All about noise

Mike Goldsmith's new book on noise is like a history lesson, but interesting, finds Lis Stedman

From its eye-catching if slightly worrying cover onwards, *Discord: the story of noise*, a new book from the ex-head of the National Physical Laboratory Acoustics Group, Mike Goldsmith, breaks enjoyable new ground. He succeeds, somehow, in recording the history of noise in highly-readable and often amusing detail.

His approach teams clear explanation of the often-complex terms and concepts that frame acoustics with witty asides, so for both the interested acoustical beginner and the expert it will prove a rewarding read. Given that it provides succinct explanations of the arcane terms beloved of acousticians, it's clear that many of his messages are for a wider audience beyond the noise fraternity, which shouldn't discourage anyone who enjoys a good book from picking it up.

Goldsmith manages that rare feat of combining a book that should, by all normal standards, be highly technical, with a plethora of fascinating and occasionally bizarre detail –an intelligent and amusing commentary that documents the history of noise from the fortuitous 'clumpiness' of the early universe via Chaucer's fondness for farts right through to the latest breakthrough acoustic devices.

One has to begin with the observation that the book is not strictly just about noise, but sound (a distinction that could in itself cause endless discussion). Hence it deals with both the discoveries and benefits of sound and the whole evolution of the art and science of quantifying and dealing with noise.

Goldsmith himself, interestingly, eschews the standard definition of noise as "unwanted sound" in favour of "sound out of place," explaining: "A trumpet is just what is wanted in a piece of jazz, but is not so good in a lounge."

His book provides, among many other elements, a creditable ongoing discussion of why it is that it is so difficult to define noise, and the best way to define and measure it. Early on, he notes that for millions of years loud, irregular sounds have signalled danger, adding: "Our tiny shrewlike ancestors, scampering from the thundering of tyrannosaurs, are connected by an unbroken thread to the angry sleepers under the flight paths of aircraft."

He also observes contentiously (but accurately) "even quiet sounds can become frightening noises if they are unidentifiable, particularly when heard in the quiet of the night when their source remains unseen." Wind turbines?

Goldsmith's peregrination through the history of noise takes the reader through such treats as cave-age lithophones (rock gongs), the ingenious and beautiful earthquake detector of the ancient Chinese scholar Zhang Heng, and many more wonderful and odd inventions.

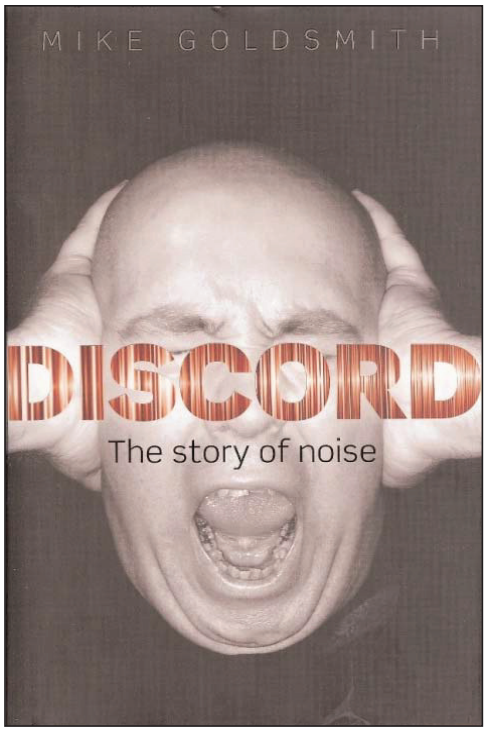
Under the chapter on classical noise readers will find an eclectic mix: Achilles and Minerva from Homer's Iliad; Pythagoras' acoustical research and the myth of the music of the spheres. The irritation of a scientist is revealed when Goldsmith likens this type of approach to the heated debate that raged on for centuries about why adding a goldfish to a bowl of water does not increase its weight, which "continued undisturbed by a single experiment – which would have shown that it does".

Ancient uses of the properties of sound were truly fascinating – take Herodotus' account of the Persian siege of the Libyan town of Barca, in which the assailants tried to tunnel beneath the city. They were foiled by the ingenious use of a brass shield laid down (as Goldsmith notes, this must have been done with some force) on the ground – where the earth was undermined the shield rang, the Barcaeans dug down, and killed their enemies.

The amble through history also reveals that the Romans were plagued by noise (despite mocking the "decadent" Sybarites, who banned noisy trades – and roosters – from within their city walls). Reading the description by Vitruvius of the nature of sound is to understand that humans have been trying to define this elusive concept for an extremely long time, even if (like Vitruvius) some of their ideas about how it worked were a little wacky.

The observations of the attempts to control noise in fifteenth-century London illustrate a step towards regulation, starting with an ordinance stating that "no hammar man, as a Smith, a Pewterer, a Founder, and all Artificers making great sound shall not worke after the houre of nyne in the night, nor afore the houre of four in the Morninge." By today's standards this is remarkably generous, but a start nevertheless.

Zoning (which the book dryly refers to as 'that ever-popular cure-all') first made an appearance in the 16th century, with some leases occasionally stipulating times and places where certain activities could not take place. However, progress was "scattered and slow", Goldsmith notes, and even in the mid-17th century the Cheltenham Assizes frequently had to halt proceedings because of street noise.



NPL's Mike Goldsmith has produced a very readable book on noise

The book's observation that "people who complain vociferously about noise – with no matter what justification – run the risk of being thought of as unreasonable, oversensitive, selfish or just plain mad" will strike a modern chord (to pick a suitably musical metaphor) with many readers – Goldsmith cites the mocking of Morose, the noise-sensitive character in Ben Jonson's play Epicoene, as an early example.

Morose had plenty to be doleful about – among the most fascinating of the book's many excerpts are the examples from historical texts illustrating long-lost soundscapes, such as Dekker's 1606 description of London: "In every street carts and coaches make such a thundering as if the world ranne upon wheeles: at everie corner men, women and children meet in such shoales, that postes are set up of purpose to strengthen the houses, least with jostling one another they should shoulder them downe. Besides, hammers are beating in one place. Tubs hooping in another. Pots clinking in a third, water-tankards running at a tilt in a fourth."

The book goes on to document the early 17th century flowering of art, science and inquiry, with Galileo Galilei and his father Vincenzo at the heart of furthering research into harmony and dissonance – those with a smidge of musical knowledge will find this section fascinating. The history of acoustics, it transpires, is littered with both geniuses and eccentrics, whom Goldsmith portrays with equal gusto.

Charting the course of sound onwards from unbelievably noisy "uncouth and cumbrous" early locomotives and miners who preferred their Watt pumps to screech (a comforting reminder that they were working), and the first real recognition, in the 19th century, of the health effects of noise, Goldsmith makes a fascinating observation of the apparent immunity of industrial noise from criticism: "It may be that noise was so intrinsically associated with industrialisation that it seemed to be an irremovable part of it, and that to criticise noise would be like criticising steam power itself."

The equally strange corollary was a rise in antipathy towards "religious noise", church bells – he suggests that by this time industrial machinery "had fully supplanted religious sound sources as "sanctified" or "sacred" ones – a good example of his quirky, intelligent take on the subject.

Droll observations also abound in the book – one particularly lovely one relates to an early steam carriage, of which Goldsmith notes: "The fact that the vehicles had seven(!) radiators, which exploded from time to time, may also have been a factor in their abandonment."

He also observes, first, the Railway Bonus and later, the mysterious Aircraft Malus (the weighting effect of the fact that people seem to quite like train noise but dislike airplane noise). Musing on these quirks, he wonders whether they can be ascribed to the fact that people can never absolutely be sure a plane flying overhead isn't going to fall on them and kill them (though plane noise from ahead seems to annoy people more than noise overhead, oddly), but trains "rarely kill people who aren't travelling on them". Such opinions will no doubt generate much discussion.

There is much more fascinating history before Goldsmith catches up to familiar territory – the trail follows the views of Florence Nightingale (that noise was "an absence of care"); Bell's seriously-weird version of the phonautograph; and wartime advances in sonar, through the definition of the decibel and A-weighting (admirably explained) and a sterling section on John Connell, whom Goldsmith admires.

His descriptions of the "disharmony" between various key nations' approaches to noise sets the scene for the modern era, charting the gradual change in mindset from seeing noise as inevitable or even positive, to understanding its health effects and making increasingly-structured attempts to quantify and counter them.

The book's reach is as wide as its subject, discussing such vastly different topics as the development of building acoustics, the use of sound in interrogation, underwater acoustics research and lithotripsy (the use of sonic shocks to destroy kidney stones). Goldsmith also ventures into the unheard territory of ultrasound and infrasound, and the struggle to achieve recognition of the latter as a real effect (including mention of various legendary hums around the world).

He later introduces the popular but controversial theory that infrasound may be the root cause of some so-called "ghostly" phenomena, as it can (apparently) affect vision and create feelings of dread and depression.

The RANCH project rightly gets fair mention, and interestingly in the process of charting the various laws that have appeared he describes the EU as "the star of the show" as far as noise is concerned, having replaced the US as the world leader in noise control.

Charting everything noise-related takes the book onward through wind turbines, describing their effects as "not just a new noise; it is also an unusual one in several troubling respects". He efficiently summarises the effects, the issues and the conflicts, of which he notes: "Of course the answer is not that we need to decide which issue is most important but to come up with a solution that pays due and balanced regard to all. Without such compromises, only conflict, inefficiency, and alienation can result."

Having said this, Goldsmith notes the difficulty of applying dose-effect relationships to realistic situations, describing this as the one major remaining research gap. He goes on to describe the development of the END, which is the latest attempt to determine and reduce the overall impact of noise, and about which he is overwhelmingly positive.

The section on ANASE will doubtless raise a wry chuckle or two, not least from Flindell et al at MVA. Goldsmith notes that the results were published after a long delay, observing: "At this point the government made it clear that the results were not really that interesting; in fact they were hardly worth looking at; it wasn't sure why it had bothered to get the survey done in the first case, and it certainly wouldn't be worth taking the results into account in deciding future policy. So one could tell something significant had turned up."

He speculates that the increasing intolerance of aircraft noise might be due to further changes in society as to who holds the whip hand, but adds that the approach to tackling noise in the UK is still complex and generally still based on the laws of public and private nuisance. One suspects many will agree.

The final segment deals some real gloom, quoting Francis McManus's opinion that national noise strategies are weak and vague; he also offers some detailed discussion of the ongoing negative effects in the US of the closure of the Office of Noise Abatement and Control. He looks generally at noise issues and activities in other countries including Russia, China, Australia and Japan, which demonstrate, if nothing else, how very differently other places approach the topic.

The final segment of the book looks to the future, and perhaps inevitably concludes that some noise is almost as problematic as it has ever been, although significant efforts have been made in combating other pollutants, such as odour.

In response to why this should be, he highlights an effect he observes at various points in the book, that regardless of whether a sound is quieter than previously, our hearing has evolved to clearly hear it – hence, closing one window in a house represents very little sound attenuation. He notes that "the inevitable consequence of this is that, while removing 90% of litter, CFCs or burglars is 90% of a good job done, removing 90% of an annoying sound is barely noticeable".

He also notes an unsettling truth, that noise is a source of power for the noise-maker, saying: "So noise is made deliberately by many, whether Watt miners who liked their pumps screechy, the owners of ghetto blasters and boom cars, or those who shout into their mobiles in restaurants. The flipside of the power of noise is that those who complain about it are regarded as weak."

His subsequent dissection of this phenomenon is unsettling, thought-provoking and offers potential approaches to enable change. These include the possibility of using devices called Micro Electro Mechanical Systems (MEMS, which are already used in mobile phones) as cheap and robust noise monitors to increase the real-life data available.

On the way forward, he makes the important point that "progress is possible only if governments grasp the nettle and decide on quantitative criteria, following full but finite discussion with local authorities and communities". He provides many more interesting conclusions, and ends on an encouragingly positive note.

What will people take from this book? On the one hand, it is frustrating to review in that as it follows a timeline, it does not necessarily follow a trend or train of thought. Ideas and inventions pop up like bubbles and then disappear to resurface much later, as a new mind takes the baton and progresses them.

On the other hand, this approach is fascinating for the reader, in that it gives a real flavour of the vastness of the subject and the struggle for understanding, in which concepts are born in raw form but then may lie dormant, sometimes for a remarkably long time.

The author's combination of expert standpoint and readable style should hopefully bring some important messages to a much wider audience than usual – it's a book not only to read, but to re-read, for the sheer fun of it. Not something that can be said about every book on noise!

● *Discord*, ISBN 978-0-19-960068-7 is printed by Oxford University Press, hardback, list price £16.99.