situation in a given moment and place. The river crossing example given by the adventurers highlighted this attribute of expertise in the context of the limitations of rules. Aural and other sensory cues were integral components of their subtle, nuanced and context-specific judgements. From the perspective of expert adventurers, the ‘agreed’ procedures of river crossing were often inadequate because, in a context where the situation and an adventurer’s understanding of it was shifting moment to moment, the rules rarely applied in their entirety. Accordingly, to speak of ‘best practice’, in a sense, missed the point. This finding reinforced the argument that knowing is located.

Ways of gaining expertise

Another significant finding was that a holistic knowledge within any epistemic community demanded an appreciation of multiple knowledge types and sources. My examination of sensory knowledge showed the critical role of the often-overlooked informal and experiential modes of learning. Particularly with regards to sensory knowledge, people learnt more through experience and mentoring than reading a textbook or undertaking formal sensory training. However, these informal and experiential aspects were often only part of the learning puzzle. The case of the doctors revealed that formal and theoretical knowledges also performed important roles in sensory skill and knowledge acquisition. To repeat one doctor’s explanation of the role of theoretical knowledge: ‘Knowing simplistically what generates the sound gives you a bit of a feel for why a sound happens’. While the doctors had a high regard for formal education, effective medical judgements – such as being able to hear a seagull murmur or see jaundice – could only be realised through informal and experiential learning. As I concluded in Chapter 5, some communities tended to privilege some learning methods over others, but formal, informal and experiential learning were frequently interdependent.

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The importance of this finding is that while learning is most effective when approached through holistic means, the methods that are best or most effective depend on the content being learnt. In other words, in addition to the influence of context, the types of skills and knowledges to be developed also impact on effective approaches to learning because knowledge types could build different understandings. In the case of the musicians, for example, it was found that more informal and experiential learning developed a contextualised sense of musical meaning. Formal learning, particularly in the context of the classical tradition, was seen to be important for learning the theoretical aspects of classical harmony and technique, as well as a language with which to discuss music. Expert musicians interviewed felt that expertise or musical ‘fluency’ required both aspects of musical knowledge. However many believed that the best musicians began informally, took formal lessons, and then continued to refine their own musicianship through practice and experience. There was a similar pattern in the Morse case, with Morse operators beginning informally with a mentor, working through their formal training, and refining their practice with experience.

The role of different types of knowledge was also revealed in the case of the doctors. The first highly-valued step in the development of medical knowledge was formal learning undertaken through the university system. This knowledge was largely theoretical. However, professional practice ultimately relied on more informal or experiential learning methods. Some of this learning occurred during a training doctor’s university degree, though most happened in the workplace after graduation. This often meant that commencing professional practice involved a substantial learning curve.

Those working towards mastery engaged in lifelong learning. Individuals built their skills and understanding through their professional roles, friendships, the places they went, the cases they encountered, and the organisations that regulated them. Formal, theoretical, and articulated knowledges were essential means to developing understanding and technical competence. Equally, practicing with others and alone were crucial for developing ‘fluency’. Referring back to the uses and limitations of rules, this fluency involved going beyond formalised knowledge, and even the informal knowledges of others. It meant that experts had built their own systems for decision-making and practice, which they continually tested and revised to develop their own stock of knowledge. The continual accumulation and modification of knowledge was required especially in the case of the senses, as the judgements of and connections between increasingly subtle and nuanced indicators were sharpened.
Future directions

The findings of this research enhance our understanding of sensory knowledge in the context of epistemic communities. As I outlined in the previous section, the study has added to our understanding of learning processes, expert practices, and issues of knowledge management. A major advantage of this thesis was its multiple case study approach, as well as its inclusion of community members from intermediate through to expert levels. As I detailed in Chapter 3, this method was adopted because of its capacity to provide rich data and contextual depth, as well as the nuanced understandings that come from a comparative approach. Approaching sensory knowledge from multiple angles was particularly valuable, because the senses are often neglected and rarely conceptualised. By focusing on the senses from multiple angles, I have been able to take a first step towards a better understanding of knowledge processes relating to the senses.

While this comparative approach provided a breadth of community experiences, it necessarily compromised on depth. One area that emerged for future research was the conditions for building sensory aspects of expertise in communities and organisations. As highlighted in Chapter 6, building expertise is a complex process that is more than the product of formalised training, development of professional procedures or regulations, or time spent in a particular activity or occupation. Time was required to develop the sets of expertise, and the knowledge gained in formal contexts was valuable. Additionally, experience and mentoring were identified as important facilitators. Although professional organisations tend to be strong in the area of formal training, they can be weaker in their support of informal and experiential learning. In the field of organisational knowledge management, expertise is receiving close attention with the aim of reducing knowledge loss caused by a high degree of worker mobility. The nature of expertise deserves ongoing attention, with an additional awareness of sensory knowledges and the organisational cultures that support their development.

A closely related issue emerging from this research which needs further attention is the identification and support of expertise within communities. Chapters 6, 7, and 8 all sought to address this issue of expertise, expert autonomy and organisational management in the context of supporting experts to make nuanced judgements using their sensory knowledge. I argued that this capacity distinguished them not only from beginners, but also those who were professionally 'competent'. In the broader community, there is a push towards reducing errors, which has resulted in resistance to expert practices such as intuitive decision-making. Reducing errors here is typically thought to be achieved through the development and

See Lam, "Tacit Knowledge, Organizational Learning and Societal Institutions."
monitoring of rules and regulations. Yet, as I showed in Chapter 6, these rules often diverge from expert practice, and can inhibit the capacity of experts to make the sensory judgements that allow them to make full use of their expertise. The doctors, for example, with their largely professional bureaucratic model, supported more expert autonomy than tended to be seen in the other communities. Contrasting, the recent move towards formalising adventurer learning and standardising potentially hazardous practices such as crossing rivers has been observed to inhibit expert practice. This issue of management of expertise in communities is critical, because in some cases expertise can mean life or death. For example, in the river crossing case, adventurers observed that the application of their sensory knowledge in response to a given context was most vital for their judgements about entering the water and continuing to cross. Future research that examines contexts and cultures that support the sensory aspects of expertise would be valuable. Further work would be critical for high reliability professional communities, for example engineering, as judgements of risk are partly informed by the senses.\footnote{See Andrew Hopkins, \textit{Disasterous Decisions: The Human Causes of the Gulf of Mexico Blowout} (Sydney: CCH Australia, 2012).}

The contemporary medical example of Telehealth is one case where the perceptual conditions for expert practice need further attention. This was illustrated in the example of a medical professional from rural Australia who voiced concern over the application of videoconferencing technology for patient consultations. The physician described how his capacity to make judgements about the health and wellbeing of his patients was undermined because the technology does not allow for fine sensory discriminations. There are good reasons why such technologies are used, such as the ability for care to be given when none would be available otherwise, but the implications of its use and possible strategies to increase its effectiveness deserve further research.

Processes that promote development and use of expertise are crucial for organisational functioning, particularly in critical contexts where nuanced sensory judgements are central in decision-making. Throughout this thesis I have examined the processes by which such understanding is developed, what can be achieved through expertise, as well as the contexts of and barriers to expert practice. The social forces behind effective processes are necessarily dependent on context, which implies a need to consider the role of experience and the importance of organisational and community cultures geared towards building and supporting expertise. More research is required to understand the different processes of sensory knowledge and skill development, particularly at an expert level, as well as the organisational
contexts most likely to optimise expert practice. This would allow organisations to support vital sensory knowledge development through their formal and informal learning processes.

While more sociological research on the senses is proceeding, it remains a nascent field. Studies have focused on locating the senses at a societal level, and more recently at a micro level (see Chapter 2). Looking at the senses in these terms has highlighted an aspect of life that has tended to be taken for granted. This study has contributed to this research by providing a set of ethnographies of hearing in four epistemic communities. Furthermore, it has also taken a step towards a sociology of the senses that not only locates them, but explores how they are fostered and used, how they change and how their value can be preserved in an increasingly virtual world. At this stage, there is significant scope to consider how the field can be theoretically situated, and possible directions for empirical research. Following Barth, my approach to the senses has been to consider sensory perception as an active and dynamic knowledge that forms a critical part of epistemic frameworks. Such an approach focuses on processes of sensory learning within their community contexts. Regardless of the heuristic used, it is not enough to describe sensory aspects of culture: a sociological approach to the senses must take account of not only context, but also the processes at work, and the relationships between people and their worlds.
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