

focus the light. They were hung above the proscenium and on lighting stands on the side of the stage. By 1930, Hartmann considered that 'the idea of the baby lens was the first decided innovation in modern stage lighting.'³⁵

By the late 1920s, therefore, Appia's theory of lighting seems to have been accepted throughout Europe and North America and by the early 1930s was even taking on a populist form in the new sound cinemas. Technology had developed rapidly, especially in the development of new filaments and gas filled bulbs, and was capable of delivering equipment to provide both the shadow-free diffused light and, more slowly, Appia's 'living light', a light that could reveal form and focus attention.

7 The Century of Light, 2

Light Beams and Images

I perceive light physically, not only visually. For me, light became a substance.

Josef Svoboda¹

The third kind of stage light that Adolphe Appia described in *Die Musik und die Inszenierung* was the texturing and breaking up of light beams by 'gobos' and the projection of focused images. He described them as, 'one of the most effective means of decoration, a hyphen between lighting and decor, which renders immaterial all that it touches'.² In this chapter I want to examine ways in which light in theatrical performance has gone beyond its function of illumination, of creating atmosphere and even dramatic revelation, and has taken on a material quality in its own right, and, in a variety of ways, has become a collaborator in the creation of performance.

In extensions of Rimington and Skriabin's original concept of colour music, light (especially the beam of light and the projected image) became an important ingredient on the palette of the proposer of abstract, non-representational art, and by the early 1920s, on the stages of the constructed theatre of early revolutionary Soviet artists. In the experiments of Bauhaus artists such as Walter Gropius, Farkas Molnár, Oskar Schlemmer and László Moholy-Nagy during the 1920s, light and the projected image played crucial roles in their examination of plasticity in their space-theatres and abstract-mechanical productions. Projected and filmic images were extensively used by Erwin Piscator at the Berlin *Volksbühne* in the mid-1920s, most frequently to provide images of revolution and actuality, and were planned to surround the audience and to make flexible the

by Serge Diaghilev's *Ballets Russes* Company, although no ballet and no actors appeared in the performance. The production was designed by the futurist clothes designer and painter Giacomo Balla, who built an irregular pattern of pyramid-shaped forms on the stage. The pointed tips of these pyramids were covered with a transparent material and were brightly painted with flashes, zigzags and other futurist imagery. The pyramids were lit from within, and the overall scene was illuminated by beams of colour from numerous spotlights, which were invisible to the audience. Balla had also designed and built a control keyboard of switches from which the lighting changes could be operated. The conductor was Ernest Ansermet and although the whole performance lasted little more than five minutes, there were forty-nine lighting cues, which synchronized precisely with the music.

The Theatre Department and its Studio were established at the Bauhaus School of Design, Building and Crafts in Weimar by Walter Gropius and, initially, by Lothar Schreyer in 1921. Oskar Schlemmer took over the theatre work in 1923 and was joined by the two Hungarian designers Farkas Molnár and László Moholy-Nagy before the School moved to Dessau in 1925. The modernist mission of the School was radical and bold and, in its vision of the design process, demanded a holistic commitment from staff and students. Central to this commitment was the need to fully integrate twentieth-century technologies alongside artistic design practice. Gropius recollected in 1961: 'Teachers and students as a working community had to become vital participants of the modern world, seeking a new synthesis of art and modern technology.'⁵ The artist and designer should no longer think of themselves as outsiders to everyday living and modern industrial processes of technical production. Confirmed in their utter rejection of past forms, conventions of artistic practice and aesthetic values, the curricula in all departments at the School began with studies that were based on an examination of the biological facts of human perception. The phenomena of form, space and time were investigated in a spirit of unbiased and frank curiosity, in order to arrive at clear working methods that could integrate individual creative work within what was believed to be a common background of perceptual understanding.

Technology would prove to be the mortar that would unite everyone and bind societies together within the 'new faith' of the modernist Utopian vision. Especially during the early days of the Bauhaus, therefore, there was a sense of tremendous social optimism and spiritual exhilaration at the opportunities which new technologies

might offer to creative artists, architects and industrial designers. Schlemmer said:

the possibilities are extraordinary in light of today's technological advancements: precision machinery, scientific apparatus of glass and metal, the artificial limbs developed by surgery, the fantastic costumes of the deep-sea diver and the modern soldier, and so forth. ... Wondrous figures of this new sort, personifications of the loftiest concepts and ideas, made of the most exquisite material, will be capable also of embodying symbolically a new faith.⁶

If the figures of the drama were to become creations of the designer and manipulator of these technologies, then Schlemmer argues that it would be probable that the theatre designer would, in future, develop a range of optical phenomena and *then* seek out the poet and dramatist who would provide an appropriate language of words and musical sound. Although the word is not used at this time, the concept of the designer as deviser and creator of theatre, as 'über-scenographer', is clearly established at the Bauhaus. Moholy-Nagy shared Schlemmer's sense of modernist⁷ intoxication as the possibilities of new technologies are revealed:

Nothing stands in the way of making use of complex APPARATUS such as film, automobile, elevator, airplane and other machinery, as well as optical instruments, reflecting equipment, and so on. The current demand for dynamic construction will be satisfied in this way, even though it is still only in its first stages.⁸

Although dominated by an overall visual *schema* of architectural construction, as seen in *The Triadic Ballet* (performed in Weimar in 1923), the living, individual human figure remained quite central to Schlemmer's experiments. However, within the projects of the painter Moholy-Nagy, and also evident within the architectural projects of Molnár and Gropius, there was a consistent desire to rid the theatre of domination by dramatic literature and to consider the actor as just one among many of the potential ingredients within the overall plasticity of a constructed theatrical event. The starting point for Moholy-Nagy's artistic work came from his perception that true reality could be found only in the modern industrial world of new technology and the invention of machines:

To use machinery is to act in the spirit of our century. ... It is the art of Constructivism. ... In it the pure form of nature finds expression – unbroken

internal architecture of the Synthetic Total Theatre of 1926 (unrealized) that Gropius designed for Piscator. In the metropolitan theatres and opera houses of western Europe and America, projected imagery was perceived as offering greater scenic realism, greater atmosphere and a more rapid and magical change of scene. But to achieve all these aims, powerful light sources and optical systems of considerable technical sophistication were required.

The acceleration of electrical and optical technologies that was urged forward by the Second World War created radical innovation in the production and control of light as the new technologies filtered through into the theatre during the 1950s and 1960s. From the 1960s onwards, the insertion into a tubular bulb made of quartz of certain halogens (such as iodine or bromine) enabled the filament temperature to be significantly increased, and so increased the luminous efficiency and output of the lamps. Above all, these halogen lamps could yield a more constant, whiter light than the earlier tungsten spotlights and the tubular bulb was very small compared with the big bulbs of the old spotlights. The smaller filament of the halogen bulb therefore greatly facilitated achieving the optical focus that was required for an intense projected image. This technology enabled scenographers such as Josef Svoboda to treat the beam of light materially, as they might a beam of timber – stage light could achieve presence and material solidity within space by delineating and creating the space of performance itself.

As Appia, Craig and Meyerhold atomized and pondered the consistency and texture of the theatrical experience during the early decades of the twentieth century, they realized that as well as serving to represent the real world, light could also serve to expose the falseness of traditional conventions and to celebrate the only true theatrical reality, which existed at the moment of performance itself. Furthermore, the experience of colour music and its exploitation of abstract, un-delineated colour coincided with attempts by painters to pursue non-representational art. During the period 1910–14, the painter Wassily Kandinsky felt that by dissolving colours into themselves he was able to abandon the more conventional painterly use of lines for the purposes of definition. In consistently stripping away narrative and representational content, he was convinced that colour and form might 'speak' for themselves and become the 'materials' of the artist. In his 'Concerning the Spiritual in Art' (*Über das Geistige in der Kunst*, 1912) he outlined his theoretical understanding of colour and its place within psychology and perception. Also in 1912,

in his essay 'On Stage Compositions' (*Über Bühnenkomposition*) in *Der blaue Reiter Almanac*, he attempted to connect music and visual images through a form of non-representational, abstract theatre in which 'musical movements', 'colour movements' and 'dance rhythmical movements' would combine to produce a monumental art of the future, in which light and projections would play a central role. The essay formed a preface to what Kandinsky called a 'stage composition', 'The Yellow Sound' (*Der gelbe Klang*), which was published in the *Der blaue Reiter Almanac* in 1912.³ 'The Yellow Sound' made use of intangible divisions between music, moving form, and colour. The composition consisted of six 'pictures' that blended into each other, each having a moving programme of symbolic sound and each shaped – entirely without spoken dialogue – with music, a choir singing with and without words, pantomimic movements and dance, changeable 'mobile' scenery, and above all, with coloured light of changing intensity that passed through a range of tonal expressions – from brilliant yellow to grey-black. Kandinsky had moved significantly beyond the earlier experiments of colour music, and in 'The Yellow Sound' the spotlights acted like the solo parts of a choir, throwing beams of light of varying colours in rapid tempo upon the group of yellow giants:

Beams of light in glaring colours drop in rapid changes from all sides (blue, red, violet, green) and alternate several times. All these beams melt in the middle, where they are mixed. All is motionless. The giants are almost invisible. Suddenly all colours disappear. For a moment everything is black. Then a matt, yellow light filters down over the stage, becoming by degrees increasingly intense, until the whole stage is glaringly lemon yellow.⁴

Although Kandinsky's abstract symbolism is cryptic and quite inaccessible, his ambition for light in performance was remarkably precise, especially considering the technology of contemporary stage lighting. 'The Yellow Sound' remained only a scenario in *Der blaue Reiter*, but the ideas and principles examined by Kandinsky were to remain strong motivations in the making of performance over the next two decades.

The visceral ability of light to identify directly with human sensation and emotion that Kandinsky explored, alongside the assertive modernity of electricity, were inevitably to be the source of considerable interest and experiment by futurist artists. In 1917 at the *Teatro Constanzi* in Rome, Stravinsky's *Feu d'Artifice* was performed

colour, the rhythm of space, the balance of form. ... It is independent of picture frame and pedestal. It extends to industry and architecture, objects and relationships. Constructivism is the socialism of seeing.⁹

For Moholy-Nagy the essential 'purity' of expression and form offered by colour and the machine 'will not tolerate the actor with indistinct or splotchy make-up and tattered costuming'.¹⁰ Furthermore, the time-based opportunity offered by lighting and by human responses to the phenomena of colour, as explored by painters such as Kandinsky, led Moholy-Nagy to develop the perception of light as a distinctive force within a new concept of dramaturgy: 'this will constitute the new ACTION OF LIGHT, which by means of modern technology will use the most intensified contrasts to guarantee itself a position of importance equal to that of all other theatre media'.¹¹ His argument logically extended the abstract painter's view of colour and pigment: if pigment were to assume the primacy of expression as both the subject and object of painting then its role, as perceived through light, would be similar in the theatre: 'There is no doubt', he said, 'that ... a direct beam of light could create a very much more intense effect if it could be controlled to the same degree as painting with pigment. And that is indeed the future problem for the visual arts: the creative use of direct light'.¹²

Although lacking the rigorous modernist articulation and the overt social commitment to new technologies of the Bauhaus argument, Craig clearly had very similar interests in the possible use of light as a dramaturgical agent in performance. He had written of the importance of light in his 'screens' projects of 1910-14, as being not only that of illumination and revelation of the form of physical structures, but also important in the creation of new form: 'the relation of light to this scene', he said, 'is akin to that of the bow of the violin, or of the pen to the paper'.¹³ The instrument is silent until it resonates with vibration and makes music, and the paper is blank until it is approached by the pen. The idea of a moving spotlight and the beam of a projector were new technologies in performance; they introduced a new aesthetic and a quality of change, movement and plasticity that had not been seen before. In 1910, when Piot visited Craig and saw his plans for lighting the screens he reported back to the manager of the Théâtre de l'art, Jacques Rouché:

The decoration is simplified in that, above all, the changes of light refracting against the various volumes, give expressiveness to the decor.

By these simplifications one seems to achieve 'une fluctuation musicale du décor' which, in time, links the decor to the changes of the drama. ... It is desirable that the decor, mobile as the sound, elucidates phases of the drama in the same way as the music accompanies and underlines all movements, just as it develops in pace with the drama.¹⁴

In 1927, Schlemmer gave a lecture-demonstration in Dessau to the 'Circle of Friends of the Bauhaus' and described his own 'screens' scenography and their functioning with light:

since we have no interest in make-believe forests, mountains, lakes, or rooms - we have constructed simple flats of wood and white canvas which can be slid back and forth on a series of parallel tracks and can be used as screens for light projection. By back lighting we can also make them into translucent curtains or wall areas and thereby achieve an illusion of a higher order, created directly from readily available means. We do not want to imitate sunlight and moonlight, morning, noon, evening, and night with our lighting. Rather we let the light function by itself, for what it is: yellow, blue, red, green, violet, and so on. ... Let us rather open our eyes and expose our minds to the pure power of colour and light. If we can do this, we shall be surprised at how well the laws of colour and its mutations can be demonstrated by the use of coloured light in the physical and chemical laboratory of the theatre stage.¹⁵

Craig consolidated, clarified and extended many aspects of his own screens project in the publication of *Scene* in 1923. In this, he was more precise in articulating the need for light to physically move with the scene as well as to change in colour and intensity. Such movement, he said:

meets the requirements demanded by the modern spirit - the spirit of incessant change: the sceneries we have been using for plays for centuries were merely the old stationary sceneries made to alter. That is quite a different thing to a scene which has a changeable nature. This scene also has what I call a face. This face expresses. ... Its shape perceives the light, and in as much as the light changes its position and makes certain other changes, and inasmuch as the scene itself alters its position - the two acting in concert as in a duet, figuring it out together as in a dance - inasmuch does it express all the emotions I wish it to express.¹⁶

Although the language is significantly different, none the less, Craig was self-evidently close to Bauhaus thinking on the theatrical functioning of light. Furthermore, Craig anticipated later scenographers

such as Josef Svoboda, who attempted to create *kinetic*, mobile stage pictures which changed in tune with the changing rhythm of the drama, and, as Bergman claimed, 'solved the problem of how, with the aid of light ... to give even the decor a dimension of time'.¹⁷ Seventy years later, Svoboda extended Craig's 1923 *Scene* articulation and clarified his response to the nature and purpose of scenic movement – citing the particular influence of Craig:

It is perhaps already clear that you can't do static theatre, in which scenery rigidly gazes down on actions played out within its space. After all, what is actually fixed in the stream of life? Is a room in which someone declares love the same as a room in which someone is dying? By the same token, a summer pond with an unending horizon is not transformed solely by the atmosphere of the day, but primarily by the gaze of those who stand on the shores. Gordon Craig once explained it in a note that actually foreshadowed his design drama, *The Stairs* [1907 – usually known as *The Steps*]: 'Have you ever been in love and had the feeling that the street before you suddenly expands, that houses grow, sing, lose themselves, and it seems to you that the street darkens drastically, levitates, and becomes transformed into a cloud? In reality you were walking along an ordinary street – or so everyone claims, but it's a lie, don't believe them, keep faith in your own truth, which is the truth of ecstasy.'¹⁸

Walter Gropius extended the Bauhaus concern for light into probably his most influential theatre project, the projected designs that he made in 1926 for his 'Synthetic Total Theater' for Piscator. In 1935 at a conference in Rome he presented his designs to an international gathering of writers and directors, saying: 'The contemporary theatre architect should set himself the aim to create a great keyboard for light and space, so objective and adaptable in character that it would respond to any imaginable vision of the stage director.'¹⁹ Although the physical architecture of the building focused upon the large central revolving platform, which could move audience seating in order to create different forms of theatre, it seems clear that for Gropius the real interest in the project lay in the fact that the building itself could become a space of transformation and performance. Projection screens surrounded the interior like wallpaper suspended some distance from the walls – behind the stage and throughout the auditorium. Not only would these serve the experimental aims of designers and directors, but also in the face of the development of cinema, they would enable the theatre to re-assert its living immediacy

and encourage the audience to 'shake off its inertia' as it entered the building and experienced the effects of the transformation of space through image and light. To enable this, Gropius planned a complex system of spotlights and multiple film projectors, with front and back projection screens, which between them could transform the walls and the ceiling into moving pictures and which would completely replace the 'cumbersome paraphernalia' of painted scenes.

Notwithstanding the radical and experimental nature of the Bauhaus theatre work, the use of light and the projected image as a representational alternative to traditional scene painting was to remain a frequent priority. Early in the century, Adolph Linnebach developed some sophistication in projecting reasonably complicated scenic images in German opera houses and State theatres. He used a simple metal rectangular casing to house an electric arc lamp, or by the 1920s a gas-filled tungsten filament lamp, and placed a cut-out or 'fretted' image on a stand some distance in front of the lamp housing. The projected image was large and could achieve a reasonable focus by moving the stand backwards and forwards in front of the light source. The distance from the arc light also meant that the 'fretted' image remained relatively cool and this enabled coloured filters, or painted transparencies, to be used. Multiple Linnebach projectors could be used to fill a large back scene with meteorological, marine and simple natural imagery. However, by the close of the 1920s, bulb and optical technology was such that a projected image might fill an entire stage and its cyclorama using photographic diapositive glass slides. It is, however, important to note, especially in the light of the experiments of Appia, Craig and the Bauhaus, that the desire to imitate nature – to project 'realistic' clouds upon a back scene, for example – remained the ambition that controlled the developing design of projection equipment in the theatre. More particularly, the production of opera on the international circuit of theatres still dominated the order books of equipment designers and manufacturers. The mobile, touring nature of both singers and productions of opera necessitated a technical theatre structure that was transferable from theatre to theatre. The portability of rolled canvas and two-dimensional framed scenery, flatly illuminated by a systematic lighting installation, provided this international flexibility. This most traditional of theatre forms therefore tended to retain its equally traditional representational scenographic ambitions until eventually threatened by innovations after the Second World War such as those at Bayreuth and subsequently, during the 1960s, in Prague.

As with most aspects of lighting technology during the late 1920s and through the 1930s, the Schwabe Company led the market and developed techniques and equipment for others to imitate. Although it was not installed at the Festival Theatre, Cambridge, Harold Ridge describes the centrepiece of Schwabe's late 1920s catalogue – the cloud-projector:

The two-tier cloud machine ... is extensively used in continental opera houses and large theatres. A 3000 watt gas-filled lamp is placed in the centre, and around this are mounted 20 projection attachments, each of which can be fitted with a cloud diapositive. These diapositives are prepared from actual photographs. The clouds are made to move across the cyclorama by slowly rotating the entire apparatus by means of an electric motor. As the images from the objective lenses are reflected onto the cyclorama by means of plane mirrors it is possible to obtain a vertical movement by tilting the mirrors. The tilting movement of each tier of mirrors is worked by two electric motors. By using all three of the electric motors the clouds may be made to move in any direction and it is possible to make one bank of clouds move over the other.²⁰

As might be expected from the work that Ridge undertook with Terence Gray at the Festival Theatre in Cambridge, and from his innovative approach to stage lighting that he published in 1928, he included the description of the cloud-projector for completeness rather than out of real conviction. His own view of the artistic value of this machine was that it would be a significant distraction in a 'serious' play and that therefore its use should be limited, at least as far as realism goes, to use in the production of spectacular plays. Such technology, accordingly, found considerable favour not only in the international opera house but also in the spectacular musicals of the 1930s – C. B. Cochran's *White Horse Inn* at the London Coliseum in 1931 had a complete cyclorama lit by Schwabe 'horizon' lights and cloud-projection machinery. But foreshadowing post-war use of large-scale scene projection, Ridge concluded: 'If, however, the machine is used by the scenic artist for purely imaginative designs which aid the atmosphere of the scene, this type of machine can become a valuable servant in the theatre.'²¹

Nevertheless, in the still relatively dim images achieved by scene projectors when they had to compete alongside the light needed to illuminate actors further down stage, many perceived more fundamental problems of representational identity. The intangible, ethereal

quality of the projected image seemed to distance and separate it even more destructively from the world of the flesh-and-blood actor than had the painted scenic image. Fuerst and Hume noted in 1929: 'The setting stands at the back of the stage like an illustration of the action, without ever becoming part of it.'²² However, they did not reject projection out of hand, but believed that if it were to be used, then it should exploit its sense of visual difference and 'seek a new beauty of its own at the side of, and apart from, drama'. However, they added the caution that 'when new scenic means appear so seductive, there is a temptation to exaggerate the importance that projections may have for the *mise en scène* of the future'.²³ The exploitation of scene projection was unlikely to be widespread until lamp and lens technology could provide both the intensity of light and the ability to focus with precision at such great size.

Notwithstanding the slowness of technology to enable scene projection, the 1930s produced some very significant changes in the approach to the use of light on stage. Fuerst and Hume summarized achievement in 1929 and set the scene:

With the substitution of the high-powered incandescent lamp for the arc came the control from the switchboard of spotlights, floods and other units carrying lamps, ranging from three hundred to three thousand watts, just as formerly the border lights had been controlled. The result was that the old border lights themselves were replaced by high-powered lamps. In some theatres we saw the border light transformed into a steel light bridge capable of carrying any number of spot and floodlights and one or two electricians as well.²⁴

The desire for light intensity and the ability to produce sharp, hard-edged beams of light led to considerable technical development in the increasingly used spotlight. Precise dates are not especially relevant, but in 1933 Kliegl Brothers (USA) and Century Lighting (USA) simultaneously produced what were probably the first ellipsoidal spotlights in the 'Klieglight' and the 'Lekolight'. It was well known that the rays from a light source, placed at the first focal point of an elliptical reflector, would converge toward the second focal point, so that consequently it was possible to pass all the rays through a comparatively small colour filter or diapositive slide by placing it close to the second focal point. In its simplest form the luminaire, like its 'baby lens' predecessor, consisted of a tubular casing with a blackened interior surface. A light source (by now an argon gas-filled tungsten filament bulb) was placed at the focal point, with an

ellipsoidal highly polished reflector placed behind, and a plano-convex lens set at the front. Such an arrangement produced the distinctive conical, hard-edged beam of light that was rapidly becoming an icon for theatrical performance. Because of its focusing ability, the ellipsoidal spotlight could also operate as the projector of focused images when images painted onto heat-resisting mica sheets or fretted gobos (shortened from 'go-between') were placed at the focal point between the lens and the light source. With a significant boost in the light source produced by halogen bulb technology in the 1960s and more general improvements and variations to lens and mechanical handling, the ellipsoidal spotlight (mirror, or profile spotlight in the UK) remains the basic technology of modern stage lighting and still provides, of course, the 'living light' envisioned by Appia.

Whilst the date of the 'invention' of the ellipsoidal spotlight is not especially important, it is interesting to note that a year earlier, in 1932, a work of stage-lighting theory and practice was published that not only used such luminaires, but relied upon them. Stanley McCandless was a professor at Yale University (1925–64) and was one of the first teachers to offer a course in Stage Lighting. His two major works, *A Method of Lighting the Stage* (4 editions, 1932–58) and *A Syllabus of Stage Lighting* (11 editions, 1934–64), provided the first structured, formal 'method' for lighting the stage. His method required that the stage be divided into a series of 'lighting areas'. A lighting area was a small section of the total acting space. McCandless asked that you should imagine a cylindrical space approximately eight to twelve feet (2.5–3.5 metres) in diameter and seven feet (just over 2 metres) tall. Although much would depend upon the specific floor-plan of the setting, he proposed a system using a minimum of six 'lighting area', placing three areas across the front of the stage and three beyond, toward the back of the stage – the wider and the deeper the stage, the more of these 'plains' of lighting areas would be required. McCandless's original theory proposed the use of two lights focusing upon each area, both of which should be placed above, in front of, and to the left and right of the performer at as close to 45 degrees from a central axis as possible. To light all six areas, therefore, a total of twelve luminaires would be needed. McCandless went further and suggested that in lighting each area, one of the two luminaires should be filtered with a warm colour (typically amber or pink) and the other with a cool colour (typically pale blue). Subsequent editions suggested that three luminaires per area should be used for a thrust stage, and four per area for a theatre-in-the-round

stage. Lighting the stage in carefully defined areas like this focused the illumination on the performer's face, and by varying the intensity between the individual lighting areas, served also to focus the audience's attention. Thus the stage would be provided with a thorough, but flexible system of providing key lighting to any area of the stage. This key lighting would then be augmented by 'fill' light that would consist of atmospheric 'washes' of light, being provided by the traditional overhead battens, side-lights and footlights. The key light would establish the highlights; the fill light would control the colour and depth of the shadow areas. The relationship between 'key' and 'fill' was to be established by a difference either in colour or intensity – the key light would tend to be the brighter or the warmer of the two.

In this way the theory and practice of lighting the stage that had been in operation since the introduction of electric lighting was effectively reversed, although the main principles of Appia still held true. Hitherto the diffused, shadow-free general illumination from battens and borders had provided the foundation of stage lighting, within which *occasional* spotlights might be used in order to model and emphasize. In McCandless's method, the systematic use of spotlights, individually focusing upon defined acting areas, provided the basic illumination of the stage, which might then be blended, harmonized and coloured by the battens. It was a system firmly rooted in a belief in the plasticity of the stage and therefore it furthered Appia's ambition. It acknowledged the overall primacy of form and modelling in the role of stage lighting, and that, accordingly, lighting should primarily exist to reveal the actors and their actions within a scenic structure of three-dimensional architectural form. It also responded, through the circuitry used to connect and manipulate the 'pairing' of lights on the acting areas, to the idea that stage lighting should be able to follow the action; that lighting might serve as a continuous score of visual accompaniment within the performance. The remarkable coherence and thoroughness of McCandless's method, coinciding with the development of appropriate technology, has contributed to ensuring that its principles still form the basis of our contemporary approach to lighting.

However, the system, when first proposed by McCandless, made considerable demands upon light-control and dimming facilities. By the early 1930s, it was becoming common for the lighting control board to be separated from the dimmers, which were frequently, and for safety's sake, placed away from the stage in a more fireproof

environment – usually in a basement area. To do this initially necessitated cumbersome mechanical operation with tracker wires and pulleys, and then by the 1930s and learning much from the technology of the cinema organ, by using electrical servo-motors to move the dimmer levers. In 1933 the General Radio Company (USA) developed a continuously variable transformer, known as the 'Variac', that could replace the uneven and often jerky operation of the resistance or electrolyte dimmers. As with older forms of dimming, but with greater ease, the autotransformer dimmer could be remotely operated. These developments were simultaneously matched by European companies and served as the principal form of electrical dimming system until the introduction of Silicon Controlled Rectifier (SCR) dimming during the 1960s.

But to achieve the continuity and flow of a stage-lighting score and the sense of seamless integration within the dramatic action that was suggested by both Appia and facilitated by McCandless's method, a lighting-control system was required that could be 'played' like a musical instrument, with its operator having a clear and uninterrupted view of the stage. Fred Bentham's 'colour organ' of the late 1930s (see Figure 19) and its variants seemed to provide the technology and also a suitable mental 'attitude' for an artist/operator accompanying performance. But its ultimate flexibility was constrained by the limitations of the remote servo-controlled autotransformer dimmers stored beneath the stage. Such limitations had proved less of a problem when the emphasis of stage lighting had relied upon a limited number of 'colour' circuits arranged in battens, accompanied by a still relatively small number of spotlights. But after McCandless and also, as Bentham notes, after the Second World War, 'theatre was becoming more and more spotlight and other localised light based; so who would want primary colours battens?'²⁵

Whilst a large number of relevant technologies were initiated during the 1930s in the field of filament design, luminaire development and increasingly sophisticated lighting control and dimming, reactionary and extreme political forces in Europe had the effect of limiting significant innovative stage practice to the few experimental theatre companies in the USA. The scenographic experiments of Gray and Ridge at Cambridge, of Meyerhold in the Soviet Union, of Georg Grosz, Caspar Neher and Erwin Piscator in Weimar Germany, of the experimental artists of the Bauhaus, and of Italian Futurism, and Surrealism in France, all withered as their artists escaped into exile to the USA, retreated into a politically safer 'classicism' or, like Gray,

abandoned theatre practice altogether. There was, therefore, after the end of the Second World War, a sense of rediscovering the experimental basis of scenography that had been initiated in the 1920s.

A very particular and important rediscovery in connection with lighting and its technology occurred at the *Festspielhaus* in Bayreuth, where its close association with the National Socialist Party necessitated a very thorough and radical re-evaluation of production values. Wolfgang and Wieland Wagner, the grandsons of the composer, were required to re-stage the complete canon of Wagner's music-dramas in a way that disassociated them from their pre-war colonial status as emblems of the *heilige deutsches kunst*, and their exploitation and effective 'ownership' by Hitler. In a series of remarkable productions through the 1950s, Wolfgang and Wieland Wagner not only achieved this 're-birth' of Wagner's work, but also, by example and influence, revolutionized approaches to the staging of opera throughout the world. Appia's collected *mise en scène* for the works had been initially rejected out of hand by Wagner's widow, Cosima, and had consistently been over-ruled and generally derided at Bayreuth up to the outbreak of the War. Furthermore, although Appia's work on *Tristan und Isolde* at La Scala, Milan in 1923 and on the *Ring* cycle at the Opera House in Basel in 1924–5 had been significant and historically important, the lighting technology available at that time was less than adequate to fully realize Appia's ideas. However, in the early 1950s, Bayreuth had access to spotlights of considerable power through the electronic and optical developments of the German company Reich & Vogel, and also to scene projectors that could either dominate the stage with gobo texture, or fill the entire back-scene with powerful and clearly defined imagery.

Ludwig Pani began in the early 1930s as a division of a maker of optical quality lenses, Optischen Werke C. Reichert in Vienna. Building upon associated technologies of illumination and optical definition that the War urged forwards, by the early 1950s they were making scene projectors which had incandescent filament light sources of up to 5000 watts and sophisticated and adaptable systems of objective lenses. Although extremely costly, and therefore very much restricted to large international opera houses and state theatres, the early ambitions of Appia, Linnebach and Gropius were now technically possible. Of equal, if not more importance was that Bayreuth now had the circumstance and the will to realize Appia's vision of a scene that would be fully integrated within the dramatic action of its musical score (see Figure 20). The scenes (like Appia's designs) have

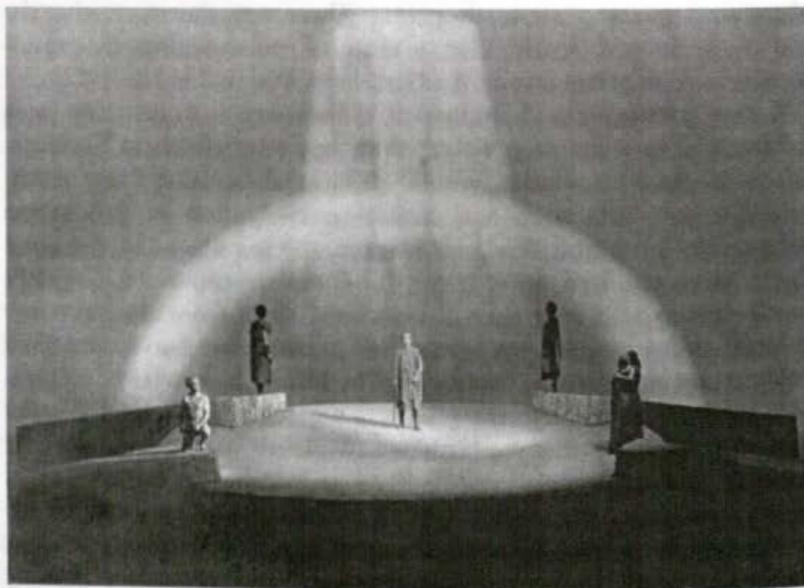


Figure 20 Projection after the Second World War – Wagner at Bayreuth realizing the scenic ambition of Appia, *Rhinegold*, 1952 (*Festspielhaus Bayreuth Bildarchiv*)

little if any pictorial significance in their own right; they provide a context for performance, but also in their inseparable partnership with the dramaturgy of the poetry and its music, they became integral to the performance. The projected scene could now serve, in Appia's terms, as the 'hyphen' that united dramaturgy and its environment. Furthermore, in rendering 'immaterial all that it touches', the projected light had the ability to endow the physical reality of stage and scenic material with movement and change. The intensity of light produced by the Pani projectors was such that the sense of separation and 'difference' of the projected image from other stage lighting noted by Fuerst and Hume could be avoided.

If it is Adolphe Appia who serves to exemplify the fundamental principles of stage lighting in performance, then it is Josef Svoboda who took the idea of movement and change, implicit in a movable beam of projected light, and developed it within his practice of kinetic scenography. In 1993 he wrote, 'If the standard scenographic guide in the '20s was a painted rendering and in the '30s a three-dimensional model, then in the '60s it was a ground plan, lighting scenario, and a filmed record of a kinetic model.'²⁶ Svoboda's writings, articles

and interviews do not have the sonority, *gravitas* or sometimes hermetic qualities of Appia nor the elusive possibilities of Craig, nor the overt political commitment and modernist social agendas of the Bauhaus. Nevertheless, *The Secret of Theatrical Space* (1993) is an extremely important collection of theory and principles derived from his sixty years of scenographic practice that in many ways united and extended the scenographic energies of the original theorists and artists. Svoboda's account ranges from anecdote to memoir and reflection, and from scientific precision to poetic stream of consciousness. Whilst he was always committed to an understanding of scientific principles and the development of advanced technology within his scenographic solutions, he also maintained a great respect for the intuitive solution and was consistently sensitive to the inter-relation of time, space, movement and light in the theatre – to the holistic sense of the plasticity of the stage that has been such an over-riding perception of the twentieth century. He was trained as a carpenter and then as an architect, but began designing for the stage shortly after the end of the Second World War. By the time he was 30 in 1950, he was head of 'artistic-technical operations' at the National Theatre in Prague. Having developed the technical and optical processes involved for display in International Trade Fairs, he founded the experimental *Laterna Magika* theatre in 1973 to pursue experiments and to make theatre that integrated filmed and live performance – experiments that continued ceaselessly in his position as Artistic Director until his death in 2002.

Implicit in the theory articulated by McCandless was the important concept of darkness – expressed simply, the theatre space is not one that is illuminated in an overall general way, but fundamentally a place of darkness that is energized and brought to life by the performance of light. The division of the stage into lighting areas that should be determined by the dramatic action, and the ability to select or deselect any such area, meant that light should not exist at all until generated and occasioned by dramatic action. This seemingly elementary description of the stage and an approach to light lay at the heart of Svoboda's concept of scenography. He said: 'After all, it's not a matter of theatre space, but of the space for a production, therefore production space, and that is fundamentally different from theatre space.'²⁷ The power and flexibility of post-war spotlights and the optical developments that paved the way for scenic projection, coupled with increasingly sophisticated lighting control, enabled Svoboda to conceive of the space of production as a distinctive

construct *within* the architectural theatre space; a construct of space-defining light born out of darkness, an abstract spatial composition shaped by light. The stage of a theatre building is a dark space; its sides disappear into the further blackness of the wings and there is no ceiling, and only the floor has a given physical reality (and even that may be scenographically redefined). The entire architectural space is therefore capable of giving birth to production space and its transformation, and from out of this darkness it is light that will create that space. The challenge for the scenographer is to create a space that both serves a production and is defined by the production. 'I'm not interested in making a burning bush or an erupting volcano on stage, in creating an illusion of reality, but in acknowledging the reality of theatrical elements, which can be transformed non-materially into almost anything. I've called them "space in space."²⁸ For Svoboda,

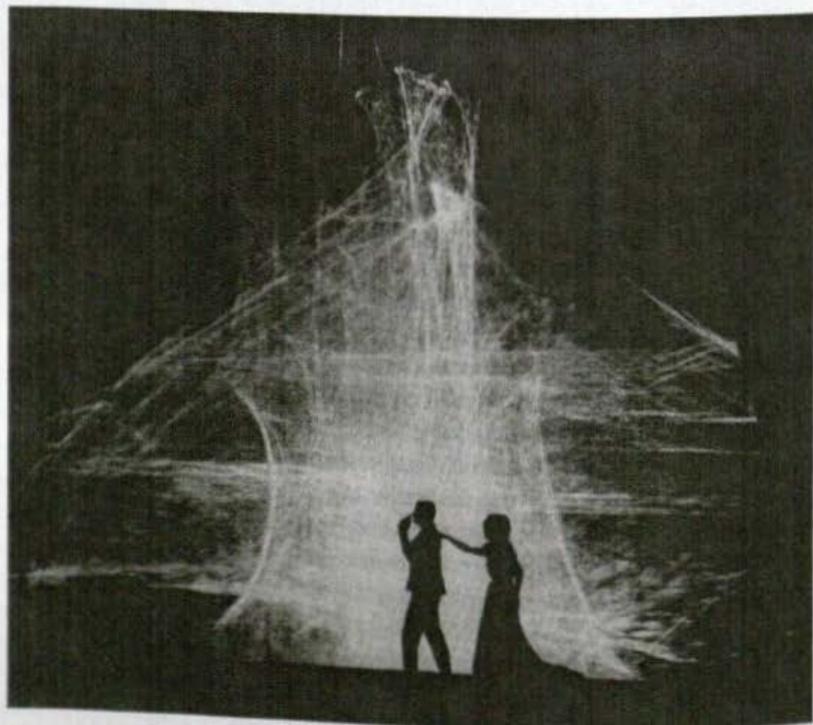


Figure 21 Technology and performance: Josef Svoboda used a web of laser beams as scenography for *The Magic Flute*, Bayerische Staatsoper, Munich, 1970; directed by Gunther Rennert (*Šárka Hejnová*)

therefore, light as atmosphere, light presented as the material quality of light beams, and light as the projected image with its possibilities for reflection and refraction, became the fundamental ingredients within the process of scenographic transformation. Although re-articulated and extended by Svoboda into technically sophisticated new effects, these remain, of course, essentially the three qualities of light as described by Appia in 1899.

Scientific investigation, and its ability to generate new technologies, have been a consistent feature of Svoboda's artistic process and therefore of the internal organization of the theatre. The scenic department of the National Theatre in Prague was organized as a collection of research laboratories that examined optical and electrical qualities of stage equipment, and the material qualities of fabrics and plastics in Svoboda's ceaseless experiment with surfaces for receiving, reflecting and transmitting light. When the theatre could not provide the expertise, Svoboda developed relationships with academic and commercial scientific research – for example, in 1970 he worked with Siemens to develop what they called *Lasergrafie*. Between them they created a moving web-like cradle of coloured laser light-beams for use in Günther Rennert's production of *Die Zauberflöte* at the Munich Staatsoper. The seemingly 'solid' needle-like beams of light intermeshed in space and created apparitions that gave body to the forces and powers of Mozart's work. Svoboda's excitement and commitment to *Bühnenlaser* was great until the considerable safety implications of laser technologies became apparent and made significant future development in the theatre impractical.

This union of art and science is essential and vitally necessary for our time. It provides art with a rational basis and helps us to carry our investigations further. If I need a cylinder of the light on stage with a dispersion of less than one degree at its base, I need to gather an entire scientific and technical team to construct such a cylinder.²⁹

In 1959, he created the scenography for a production of *Hamlet* at the National Theatre in Prague. Its requirement for light illustrates Svoboda's concern for not only making production space within the architectural framework of a theatre stage, but also achieving its fullest integration within the dramatic and psychological action of the performance. He described his inspiration as being that of three kinds of light upon a stone and their interplay: the intense, bright illumination of the sun directly striking the stone; the deep, black shadow

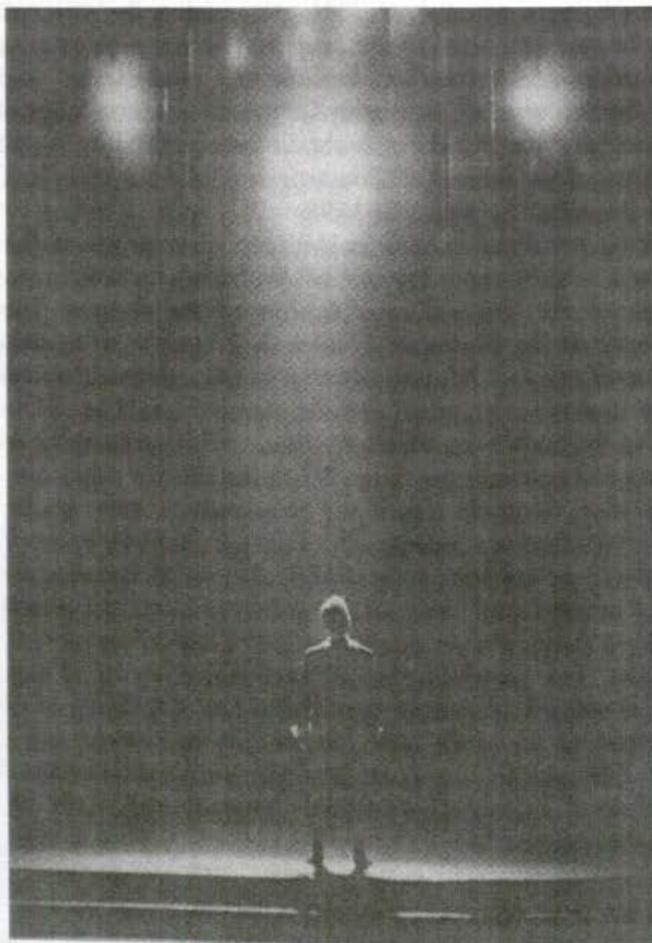


Figure 22 *Hamlet*, National Theatre, Prague, 1959 (Šárka Hejnová)

beneath the stone; and, at one side, a half-shadow and a softened light reflected from an adjacent stone. These three kinds of light, he said, were the prototypes of any plastic form that could be created by sharp, diffused and reflected light (see Figure 22). The scenic arrangement for *Hamlet* consisted of twelve rectangular screens (very similar to the Craig pattern) that were covered by a black plastic material, which had almost 50 per cent of the reflective quality of a black mirror surface. The screens were lit by spotlights hanging upon the lighting bridge, which traversed the stage directly upstage of

the proscenium arch. The actors and all other scenic details were illuminated simultaneously by both direct and reflected light. As a result of this, the range of shadow values was essentially extended, hard contrasts disappeared, and, Svoboda says, forms were fuller – and in the optical sense, more real. He clarified:

It did not conventionally describe the place of action or even create it. It placed the action in absolute space, which can represent any place and any time. That is, the scene did not picture a concrete place. The movement of the abstract panels not only indicated spatial changes but was also a materialisation of rhythm, by means of which the action progressed. Similar to the function of a film cut, it evoked the psychic state of the characters.³⁰

Similarly, at Bayreuth in 1974, light was used to express the duality of love as represented in *Tristan und Isolde*. He wanted the scenography to reflect upon the absolute, ideal nature of love whilst simultaneously being able to recognize its palpably very human, sensuous character. A scenic surface that would both reflect projected light and also transmit the light beyond the surface of the screen was used. In several productions at this period, Svoboda was experimenting with the reflective qualities of tightly stretched thin ropes hanging a few centimetres apart, and which therefore created a semi-transparent 'wall'. He described the effect in *Tristan*:

The shifting character of light envelops the shimmering environment of the entire story. The scenography of the final scene, for example, in which Tristan waits for Isolde under a tree, was based on thin, densely clustered vertical cords. A mere change in the temperature of the colours projected onto the cord reconfigured the entire space. Tristan and Isolde were suddenly like sunspots, until at the end they became a part of the sun itself.³¹

Alongside Svoboda's use of projected images and the variety of surfaces upon which they were thrown and reflected, there developed a sophisticated extension of McCandless's ambition to focus attention selectively upon the actor. This had been available, albeit quite crudely, since the days of limelight and the early electric arc lamps, where a brilliant 'follow-spot' would sweep across the space, keeping pace with star performers as they moved about the stage. By the 1960s the use of follow-spots had generally died out for drama, and they were principally to be seen in opera, ballet and the variety theatre. However, the technological development of quartz-halogen light sources, and the invention of plastics-based heat-resistant colour

filters, enabled the production of extremely powerful moving spotlights which, unlike their arc light predecessors, could be electrically dimmed and very effectively coloured.

A consistent challenge to the scenographer who uses projected scenic space is that the illumination required in order to illuminate the actors can frequently dilute the power and intensity of the projected image – rather like watching a television screen in bright daylight. Typically, the old follow-spots had been located right at the very back of the auditorium, shining over the heads of the audience onto the front of the stage – hence the need for the brightest light source available. Svoboda and his team developed movable spotlights that could be placed throughout the theatre, most especially high on either side of the stage as well as at various positions in the auditorium. His scenography for the Prokofiev *Romeo and Juliet* (National Theatre, Prague, 1971) was black and heavily punctuated with beams of back-light that framed the action. A seemingly floating colonnade of exquisitely proportioned Renaissance arches traversed the stage, covered in a dark surface that received the dim projected image of a texture similar to highly magnified fabric. As the tragedy progressed, the texture grew in size as though magnification was being increased – in Prokofiev's ballet, the dramatic action 'zooms in' more closely on the detail of the tragedy. Were the acting spaces of the stage to have been lit sufficiently to see the performers, all this would have been lost. Accordingly, therefore, each actor was 'followed' imperceptibly by two or three subtly coloured, soft-beamed spotlights whose intensity and colouring could change as needed. Highly skilled stage technicians were needed to operate the spotlights with sensitivity and subtlety as they 'picked up' performers with light as they entered the scene.

The quartz-halogen technology of the 1960s had an important additional effect in that it finally enabled the literal treatment of light as a material quality. Light beams of such intensity could be created that their resulting form could present a solidity to match a solid material, but with the ability to transform in intensity and translucency. Svoboda may well be remembered by future generations primarily for his continued experiment with a scenographic 'wall' of light and associated technologies. Using low-voltage luminaires that produced parallel beams of brilliant white light, he projected into space a hollow vertical cylinder of light for *Tristan und Isolde* in Cologne in 1969. For the five productions of Verdi's *Sicilian Vespers* that he worked on with John Dexter from 1969 to 1984, he developed the purest form of his wall of light (see Figure 23). The battens

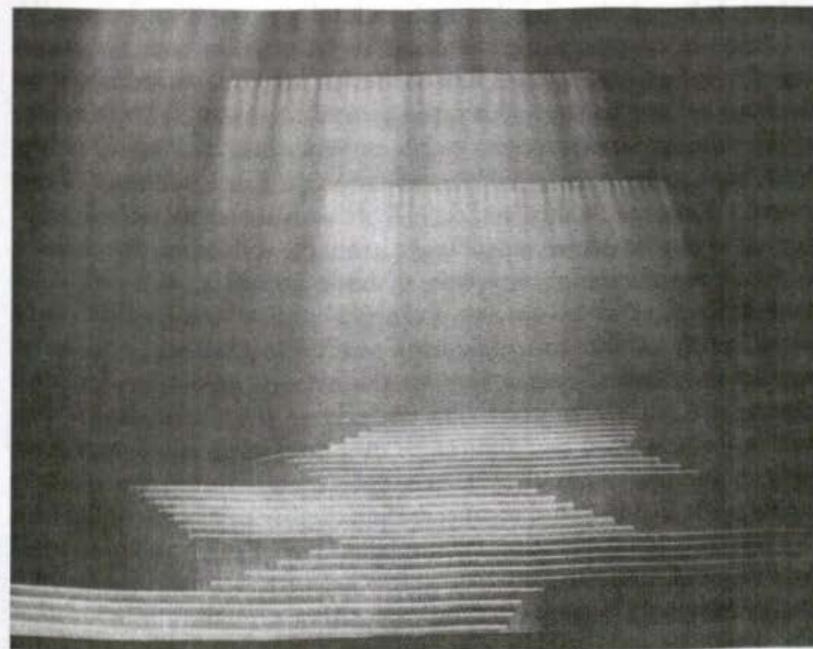


Figure 23 Josef Svoboda, 'La contra-luce Svoboda', Verdi, *Sicilian Vespers*, London Coliseum, 1984; directed by John Dexter (Šárka Hejnová)

of luminaires were suspended high over the stage and shone almost vertically down, but at a small 'back-light' angle onto the stage. Their intensity was such that light not only achieved the material quality of a wall, but also and primarily achieved the aim of becoming a potent dramatic force within the drama. Impurities, dust and residual smoke in the atmosphere enhanced the visibility of the beams of light. Svoboda said that as *Sicilian Vespers* progressed from its first production in Hamburg to its last version in Amsterdam, the wall of light became harder to achieve as the air became cleaner and more 'conditioned', and smoking disappeared from theatres. To some effect, the spraying of ionized water droplets was used to create an atmospheric haze, and when the effect was no longer required a reverse in polarity would cause the droplets to lose their suspension and fall. Svoboda adopted the name given to the effect in Italy, and remarked with playful sadness in 1999 that 'la contra-luce Svoboda was never the same when people stopped smoking'.³²

Svoboda was convinced of the need for transformation and of the ongoing role of technology within the theatre and, like the Bauhaus

artists, believed that science and technology were an inescapable condition of modern living that must be reflected in both the process and the end product of art. The challenge for him, as indeed for the Bauhaus or any contemporary artist, was to inject the true essence of life into the work: 'theatre *ought* to be a place of magic. Nothing from life can be transferred intact into the theatre; we must always create a theatrical reality and then fill it with the dynamics of life.'³³

Use of every modern technology available in order to create a facsimile representation of a tree, a house, an office, or a prison will have little effect in the theatre. Even placing the 'thing itself' onto a stage, much as the late nineteenth century had done in order to combat the effect of electric light by putting real motor cars into their scenes, will have little effect. The dislocation from a real-world context into the framed situation of an observed stage scenography will remove any life or significance from the object. During the twentieth century, the focusing and form-revealing quality of a beam of light and the changing atmosphere of coloured light have drawn attention to the fundamental, time-based nature of live performance, and the fact that drama may only be expressed through forms of action. It is therefore the *action* of light within a scenography that may enable life and energy. Through its action, scenography becomes performance. A blue length of cloth may, through the action of performance, become a river, just as, through action, six actors may become an entire army. The texture, quality and colour of the blue cloth may well achieve a theatrical reality, but it is the way in which the fabric *performs*, its role within the overall plasticity of the stage, that may endow it with what Svoboda called the 'dynamics of life'.

Before the Second World War, the mechanical control of dimmers and switching at the lighting control board was limited to the ingenious, but ultimately limited, physical control of the lighting-board operator. Electro-mechanical control through the use of servomotors allowed the creation of more complex lighting 'states' in which each 'state' might involve the control of many individual lights according, for example, to the method suggested by McCandless. Lighting control boards (or desks, as they became called as they became smaller) of the late 1950s and through the 1960s offered rows of dimmer levers and matching switches. Each 'row' of levers and switches could be used to prepare a lighting state. When required, a single 'master' dimmer lever at the end of the row was used to implement the lighting change in performance. Multiple rows of such levers and controls enabled several such states to be prepared in

advance. Inevitably, the system required a dextrous operator with a careful written account of each state, and lighting rehearsals could be slow as the operator recorded the written notation of the light that had been created. Furthermore, the number of lights, or their paired and patched equivalents, was limited to the number of circuits available to each row of controls – although the physical re-patching of lights into other circuits could vary the lights used. In practice, however, technology such as this had the tendency of treating stage lighting as a series of fixed conditions or states, with individual variations and 'specials' made to accommodate specific dramatic situations. The idea of light as a genuine accompaniment, a continuously moving and transforming lighting 'score' that Appia anticipated, was hard to achieve until methods could be found to record numerous 'states' or conditions of lighting and to be able to instantly play back the recorded lighting – better still, to allow the operator to play the entire lighting installation as a giant instrument. Recording notation to magnetic tape was reliable, but difficult to play back in any other than a straightforwardly linear way. With the advent of digital recording to computer disks, lighting control in the theatre had access to an infinitely more flexible and sophisticated means of storing and playing back complex lighting in performance.

However, the ever-increasing exploitation of electronic technologies in the design and operation of lighting control systems tended to further remove the lighting operator from close contact with the performance. Until the 1960s, and later in many old theatre buildings, the lighting control board had typically been located at the side of the stage and was frequently raised high onto a platform behind the proscenium arch. As new theatres were built and modifications were carried out to existing buildings, lighting control was placed at the rear of the auditorium alongside stage management and sound control, all with a reasonably unobstructed view of the stage. But the combination of functions, the inevitable noise and the need for air conditioning and filtration for increasingly complex electronic installations required the use of heavy, double-glazed glass between the auditorium and the control facility. Just as technology created the need for technicians to be isolated in an air-conditioned and sound-proof environment distant from the stage, so technology has more recently been used to bring the operators back into more direct contact with performance. Small and reasonably discrete 'slave' units may be operated from anywhere; the use of mini-disk and computer-manipulated sound has banished the loud magnetic 'clunk' of the

tape-recorder and enabled sound to be similarly operated from within the auditorium space.

As the light source and flexibility of the contemporary data projector increases, then it will undoubtedly replace the need for large, extremely cumbersome and expensive scene projectors. Furthermore, the optical challenge of creating the desired image when the projector may need to be sited at an acute angle to the screen, which previously was solved by photographic manipulation in the darkroom and optically at the projector, may now be undertaken as the image is generated, or processed in the computer with far greater accuracy. Accordingly some of the fundamental qualities of change, movement and transformation that have been identified by theatre artists throughout the twentieth century as being the crucial contributions of light and atmospheric colour may be explored and will inevitably accompany this method of creating scenographic imagery.

8 The Scene as the Architecture of Performance

I wish to remove the *Pictorial Scene* but to leave in its place the *Architectonic Scene*.

Edward Gordon Craig¹

A considerable feature of the struggle to find an alternative scenographic identity and a new aesthetic for the theatre during the twentieth century has been centred upon finding ways of integrating scenic space and the place of performance – the architecture of the theatre. The fictional space of the play conjured by traditional representational painted scenery – the sitting-room of Hedda Gabler, or the castle of Elsinore – has confronted a developing concern for the material reality of the scenic materials used to create such a fiction. In the tension between spatial illusion and its material reality, the space occupied by the stage has become, and continues to be, a contested and ambiguous place: a place that exists to, in some way, 'realize' a dramatic text; or, a place that is the canvas of its own art. As Gay McAuley says: 'The specificity of theatre is not to be found in its relationship to the dramatic ... but in that it consists essentially of the interaction between performers and spectators in a given space.'² Furthermore, the ongoing questioning and re-appraisal of the relationship between performer and spectator has consistently generated debates about the nature of stage architecture and the physical placement of theatre. If the scene should no longer be considered as illusionistic and pictorial, if it should no longer be an ambition to provide the audience with a 'voyeur-like' perspective into a space that, through conventional means, pretends to be other than itself, then