

# Audible Technology

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Musical instruments of all kinds have a fascinating and continuing attraction as school design-and-make projects, a fact easy to understand when one considers the range of artistic sophistication covered by the title "musical instrument" and the depth or simplicity of art and craft skills that can be employed both in their construction and operation.

A "musical instrument" made in the school workshop, art-room, or laboratory, might be a set of roughly-tuned chime-bars or a complete quartet of two violins, viola or cello; it could be a row of partially-filled test-tubes to blow across or a complex electronic keyboard instrument; a worn-out harmonium restored to working order or a full-scale organ in the school hall, chapel, or music-room. All these examples are things I have seen successfully completed in schools during the last few years and, remarkably, the most popular seems also to be the most skilful and ambitious — the construction (or reconstruction) of a real organ, usually obtained (in part, at least) from a redundant church.

All the major church organizations in England and Wales are currently going through a phase of rationalization and consolidation; redundant churches and chapels are being closed and either demolished or put to other uses, and inevitably the first to close are those with a small or impoverished membership without the resources to maintain a large building and its furnishings. Furnishings include organs and almost invariably in England the best organs for sensitive restoration are to be found in run-down city parishes and inner suburbs where affluence in the mid-19th century enabled the purchase of a top-quality instrument that has been spared spoilation ("improvement" they used to call it) by subsequent poverty; a well-designed organ with simple mechanical action from keyboard to pipes should last indefinitely with a major servicing every 100 years or so.

The organ in England developed late and it was not until the mid-19th century that any instrument here matched the capacity of those already common in the rest of Europe for the previous 400 years; evolution was suddenly accelerated by the influence of English musicians who had travelled abroad and discovered the works of Bach, and by foreign organists like Vogler and Mendelssohn who demonstrated advanced techniques of organ design and organ playing in England, so that within the 50 years between 1800 and 1850 the English organ, dormant since the 16th century, rapidly grew to full artistic maturity. This development was possible only because English organ-builders, craftsmen in wood and metal of long tradition, had already begun to evolve more accurate and sensitive mechanisms for their simple and unadventurous instruments, and to experiment with industrialized methods using the new woodworking machinery and production techniques of early 19th century engineering.

Unfortunately, this coming-of-age of the English organ happened to coincide with the 1851 Exhibition, when the products of some of the best English organ-builders were shown alongside those of the burgeoning engineering industry; the organ, a musical instrument with nearly 2000 years of tradition behind it, became identified in the public image with powerful machinery and the steam-engine trade; its classical repertory, so recently rediscovered, was all but forgotten as artistry in design, construction, and musical interpretation gave way to a pre-occupation with needlessly complicated mechanisms patented by rival organ-builders.

One reason for this was the development of automatic blowing. From early Christian times up to the late 19th century all organs were blown by hand (or foot); this limited wind pressures to something like the output of an orchestral woodwind player. By the end of the century, hydraulic



engines, driven from the new water mains, and the later electric centrifugal fans, made possible pressures up to 20 times the hitherto accepted artistic limit – encouraging the construction of even louder (and less beautiful) organs and culminating in the invention of powerfully-toned pipes identical in construction and sound-quality with the fog-horn.

Higher wind pressure naturally gave rise to heavier keyboard-touch, hence the need to treat this symptom of decadence by inventing yet more new mechanisms, pneumatic and electric, to isolate the player from arduous physical contact with what had once been his musical instrument but had now become a complex machine, operated by remote control. The ultimate in this dead-end of instrument technology was the

cinema organ of the 1930s with a highly sophisticated mechanism developed from telephone engineering, an average working life of under 30 years, and a narrow and severely restricted artistic potential; it needed a music-technician to play it, the audience paid to see his acrobatics at the switchboard of an invisible instrument, and artistry was abandoned to commercial and technical criteria.

For a school organ restoration project to be successful, one needs a potentially artistic instrument with the simplest possible mechanism; such instruments were the norm in England up to about 1870 and are now being made again in increasing numbers. Hence any instrument over 100 years old that is offered to a school for restoration is worth looking at seriously, and at a first



*An organ in the English classical style built by Samuel Renn of Manchester in 1843, in a church closed in 1963. The organ was in perfect condition when it was dismantled by boys and parts used to build a smaller instrument in Chetham's School, Manchester.*



inspection the usual criteria for old furniture will apply; look for signs of woodworm and split timbers, particularly in soundboards and pipes, and for cracked bellows that will almost certainly need re-building anyway. An organ with pneumatic or electric keyboard mechanisms is a real hazard for restoration projects: pneumatics need extremely sensitive adjustment to be artistically acceptable to a musician and almost inevitably a large number (possibly hundreds) of tiny bellows will need accurate remaking with fine leather (plastics are much too inflexible); electric systems will almost certainly be found to have oxydized or corroded switch-contacts, and faulty relays may well be of an obsolete pattern and not replaceable.

Mechanical key-action, by contrast, is simple, comprehensible, reliable, easily replaced, and (if well designed) easily adjusted to satisfy artistic criteria; it is made from wood and metal components with ordinary hand-tools by traditional craft techniques and specialized small parts can be purchased from trade suppliers.

The music, however, is produced in the pipes and the soundboards they stand on, and these need to be in unspoilt condition. Metal pipes are traditionally made of a tin-lead alloy similar to solder and hence care is needed in any repair work, in any case the pipe-mouth and foot adjustments will have been made with great delicacy by a specialist artistic pipe-voicer and are best not touched; wood pipes are normally glued together and sometimes repaired by wrapping tightly with twine, again mouth and foot adjustments are sensitive and best left alone after careful cleaning. If restoration is being undertaken as a school project, it would be best to call in a professional organ-builder at an early stage, if only to be certain of experienced help with final regulation and tuning.

The instrument is played from a console containing one or more manual keyboards (one for each soundboard and its pipes) and

a pedal keyboard. There are standard dimensions now for organ consoles, which might be obtained by measuring and drawing the console of a modern organ; an old console may need minor alteration to conform to current standards, also the keyboards (particularly the pedals) may be worn and require the insertion of new pieces of timber (known in the trade as "piecing") to restore original dimensions. Stop-handles too, and the mechanism through which they operate the soundboard, may need piecing to restore pin-joints and register-holes that have worn slack.

As a long-term project giving permanent benefit and enhancement to a school hall or chapel, an organ restoration is a perfectly feasible exercise, bringing pupils into direct contact with 1000 years of English craft tradition and the actual products of artists and craftsmen from an earlier generation, whose aim was to build sensitive musical instruments for excellence and indefinite life. Electric and pneumatic mechanisms are complex and best avoided: they are insensitive and relatively short-lived and the traditional mechanical action system offers plenty of scope for real craftsmanship in the use of hand-tools, and for experience of delicate adjustment and fine judgment in an artistic context.

As for the electronic transistorized organ-substitute, this is still an untried and experimental apparatus. Its life-span is still uncertain and new techniques of integrated circuitry are constantly being developed; but if experience of similar methods in the computer industry is anything to go by, obsolescence within about 10 years seems likely for some time yet. The electronic instrument is, however, a new instrument in its own right with a slowly growing repertory of compositions; but as a substitute for the traditional organ it is still poor value in the long run as maintenance and replacement costs soon overtake those of the instrument planned for several centuries life

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