Sound of Our Times
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Everyone in the acoustics community knows names like Bell, Chladni, Edison, Helmholtz, Hertz, Lagrange, Kirchhoff, Laplace and Tyndall (in alphabetical order), and Mr. Strutt, better known as Lord Rayleigh. But, who of us knows, in detail, what each of those people has achieved during their time in acoustics? Robert T. Beyer's book gives the answer, not just by presenting their life dates, some notes and a picture, but by presenting their experiments, their measurement setups and their results. This approach provides a detailed in-depth view not only about the achievements in acoustics during the last 200 years (starting from 1800), but even more, it gives insight into the community of physicists exchanging opinions by letters (no Twitter, Donald, no!), discussing ideas back and forth, and – in the end – coming up with a common agreement about a solution or an explanation. Wouldn't this be a kind of model for present-day international politics?

The book has 10 chapters, two of them dealing with distinct persons, the others referring to time periods:

- Chapter 1: The State of Acoustics in 1800
- Chapter 2: Acoustics 1800–1850
- Chapter 3: von Helmholtz and Tyndall
- Chapter 4: Lord Rayleigh and his book
- Chapter 5: Investors in the Fore!
- Chapter 6: The Last Half of the Nineteenth Century
- Chapter 7: The Twentieth Century: The First Quarter
- Chapter 8: The Second Quarter of the Twentieth Century
- Chapter 9: The Third Quarter: 1950–1975
- Chapter 10: Acoustics 1975–1995

Chapter 1 starts with the works by the German lawyer and physicist E.F.F. Chladni (known for his modal patterns) and the English ophthalmologist and physicist Thomas Young (giving name to the modulus of elasticity). The following sections treat the contemporary knowledge on sound propagation, sound production and sound reception. The author not only discusses the achievements of both persons but also draws a line through the entire scenery of physics and physicists (called "natural philosophers" at that time) contributing to clarify – for example – propagation phenomena like velocity of sound in air, liquids and solids, diffraction and refraction, and echoes. The extensive reference list at the end of this and all other chapters refers to the respective original literature or to translations to the English language as far as available.

In Chapter 2, the sections propagation, production, and reception are kept and updated to that time. Due to the lack of apparatus for generating and measuring sounds (like in other fields of physics, e.g. electricity, magnetism, optics and thermodynamics), it was hard to obtain "neutral" experimental data, not being affected by the experiment's setup and influencing the result, complicating the task to study and to extract the fundamental physical phenomenon.

Chapter 3 pays tribute to the famous Hermann von Helmholtz and John Tyndall. Von Helmholtz's book "On Sensations of Tone" got translated by himself into English in 1862 already, in the same year of the original German edition. Tyndall's book "On Sound" published 1867 had a similar effect on the acoustics community as the former one. Both became friends, based on extensive exchange of letters. Julius Robert Mayer – the "discoverer" of the law of conservation of energy – became known to Tyndall by von Helmholtz showing that "natural philosophers" at that time had not a single field of interest, but were working in several areas in parallel.

Of even larger impact was Lord Rayleigh with his book "The Theory of Sound," covering the entire Chapter 4 in Beyer's book. Rayleigh got interested in acoustics by reading von Helmholtz' book and was also in contact with Tyndall. Those of you not having found the time to read "The Theory of Sound" could also go for reading the review von Helmholtz wrote about Rayleigh's book (also reprinted in an annex of Beyer's book).

Chapter 5 is on the technical achievements to bring acoustical devices to the society in the whole. Telegraph and telephone are closely associated with the names Joseph Henry, from Albany, NY, Philip Reis, Alexander Graham Bell and Thomas Alva Edison. The latter is also the inventor of the so-called "phonograph," the first recording device reproducing sound "stored" on an engraved and rotating cylinder. The chapter describes the developments in detail and uses several contemporary illustrations (this holds also for all other chapters in the book).

In Chapter 6, the new devices for making sounds visible are discussed. Formerly, only the modal patterns by Chladni making use of sand or some organic particles were known. Blake used a photographic plate to store oscillations reflected by a mirror from the microphone of a telephone, enabling to judge the time structure of vowels and syllables. The German August Toepler invented a stroboscope technique to study the so-called "singing flames". Later he invented the "Schlieren-pictures" – named after him till today – enabling to show waves being reflected or refracted at obstacles based on differences in optical refraction of the propagation medium. All this also led to the study of shock waves, mainly driven by the interest of generals about projectile sound/noise.

Besides ballistics topics also ”blast noise” (euphemistic for explosions) came into view. But, real battles in the second half of the 19th century drained the river of international scientific contacts, exchange and cooperation. The work of Ernst Mach (also by making use of “Schlierenpictures”) is closely related to that period. For something less military: J.B. Upham from Boston discovered that pleasantness/unpleasantness of rooms is related on how the sound persists (the term “reverberation” yet not been defined) to which Wallace Clement Sabine gave birth in 1868.

Chapter 7 covers all sorts of devices being developed based on the widespread availability and use of electricity: microphones, loudspeakers and amplifiers using the new vacuum tubes. The discovery of oscillators led to the invention of the radio based on the works of Heinrich Hertz. The oscilloscope – forming the basis of the later invented television – is linked to the work of Ferdinand Braun, inventor of “Brown's tube” (in proper English-German). This is also the period of W.C. Sabine's systematic work on room acoustics and reverberation culminating in his empirical formula to calculate reverberation time. Later he applied Toepler's method to visualize sound waves and reflections in vertical planes of an auditorium model. Further topics in this chapter are the beginning of ultrasonics, underwater sound and substantial progress in structural vibrations (joined to the names Timoshenko, Airey, Lamb and Love). The term “noise” may be firstly used in Harvey Flechter's book “Speech and Hearing” from 1928.

Hearing and speech became of closer interest by studying the structure of the inner ear and cochlea, also evaluating the relevance of phase in binaural hearing, thus updating Rayleigh's assumption that directional perception is based on intensity differences. And, moreover, from this period the “decibel” results, linked here to Knudsen and Flechter — not mentioning the work by Heinrich Barkhausen in Dresden, Germany.

With the last three, Chapters 8 to 10, it becomes clear that acoustics – in the same way as other fields in physics – had then developed to such a wide range of topics and with so many researchers being involved that single names became less and less relevant — and known. For this reason, the details presented in these chapters will not be discussed here, but it is worth mentioning that the author strictly follows the approach used in the preceding chapters.

Finally, stating an honest compliment: Everyone who has ever done such a kind of huge historical review knows how hard this is. Before being able to write a single paragraph, you must have read all relevant literature to make a fair judgment on what is relevant, so what to keep and what to skip. Robert T. Beyer has done a marvelous job with his book which is, up to the present, an outstanding work and which has so far not been surpassed. It is certainly not a book to read from the first to the last page in a single run. But, you could read chapter by chapter you are interested in occasionally.

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