1 Origins and development of the organ

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> Organ . . . the name of the largest, most comprehensive, and harmonious of musical instruments; on which account it is called 'the organ', *organon*, 'the instrument' by way of excellence.
>
> (Charles Burney, writing in A. Rees, *The Cyclopaedia, or Universal Dictionary of Arts, Sciences, and Literature*, London 1819)

Although modern etymologists would question Burney's appropriation of a Greek word with a general meaning (*organon* seems to have meant a tool with which to do a job of work) for so specific a purpose, it would be hard to deny that the pipe organ in its most developed form is structurally the largest, and (for sheer variety of effect) musically the most comprehensive of all instruments. And if by 'harmonious' is meant the capacity to order diverse elements and bring them into concord with one another for a common purpose, then Burney's claim for the organ, with its multiplicity of sound-producing and mechanical parts, can surely be substantiated.

At its most basic, the organ is a simple wind instrument. It consists of a grooved chest supporting a set of pipes, bellows to supply wind to the pipes, and some sort of mechanism to cause the pipes to sound. Though such simplicity is now rare it perfectly well describes the sort of organ depicted in medieval illuminated manuscripts (Figure 1.1). The path from such modest instruments to giant modern organs boasting four or five keyboards, 32′ pipes, dozens of registers, sophisticated stop controls and electrical blowing apparatus encompasses a complex and fascinating process of development in which music, technology, architecture, liturgy, industrial organisation and changing taste all play a part.

Certain things follow from this long historical development.

First, at any given period, styles of organ throughout Europe (and it is Europe with which we are principally concerned before 1850) varied considerably. Fifty years ago it was widely assumed that any pre-nineteenth-century German organ was suitable for the performance of Bach. Today, we are becoming more aware of the distinct characteristics of organs built in Swabia and the Rhineland, Hamburg and Westphalia – and perhaps none of them is altogether appropriate for Bach, who spent most of his working life in Thuringia and Saxony. Repertoire must be related
[1] carefully to the type of instrument for which it was conceived: not

Figure 1.1 A detail of an illuminated initial from a Book of Hours of King Alfonso V of Naples (Aragon, 1442; British Library MS Add. 28962, fol. 281v). This portrayal of a positive organ appears immediately below a scene depicting the celebration of a mass in the royal chapel of the Aragonese court, and is probably indicative of the type of instrument used in such circumstances.

because this determines how it must be played today (which it does not) but because it offers an opportunity to understand more fully the intentions of the composer and the experience of the original player. From this informed position intelligent decisions can be made about modern performance.

Secondly, historic organs (with few exceptions) possess their own building history. We still know little about the 'ageing' process as it affects organs; change must be assumed in the molecular structure of pipe metal, and that may affect the tone. More obvious is change brought about by human intervention. Compasses, temperament, pitch, wind pressure and voicing are all matters that can be altered relatively easily in response to changing fashion, even when more drastic alterations are avoided. Nor is restoration necessarily a guarantee of authenticity. Old organs restored in the 1950s and 60s are now being restored again. (The famous F. C. Schnitger organ of 1723–6 in St Laurents, Alkmaar was restored by Flentrop in 1947–9, and again in 1982–6 to more exacting standards.) Whether current restoration techniques will be regarded as adequate in

another fifty years time remains to be seen. Claims to historical correctness should always therefore be treated with some caution, though few old organs will fail to yield some valuable insights for the player.

Thirdly, with a documented history going back at least a thousand years, and an archaeological history spanning six centuries – setting aside such fragmentary remains as the cache of medieval organ pipes found at Bethlehem (Williams 1993: 348–9) and the earlier Graeco-Roman organ found at Aquincum in Hungary (Perrot 1971: 109–16) – the organ has benefited from a succession of technological innovations. At the end of the medieval period new techniques of carpentry, metalwork and bellows-making were exploited by organ builders for their own purposes (Williams 1993: 314–35). Four hundred years later, their successors were using steam-driven machinery in their workshops, and experimenting with pneumatics and electricity (Thistlethwaite 1990: 61, 351–61). Today, many organ builders take advantage of computer technology in both the design (computer-simulation in the drawing office) and equipping (multi-level memory systems, playback facilities, transmission) of organs. This suggests the wisdom of keeping an open mind about such technological developments. The pneumatic lever, for instance, is an integral feature of the nineteenth-century Cavaillé-Coll organ, which itself inspired an important school of organ composers at least in part because of the flexibility the pneumatic motors gave to these ambitious instruments. For the same reason, contemporary console developments in new organs are not to be condemned out of hand just because there is no precedent for them in the organ's earlier history. Probably the strongest objection that can be made to them is that they can seem to diminish the gap between the legitimate pipe organ and a variety of electronic keyboard instruments which endeavour to reproduce its effects.

In the following chapters, a good deal of attention will be devoted to particular repertoires and the instruments for which they were written. It may therefore be found helpful to have a brief summary of the organ's historical evolution with special reference to those technological innovations which created new opportunities for composers and performers, and which, taken together, assist us in defining the genius of this 'largest, most comprehensive, and harmonious of musical instruments'.

The medieval organ

The origins of organ technology and the type of instruments to which it gave rise in the earlier medieval period have been discussed elsewhere, notably by Jean Perrot (1971) and Peter Williams (1993). Here, it must

suffice to say that organs had found their way into churches by the end of the tenth century, when several Anglo-Saxon monasteries (Malmesbury, Ramsey, Winchester) are known to have possessed them. However, their construction and the uses to which they were put (signalling devices, like bells; the expression of jubilation in the liturgy?) remain obscure.

Organs gradually spread throughout Europe, though the date of reception and the degree of mechanical sophistication must have varied considerably from one region to another. Probably the Benedictine order, with its interest in the useful arts, technology and science, played an important part in disseminating knowledge about organs. If so, it should not surprise us that the most comprehensive account of organ-building before the fifteenth century was written by a monk named Theophilus, who seems to have lived in what later became Westphalia in the period 1110–40. His treatise (which is part of a much longer work entitled *Diversarum Artium Schedule*) describes the manufacture of copper pipes, a wind-chest with seven or eight notes, wooden sliders projecting from the chest and lettered so that the player knew which note he was sounding, bellows, a wind collector (*conflatorium*) and a hollow wooden duct to convey wind to the chest (Perrot 1971: 232–52).

The evolution over the next three centuries of this simple (but in its own terms doubtless effective) sound-producing instrument into the early modern organ with its multi-ranked *Hauptwerk*, a *Rückpositiv* with separately-drawn registers, Pedal *trompes* (bourdons), extensive keyboard compasses and a variety of pipe constructions was a complex process which there is not space to discuss here (but see Williams 1993: 336–57). However, certain crucial developments need to be briefly mentioned.

The *soundboard* is a large box on which the pipes are mounted, and which supplies them with wind. In early organs, wind was admitted to the pipes by means of sliders running in grooves beneath each pipe or set of pipes and operated directly by the player. By *c*1400 (possibly earlier) pallets had made their appearance. A small wooden clack-valve was located beneath each groove; when the player caused this pallet to open, wind entered the groove and the pipe(s) sounded. The connection between key and pallet was made by means of linkages known as trackers, and with the development of rollerboards to convey the action sideways it became possible to arrange the pipes in a different sequence from that dictated by the keyboard. It also enabled organ builders to make larger soundboards and to accommodate more and bigger pipes on them. Ultimately, these technological developments encouraged the multiplication of soundboards in an instrument; sometimes they were connected to a single keyboard, but in north-west Europe after *c*1450 it became

increasingly common to find organs with two or three keyboards and a Pedal division.

Meanwhile *sliders* found a new role in enabling the player to shut off individual registers or groups of pipes. The large church organs of the later medieval period incorporated massive choruses (*Blockwerk*) in which each note sounded multi-ranked unisons and quints. Henri Arnaut de Zwolle (*c*1450) describes organs with between six and twenty-six pipes to a note (inevitably including much duplication of pitches). By his time some attempts were being made to split up the *Blockwerk* into groups of pipes, for example, a division into three: principals (8′s + 4′s), low-pitched mixture, high-pitched mixture. By making soundboards with sliders running at right angles to the grooves, organ builders gave players the means of shutting off groups of pipes. Only after 1500 did 'stops' come to be thought of as bringing registers on rather than shutting them off.

In some parts of Europe (notably Italy) a second set of pallets was preferred to the slider. Each note of a register had its own spring-loaded pallet which opened when the player brought the stop on. As soon as the player released the lever or knob the springs closed the pallets, silencing the register. Soundboards of this type were known as *spring-chests*. They were seldom made outside Italy after the sixteenth century.

Keyboards and *compasses* evolved in response to the changing technology of soundboards and actions, and the desire of musicians to play polyphony. It is not known whether keys were ever 'thumped' with the whole fist as used to be suggested, but there can be little doubt that the early organs with their crude engineering would require some force to operate, whether the player pulled sliders or pressed keys. Theophilus's organ had seven or eight notes operated by sliders. Over the next three centuries compasses gradually expanded, the diatonic scale with B♭ added to accommodate plainsong giving way after *c*1300 to (sometimes incomplete) chromatic compasses. By *c*1450 a compass of rather more than three octaves (F–a^2) was widespread, though pitch varied greatly, and some of these organs were undoubtedly transposing instruments. An example was Anthony Duddyngton's new organ for All Hallows, Barking, London (1519); the keyboard had C as its lowest key, but the note it sounded was F (5′) or FF (10′). It is important to realise that compasses and keyboards are not necessarily all that they appear to be in the years before 1650, and sometimes later.

The introduction of pallets in place of sliders enabled organ-builders to develop keyboards which could be both elegant in appearance and subtle in action. The Halberstadt keys (Figure 1.2) perhaps represent a transitional phase (the upper set still resemble the pull-push levers of earlier illustrations) but another picture in Praetorius's *Syntagma*

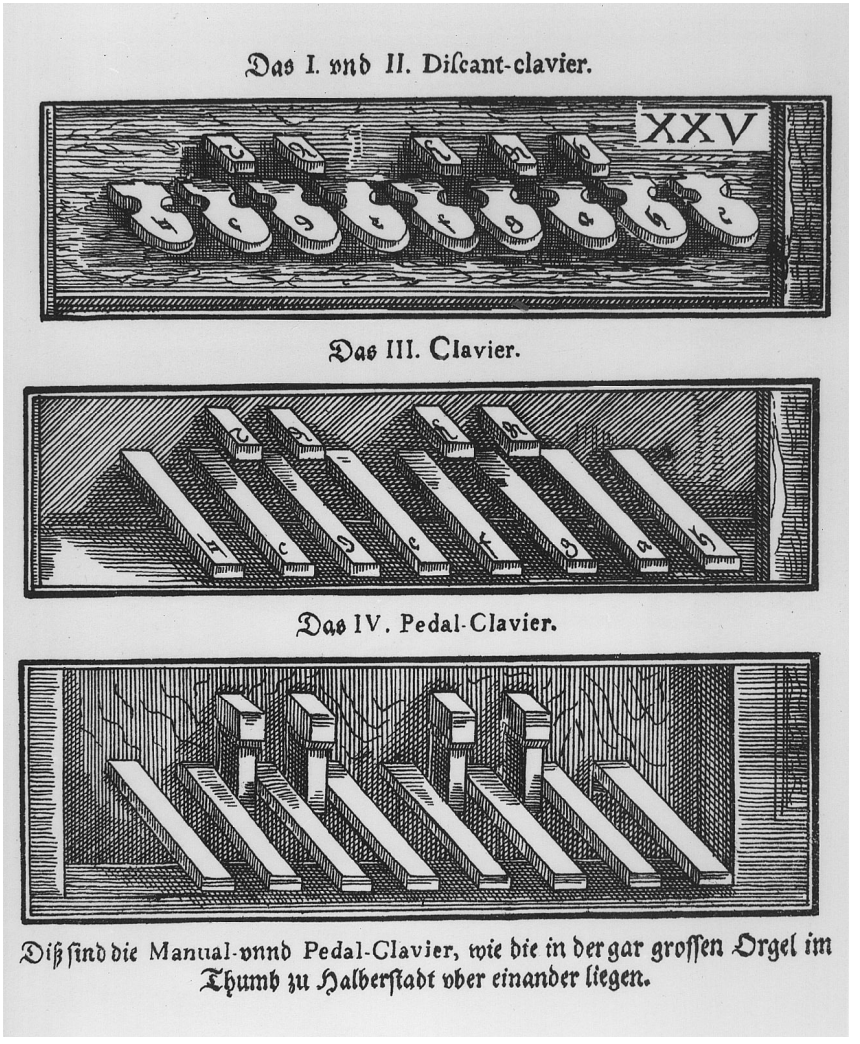

Figure 1.2 An illustration from Michael Praetorius's *Syntagma Musicum* of 1619, showing the manual and pedal keyboards of the organ at Halberstadt Cathedral, which he believed to date from the work of Faber in 1361.

musicum (Figure 1.3) shows a style of keyboard for the *Rückpositiv* at the Aegidienkirche, Brunswick (1456) which would not change radically before the nineteenth century.

Other significant developments included the appearance of new *pipe forms* including reeds (the earliest firm evidence is *c*1450) and wooden registers (possibly at a similar period, though equally possibly much earlier). In part this was due to increasing confidence in the manufacture of pipework, in part to the growing taste for novel tonal colours (in some regions, at least) to which Arnolt Schlick's *Spiegel der Orgelmacher und*

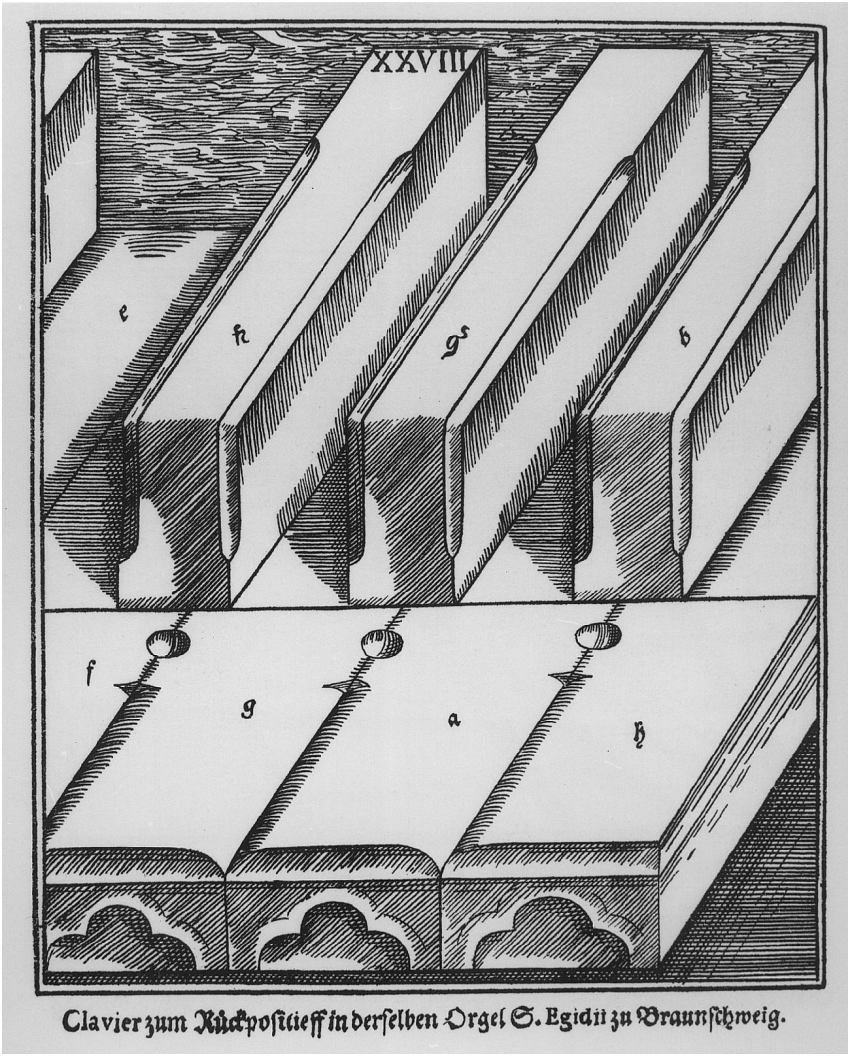

Figure 1.3 The *Rückpositiv* keyboard of the organ at the Aegidienkirche in Brunswick (1456) from Praetorius's *Syntagma Musicum*; note that the keys approximate to the modern form.

Organisten (Mainz 1511) was later to bear impressive testimony. *Organ cases* probably began to appear in the thirteenth century (Williams 1993: 322–3). If organs were not located on the floor near the singers – as most positive organs were – they would be placed in wooden galleries from which the organist could command a view of the liturgical action (reflecting the organ's growing importance in liturgy). These instruments whether raised or at floor level required architectural treatment, and surviving cases such as those at Sion (*c*1435), the Jakobikirche, Lübeck (*c*1480) and San Petronio, Bologna (1474–83) illustrate the relish with

which carpenters and decorative artists approached the task. The design of *bellows* must have been refined to meet the needs of the large organs being built by the mid-fifteenth century, though little is known about this. Small forge-bellows made of animal skins gave way to larger wedge-bellows with ribs and boards, raised by levers. Ropes seem also to have been used, but whatever the method, the fact that the wind was fed directly into the chest must have led to considerable unsteadiness of speech – a problem that was not overcome until the introduction of the reservoir in the eighteenth century.

Yet for all its imperfections, the technology of the early modern organ was essentially complete by *c*1450. It is a remarkable tribute to medieval enterprise and craftsmanship that no significant innovations in the basic design of the organ were made for the next three centuries.

The early modern organ (1500–1740)

Any scrutiny of organ schemes from the first half of the sixteenth century reveals great diversity of practice. Despite this, two 'families' of organ types can be distinguished. In Italy and southern France, organs with a single keyboard, spring chests and separately drawn registers were the norm; this 'southern' type was also influential in parts of Spain and southern Germany. In the north (the Netherlands, northern France, Scandinavia and much of Germany) larger organs with two or three keyboards, multiple chests, pedals, multi-ranked principal choruses and an extensive selection of colour stops – often imitations of other instruments – were common. (A variant of this 'northern' type was found in Spain during the years of Spanish rule in the Netherlands.)

The sixteenth century was a period of intense activity and bold experimentation in organ building. Builders explored, refined and extended the techniques of their medieval forebears to meet new demands. In many wealthy towns of northern Europe organs became status symbols, provided, maintained and played under the direction of the civic authorities; tonal novelties, daring mechanical layouts and splendid casework were deployed to add lustre to the town's reputation.

Organ builders often travelled widely in pursuit of work and new ideas. In particular, builders from the Low Countries – that cradle of European organ building – worked extensively outside their native region. Hendrik Niehoff built influential organs in Hamburg (1550) and Lüneburg (1552), Nicolaas Niehoff at Cologne (1573). Nicolaas Maas spent the majority of his working life (1590–1615) in Denmark. The Brebos family built important organs in Spain (1579–92) whilst Jan and

Matthijs Langhedul and Crespin Carlier laid the foundations of the French classical organ in the years to either side of 1600. Altogether, these Dutch and Flemish craftsmen had a vital influence on the regional schools of organ-building which (like the corresponding nation states) had begun to emerge before the end of the sixteenth century.

Organ-building was not unaffected by politics (the existence of the Habsburg Empire facilitated a free trade in ideas between craftsmen and artists within its borders). But it was more immediately and directly influenced by religious change – of which there was a great deal in the sixteenth and seventeenth centuries. The upheavals of the Protestant Reformation and Catholicism's spirited response, the Counter-Reformation, had profound implications for the role of the organ in worship (see below, Chapter 9). Design is driven by function, and the particular ecclesiastical demands of the different traditions played a major part in determining the character of regional organ schools.

This can be illustrated by comparing four different organ cultures.

The Netherlands experienced some destruction of organs in the riots of 1566, and more were removed from churches in succeeding years under the influence of the Calvinists. However, the fact that they were usually the property of the town helped to protect many organs, and although the Reformed Church at first refused to countenance their use in worship, in most towns they continued to be played before and after the service and in weekday recitals that had long been a feature of Dutch municipal life. So organs were built and repaired, and distinguished players such as J. P. Sweelinck were able to exploit the resources of the Dutch organ (weighty *plenum*; flutes, reeds and imitative registers in *Rugpositief* and *Bovenwerk*; Pedal solo stops) in variations on psalm tunes, decorated transcriptions of vocal pieces, and improvisations (Peeters and Vente 1971: 88–122).

In England, by contrast, the Puritans (radical Calvinists) had all but succeeded in having organs banned from churches in 1563. They failed, but organ building languished for most of Elizabeth's reign until the emergence in the 1590s of a party determined to restore something of 'the beauty of holiness' to the worship of the Established Church. The primary role of organs built under its influence was the accompaniment of the surviving cathedral and collegiate choirs in the daily services of Matins and Evensong. The instruments were correspondingly unadventurous. They lacked pedals, and relied instead on long manual compasses. Most had a single keyboard with five or six stops, though the occasional provision of a Chair Organ extended the scope a little. There were no mixtures, mutations or reeds, but duplication of chorus registers was usual. Such an instrument provided adequate accompaniment for a small group of

singers and permitted the performance of short voluntaries – which was all that was required (Bicknell 1996: 69–90).

Lutheranism had no single view about the appropriateness of organ music in worship. Where it was permitted (perhaps the majority of Lutheran churches) the organist was encouraged to play preludes – sometimes at considerable length – before the congregation sang an unaccompanied chorale. Interluding between verses, *alternatim* performance, and choir accompaniment were also common requirements. The organs of northern and central Germany, with their large Pedal divisions, massive *plenums*, and subsidiary manuals stocked with flutes, mutations and reeds, equipped the organists for a multitude of liturgical tasks, and the strongly marked distinction of pitch, placement and tone between the different departments was particularly valuable in an instrument required to be so versatile.

The French organ also relied upon colour and contrast, but for different reasons. France had remained within the Catholic fold, and French organs were required to accompany the mass and other liturgical offices, performing music in which plainsong themes figured prominently. In particular, the organ performed movements of the mass in alternation with voices (see Chapter 9). Solo registrations were functionally important for 'bringing out' a plainsong theme (hence, for example, the *Tierce en taille*, the flûtes and trompettes 8′ of the Pédale, the popularity of the *Cornet* and the appearance of short-compass solo divisions – Écho and Récit – in the early seventeenth century) and rigid conventions grew up concerning the use of particular registrations for particular movements of the mass. 'Every stop in a French organ of about 1700 came to have an appointed purpose' (Williams and Owen 1988: 105) and this purpose was entirely dictated by liturgical use.

These brief summaries give an indication of the highly specific background to the emergence of regional schools of organ construction, design, composition and performance in post-Reformation Europe. They will be discussed more fully below, in relation to the repertoires. Many of the organ types they fostered came to maturity in the second half of the seventeenth century: the Hamburg *Werkprinzip* organ in the work of Arp Schnitger (*fl.* 1666–1719), the French classical organ at the hands of Pierre and Alexandre Thierry and Robert Clicquot (from the 1650s), the Spanish baroque organ with its horizontal reeds and echo organs made by various builders after 1680, and the English long-compass organ developed – in conscious rivalry with one another – by Bernard Smith and Renatus Harris during the 1670s and 80s. In other parts of Europe taste, relative affluence, liturgical priorities, musical innovation and news of developments elsewhere had an impact on local traditions. By 1700 a

comparison of organs in leading European cities would reveal extraordinary contrasts of scale, disposition, effect and function, and yet, despite unmistakable regional characteristics and local preferences (suspended key actions in France, separate Pedal cases in Hamburg, *en chamade* reeds in Spain and Portugal) the *technology* of the organ remained essentially that inherited from the late-mediaeval builders. Some innovations had been tried (couplers, ventils, tremulants, toy stops, transmission) and, of course, tonally, the organ of 1700 was radically different from that of 1500 in many respects, but the technology was essentially the same and provided a foundation upon which the leading builders of the late seventeenth century raised regional organ cultures of great refinement and distinction.

In the period which was to follow, however, players and builders alike would increasingly feel its limitations.

The Golden Age, 1740–90

By the mid-eighteenth century, certain trends were manifesting themselves in many parts of Europe which serve to distinguish the period from what came before and anticipate developments in the nineteenth century. Inevitably, their impact varied considerably from one region to another, and some traditions changed only slowly (Holland after 1770) or scarcely at all (England before 1820). Yet in most places priorities shifted decisively between 1710 and 1750. Generalisations are dangerous, but it would not be too wide of the mark to say that in Protestant communities there was a desire for more power (perhaps in response to the increasing use of the organ in congregational accompaniment) whereas in Catholic areas the new taste was for colour effects – solo flutes, strings, undulating registers, imitative reeds, echo departments, percussion stops and other musical gadgetry. Both trends radically revised the balances between different departments of the organ (as compared with, for example, the classic *Werkprinzip* scheme) and the fashion for intensity of effect, supported by the growing practice – made possible by more resourceful wind systems – of drawing handfuls of stops all at once, led in many areas to the superseding of the discriminating registration practices of previous generations.

Although large organs were by no means unknown before the eighteenth century (Schnitger's 1687 organ for the Nicolaikirche, Hamburg had sixty-seven stops) the period saw the construction of numerous instruments which impress by their sheer size, tonal range, complexity of action and monumental visual effect. They are to be found across Europe.

Christian Müller's Haarlem organ (1735–8) with its sixty stops; the Hamburg Michaeliskirche (1762–7) by J. G. Hildebrandt with a 32′ front and fifteen-stop *Brustwerk*, François Thierry's five-manual for Notre Dame, Paris (1730–33); Christ Church, Spitalfields, London (Richard Bridge, 1730) with its sixteen-stop Great containing duplicated trumpets; Toledo Cathedral (José Verdalonga, 1796–7) with enclosed and unenclosed reeds from 32′ to 2′ pitch – these represent a breed of organ which, in the course of the eighteenth century, attained a novel degree of scale and sophistication.

Some of the most spectacular organs were those of southern Germany and Austria, particularly the organs of the great abbey churches. This was an area which had always favoured colour stops (Schlick's *Spiegel* is early evidence), and the taste was sustained by the requirement that the organist play quiet interludes at various points during the mass. The logical conclusion was an instrument like Gabler's *Chororgel* at Weingarten (1739): the eleven-stop *Hauptwerk* contained seven 8′ registers (Prinzipal, Violoncello, Salizional, Hohlflöte, Unda maris, Coppel and Quintatön), the second division was an Echo of 'quiet and pleasant stops', and (characteristically for this region) there was not a reed or mutation in sight. Gabler had the opportunity to expand his repertoire of fanciful colour stops when he built the west-end organ at Weingarten – including, for example, a flageolet of ivory, conical pipes made of cherrywood, bells and glittering multi-ranked mixtures – but its fame is as much due to its astonishing visual effect, the cases appearing suspended in mid-air, supported by cherubim and angels, and surrounded by light from the windows behind (see Figure 5.11).

Gabler's concern with colour, and his desire to make the organ a more flexible musical instrument, was reflected elsewhere in Europe. Even in Protestant regions the period saw a move towards subtlety, refinement and tonal variety which in some instances (G. Silbermann at Freiberg, 1710–14; J. Moreau at Gouda, 1733–6) involved drawing on French ideas. In all but the most conservative areas less and less importance was attached to providing balanced choruses in all departments; 'terracing' of dynamics offered the possibility of those dramatic contrasts for which a taste steadily developed during the course of the century. The same taste was the ultimate beneficiary of Jordan's 'invention' of the Swell (St Magnus the Martyr, London Bridge, 1712); this offered the prospect of greater expressiveness – initially for a handful of short-compass stops, later for the entire organ (Samuel Green at St George's Chapel, Windsor, 1790) – and other peripheral traditions (Italy, Spain) also experimented with echoes, swells and tonal novelties.

Power, too, was increasingly sought. When in 1738 J. C. Müller rebuilt

the 1724 Vater organ in the Oude Kerk, Amsterdam he took steps to improve the wind supply, increased the pressures, doubled chorus ranks in the treble, added further ranks to the mixtures, re-made the reeds and added stops to strengthen the *plenum*. Perhaps Vater's organ was not a very good organ anyway. But these were the sorts of changes builders were making all over Europe in order to enhance the organ's power. The Bavokerk at Haarlem (1735–8) with its big mixtures and more chorus reeds than would have been found a generation earlier is indicative of the same trend, and Zacharias Hildebrandt's Naumburg organ (1743–6) – approved (perhaps inspired) by J.S. Bach – is remarkable for its strength of tone (especially in the bass) allied to brilliant mixtures and solid reeds. But then Hildebrandt was a pupil of Gottfried Silbermann, who at the Dresden Hofkirche (1754) specified a *Hauptwerk* of 'large and heavy scaling' to be supported by a 'forceful and penetrating' Pedal. Even in the rather different circumstances of France, where organs were not required to accompany hearty congregational singing, the introduction of the Bombarde division (Notre Dame, Paris, 1733), the doubling of 8′ Trompettes, the addition of 8′ and 4′ chorus reeds to the Positif, and the gradual expansion of the Pédale bore witness to similar priorities.

All of this testifies to the emergence of preoccupations which were to become central to the evolution of the organ in the nineteenth century.

The triumph of technology (1790–1890)

By the end of the eighteenth centry, the aspirations of the builders had overtaken the available technology. The Weingarten organ, for instance, with its five manual and two pedal departments strewn (apparently effortlessly) across the west end of the church, and played from what may have been the world's first permanent detached console, must have presented formidable problems of action layout to its builder. It was to be another century before the technology was invented which would assist organ-builders in managing long tracker runs to huge soundboards, and a further generation on from that before builders were released altogether from the need to connect keys to pallets with levers and rods.

Priority in introducing the pneumatic lever is disputed (Thistlethwaite 1990: 351–7) but there is no doubt that it was the Englishman C. S. Barker and the great French builder Aristide Cavaillé-Coll who first brought it to a reliable form. It was used in Cavaillé-Coll's earliest triumph, the organ for St Denis (1841), in which pneumatic motors, located between key and pallet pull-down, assisted what was otherwise a complete tracker system, enabling the builder to increase the

number of chests and raise wind pressures. Pneumatic levers were widely used in the largest organs in France, England and Germany within three decades. The next development was tubular-pneumatic action, in which the motion of the player was transmitted not by way of wooden rods but by air under pressure travelling through lead tubes and inflating motors connected to the pallet pull-downs. (An early but imperfect version was made by P. Moitessier during the 1840s.) By freeing the builder to arrange chests, console and mechanism in hitherto unconventional ways, this form of action was of the greatest use to a builder such as the Englishman Henry Willis (1821–1901), confronted with an organist's demand for a large organ and the architect's refusal to accommodate it. By pioneering the division of a cathedral organ on either side of the choir at St Paul's, London in 1872, Willis at once overcame a difficulty and created an opportunity for abuse which other builders and players were quick to exploit. The system was popular in England, where it was extensively made between 1875 and 1925. Electric action was the next logical step. The possibility of using electro-magnets to open pallets had been recognised as early as the 1840s by Wilkinson, an English builder, but it was not until the collaboration of Péschard and Barker in the 1860s that a workable electro-pneumatic system was made. Organs powered entirely by electric actions appeared in Paris and London in 1868, and New York in 1869. Electric action became particularly important in the USA through the pioneering work of Hilborne Roosevelt (1849–86); by the 1890s most companies were experimenting with it, and it was in the States that Robert Hope-Jones (1859–1914) found the welcome for his improved electric action that had been largely denied him in England.

A revealing snapshot of the state of organ technology in the 1880s is afforded by a comparison of three instruments that competed for the title of 'the largest organ in the world'. E. F. Walcker's 124-stop organ for the Riga Dom (1883) had mechanical action with some assistance from pneumatic levers. Roosevelt's 114-stop instrument for the Cathedral of the Incarnation, Garden City, Long Island (also completed in 1883) had rather more than half its stops on electric action, whilst Hill & Son's *magnum opus*, Sydney Town Hall (1889), with 126 stops and the famous 64′ reed, had mechanical coupling, pneumatic levers to the Great and tubular-pneumatic action to all other departments.

Innovation equipped the builders of the nineteenth century with the technology they needed to pursue objectives (power, dramatic contrasts, orchestral registrations, proliferation of chests, detached keyboards, the physical separation of divisions of the organ) already to be identified in the most ambitious instruments of the previous century. Console gadgetry, novel soundboards (e.g. the German *Kegellade*, or cone chest),

steam-powered, hydraulic or electric blowing machines, horizontal bellows to steady the wind (widely used in England after 1800), dispersion of reservoirs throughout the organ, ventils (for admitting or denying wind to selected chests and fundamental to an understanding of the French nineteenth-century organ), pneumatic thumb pistons (patented by Henry Willis in 1851 and equally essential to an understanding of the English organ of the period), relief pallets to reduce the weight of touch, crescendo pedals (including the *Rollschweller*, implied in many of Reger's registrations), sforzando pedals – these, and a multitude of other 'improvements' provided the technological foundation upon which to erect a nineteenth-century organ aesthetic. It represented a considerable achievement – the transformation of a technology little altered in fundamentals for three centuries – but at a price: although the organist had greater resources at his command and more control over registration, he had less control over key touch and might (particularly in England and the USA) be separated by a considerable distance from the sound-producing parts of his instrument.

The musical character of the organ which this technology made possible paradoxically expressed both the fulfilment of the ideals of progressive eighteenth-century builders and their eclipse. E. F. Walcker's important organ for the Paulskirche, Frankfurt (1827–33) continued the fashion for massive choruses with thickening quints, a 32′ *Hauptwerk* and solid reeds. The fourteen-stop Swell and the generous provision of south German colour stops (strings, dulcianas and flutes) is a further link with tradition. However, the free reeds and Pedal mutations owe something to the 'simplification system' pedalled around Europe by the Abbé Vogler in the 1780s and 90s, and the divided Pedal section (with two pedal boards, one above the other) served a contemporary preoccupation with dynamic variation. Other German builders might prefer more conservative tonal schemes (J. F. Schulze, Marienkirche, Lübeck, 1858; F. Ladegast, Merseburg Cathedral, 1855) but Walcker's Frankfurt organ sketched the lines along which German organ-building would run in the nineteenth century and foreshadowed the firm's later mammoth organs for Ulm (1856), Boston (1863) and Riga (1883).

In England, something more radical was needed. Under the influence of the Bach revival on the one hand, and the taste for orchestral transcriptions on the other, William Hill (1789–1870) introduced the 'German System' organ – an instrument with C-compasses, 16′ manual choruses and a comprehensive Pedal Organ. Tonally, it represented a fusion of traditional English choruses, 'German' flutes and strings, and modern reeds. The latter included Hill's invention, the ophicleide or tuba mirabilis – a solo reed of commanding power, speaking on around 10″

wind pressure (Birmingham Town Hall, 1840). Other builders looked to France for inspiration (Gray & Davison at the Crystal Palace, 1857) until Henry Willis finally solved the quest for power and orchestral colour with his organs for the Alexandra Palace (1868) and the Royal Albert Hall (1871).

The organ built by Cavaillé-Coll for St Denis still owed much to the French classical tradition. Five years later (1846), at La Madeleine, Paris, the debt was much less apparent. The proliferation of harmonic stops (flutes and reeds), the inclusion of strings and a céleste, the disappearance of cornets and mutations, the transformation of the Positif into a mixtureless colour department, and the provision of ventils for the various *jeux de combinaison* all pointed to the romantic-symphonic organ of the 1850s and 60s. With its immaculately blended *jeux de fonds*, peerless reeds (harmonic, and with varying pressures throughout the range), luxurious consoles and finely engineered actions, this instrument has good claim to be regarded as the summit of the nineteenth-century organ-building achievement, not least because (unlike Willis's instruments) it inspired a school of distinguished organist-composers.

Epilogue: the romantic twilight (1890–1950)

It may seem both churlish and arbitrary to dismiss several decades of European and American organ building in what must appear little more than an addendum. The fact remains, however, that by the 1890s influences were making themselves felt which increasingly separated the organ from much of its legitimate repertoire. Hope-Jones's reduction of the organ to a series of extreme tonalities controlled from an electric console bristling with accessories prepared the way for the cinema organ. G. A. Audsley's *The Art of Organ-Building* (New York 1905) revelled in the *minutiae* of the voicing, construction and design of the romantic organ, whilst asserting the desirability of extensive enclosure including even a portion of the Pedal. On both sides of the Atlantic, builders exploited the technical possibilities of electric action, among them, the construction of unit chests enabling one set of pipes to be made available at several pitches. (It was in the tradition of Vogler and his 'simplification system', and appealed to factory organ builders anxious to build cheap organs.)

Some leading firms of the nineteenth century continued to build distinguished organs in their respective house styles – Hill in London, Cavaillé-Coll (under Mutin) in Paris, Sauer in Frankfurt among them. For them all, the First World War proved a watershed. Others endeavoured to take the romantic-orchestral organ on a stage further from the

work of the great nineteenth-century masters. In England, Harrison & Harrison dominated the scene, whilst on the other side of the Atlantic, Ernest M. Skinner and John T. Austin developed a more thoroughgoing orchestral instrument. Yet despite the undoubted integrity of the best organs of this period there were those who felt that the true nature of the organ had become obscured. Albert Schweitzer was one of the first, and the views he expressed in the early 1900s paved the way for that gradual and often painful recovery of 'true principles' which is discussed in Chapter 6.