

"A World of Sound" – An Organ Concert for Physicists

The use of pipes to make musical sounds goes back to antiquity. Certainly pipe organs have been built since Roman times and, through generations of innovation, ranks of pipes became organised with keyboards to play music. By the 16th Century the organ as we know it, with multiple pipes, bellows, manuals, stops and pedals, had evolved. Builders had discovered how to create new sounds by combining the sounds of several pipes at different pitches simultaneously. Borrowing ideas from harmony, a system of creating musical intervals of octaves (8 notes apart), fifths and thirds evolved, a system which forms the basis of organ design to the present-day.

In the 19th century builders invented many new sounds imitating musical instruments of the orchestra, including strings, enabling the organ to function as a whole orchestra. In the latter half of the 19th Century organ concerts featuring transcriptions of orchestral music were popular and could be heard in town halls and concert halls throughout England. In the early part of the 20th Century organs provided popular musical entertainment in cinemas, frequently including percussion departments. In our own lifetime the sounds from pipes have been recorded, digitised and stored in computers such that you can now play the sounds of numerous historic organs of your choice from a keyboard connected to a personal computer. The pipe organs we inherit today truly offer a 'world of sound'.

There is much that the tonal structure of a pipe organ can teach us about physics; the characteristics of sound as understood by physicists and mathematicians are beautifully demonstrated on the organ. At the simplest level, the instrument is a sound synthesizer, capable of creating an enormous palette of different sounds. Of particular interest to physicists, the organ facilitates the study of sound waves, tonal quality, beats, harmonics, Fourier analysis, intonation and temperament. The properties of interference, diffraction, resonance, reverberation are ever-present in the physics story that the organ can tell. This concert, whilst offering a programme of music as entertainment, will include demonstrations and commentary exploring the synergy between physics and organs.