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What Tuberculosis did for Modernism: The Influence of a Curative Environment on Modernist Design and Architecture

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Introduction

From the mid-nineteenth to the mid-twentieth century, specialist institutions such as sanatoria and asylums were established. In these, patients could be separated and isolated from the community and provided with the control and management of specific medical conditions such as tuberculosis and lunacy. At the start of this period, tuberculosis was a disease closely associated with the rapid growth of industrialization and a poorly nourished urban working class who lived in insalubrious, overcrowded conditions. By the early twentieth century, despite attempts by reforming socialist organizations such as the Garden City movement in England or the Life Reform movement in Germany to introduce healthier housing, these conditions had changed little. As the disease was more prevalent in younger men and women of working age, the financial drain on the European economy was considerable.[1] By this time, research and treatment of the disease had coincided with the advent of modernism. This was a cultural movement that in architecture and applied design involved the integration of form with social purpose. It also attempted to create a new classless and hygienic lifestyle with socialist values.

In the 1950s, when the scourge and stigma associated with tuberculosis were still prevalent throughout the developed world, the introduction of the triple-drug therapy meant that the long-held apprehensions would soon be forgotten. The emergence of a multi-dependent, drug resistant form of the disease that is also linked with HIV/AIDS has stimulated press by-lines such as ''The shadow of the sanatorium looms again'' or those that describe tuberculosis as ''the white plague''. It has also alerted a generation—ignorant of the former manifestations and life-style demands of the disease—to a treatment regime conducted in tuberculosis sanatoria which required specific architectural and design features and which, it shall be argued, had important repercussions on modernist design.[2]

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[1] In late nineteenth-century Germany, the need for a healthy work force led to the introduction of workers' health insurance schemes, started in Britain in 1911. The poor health status of recruits for the Boer War (TB was cited as a dominant factor) led to measures to improve general health standards. See Linda Bryder, *Below the magic mountain*, Oxford, Clarendon Press, 1988, p. 22.

[2] *Edinburgh Evening News*, 16 Dec 2002, and 'Inside Science', Supplement 155, *New Scientist*, 9 Nov 2002.

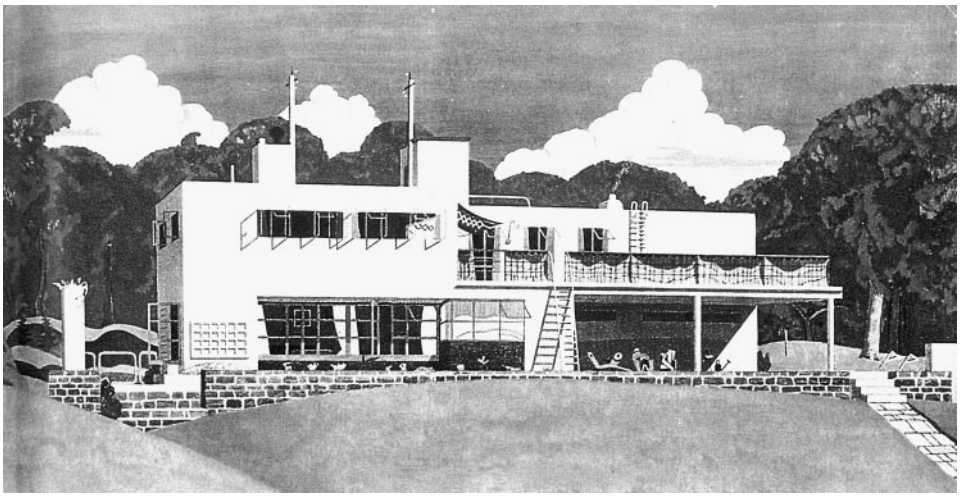

Figure 1: Pen Pits (1936), watercolour by Edward Wadsworth (1889–1949). House designed by P J B Harland for Sir Arthur Bliss. Wadsworth, artist and engraver, was involved in dazzle camouflage for First World War warships and a founder member of avant-garde British art groups such as Unit One. (© Estate of Edward Wadsworth 2004. All rights reserved, DACS.)

Modernism and Tuberculosis

In 1936, Pen Pits (Figure 1), one of many modernist houses in the fashionable ''ocean-liner thirties'' style, was built in Surrey for the English composer Sir Arthur Bliss.[3] Designed by the English architect P J B Harland, it incorporated some of the principal architectural signatures of modernism: flat roof, balcony and terrace, on which elegant Jazz age young women, dressed in patio-pyjamas, could sunbathe on chaises longues. In the early twentieth century, the health-promoting benefits of sunbathing were commended, not only by the medical profession, but also by the *beau monde*, among them the avant-garde French couturier Coco Chanel, for whom suntan was *de rigueur*.[4] At the time, as it was thought essential to the cure for rickets and tuberculosis, and to general well-being, deliberate exposure to the sun, or heliotherapy, was encouraged by the medical profession. It is likely that, in the garden at Pen Pits, a revolving summer house would also have been strategically placed to catch the sun's rays throughout the whole year.

Modernism was a cultural reaction to nineteenth-century historicism. It resulted architecturally in a liberated expression of equality, which incorporated a practical, economic design aesthetic with mass-production as an essential factor. In the early twentieth century, this was a new social philosophy, eagerly adopted by a sophisticated Europeanized urban society. Distinctive architectural features such as flat roofs, balconies and terraces were regarded as ''modernist'' through their association with ''Modern Movement'' and later

[3] Sir Arthur Bliss (1891–1975), English conductor and composer, Professor of Composition at the Royal College of Music. In the 1930s, his works included musical scores for contemporary operas and ballets (*Miracle in the Gorbals* and *Checkmate*) and film music (*Things to come* and *Conquest of the air*).

[4] Elizabeth Wilson, *Adorned in dreams: fashion and modernity*, London, Virago, 1985, p. 131.

''International Style'' buildings.[5] But, apart from popular architectural demands, why were flat roofs, balconies and roof or garden terraces found at latitudes and in climatic conditions that would normally be considered unsuitable for outside use? Not only did they satisfy a desire to acquire a fashionable suntan and reveal *avant-garde* architectural taste; their other, and less attractive, purpose was for the treatment of pulmonary tuberculosis.[6]

After the identification of the tubercle bacillus (*Mycobacterium tuberculosis*) by Robert Koch in 1882, but before the spectacular results following from Selman Waksman's discovery of streptomycin in the 1940s, treatment methods for tuberculosis were relatively simple. The curative effects of fresh air had been well known since the times of Hippocrates and Galen and were used in the nineteenth century by physicians such as George Bodington and Hermann Brehmer.[7] The supposed recuperative properties of dry air meant that early sanatoria were located in alpine regions, and when combined with prolonged periods of rest and a rich nourishing diet, tuberculosis patients often experienced a degree of remission.

In the later nineteenth century, many of these specialist institutions were established to control and combat tuberculosis, mainly through spontaneous efforts of official and philanthropic agencies.[8] The outcome was a therapeutic and social phenomenon known as the sanatorium movement, in which the *jour médical* was the principal method of treatment. Several weeks, months or even years' residence in a sanatorium were required under this regime. These institutions, of which Hermann Brehmer's Görbersdorf Sanatorium was the first, were usually set in a tranquil, wooded environment, where good food, rest and gentle exercise, graded to the patient's condition sometimes resulted in partial cure.[9] Despite varying regimes that reflected differing attitudes of physician superintendents, certain architectural features were essential to early sanatorium design. These were deep verandas, balconies, covered corridors and garden shelters which were furnished with reclining couches for the *jour médical*—or the ''Cure'', as implied in the terms *Freiluftkur* and *Freiluftliegekur*. This was the obligatory daily two-hour period of rest in the open air, usually taken between two and four o'clock in the afternoon, and frequently observed in silence.[10]

[5] P Reyner Banham, *Theory and design in the first machine age*, London, Architectural Press, 1960, and Richard Weston, *Modernism*, London, Phaidon, 2002. Both explore the tenets of modernism. See also J M Richards, *An introduction to modern architecture*, Harmondsworth, Penguin Books, 1940, for a contemporary view on modernist buildings.

[6] Margaret Campbell, 'Architecture of hope: hope for a cure. Tuberculosis, a design response', MPhil thesis, Heriot-Watt University, Edinburgh, 1999.

[7] In 1840, George Bodington (1799–1882), a Warwickshire physician, published *An essay on the treatment and cure of pulmonary consumption*. His method was based on rest in the open air and a good diet. Later, he set up a small treatment centre in Sutton Coldfield, where his therapeutic regime was conducted, but not exclusively, for patients with tuberculosis. Hermann Brehmer (1826–89), a German (Silesian) physician, whose teacher, J L Schonlein, coined the word ''tuberculosis''. Brehmer's sanatorium at Görbersdorf was established in 1859. Peter Dettweiler (1837–1904) was both a patient and a student of Brehmer. He was so impressed with the success of the *Freiluftkur* that, in 1876, he founded his own sanatorium in the Taunus Mountains at Falkenstein near Frankfurt. A German chest physician, Otto Walther, situated his sanatorium or *Colonie* (1888) in the valley of the river Nordrach in Ansach, near Freiburg. Operated on a spartan regime, it emphasized the benefits of outdoor living. Otto Walther, 'The advantages of a colony sanatorium', *British Journal of Tuberculosis*, 1907, **1** (3): 307.

[8] Bryder, op. cit., note 1 above, is an excellent account of the social history of tuberculosis in twentieth-century Britain.

[9] Margaret Campbell, 'Therapeutic gardens', *Historic Gardens Review*, Winter, 1998–9, pp. 27–34.

[10] The *cure de silence*, a variation of the ''Cure'' by which seriously ill patients, when first admitted to the sanatorium, were forbidden to talk. In the course of recovery, whispering was allowed and then a cautious resumption to normal levels of speech.

In the second quarter of the nineteenth century, following serious outbreaks of cholera in Europe, official concern about urban hygiene had focused mainly on water-borne epidemic diseases. Environmental conditions within dwellings could also affect the health of the occupants, although initially emphasis was placed on the insanitary nature of these rather than on overcrowding and lack of sunlight. After 1882, public health concerns that had initially focused on the provision of clean water and efficient sewers shifted to examining the poor physical state of working-class urban housing with a high incidence of tuberculosis and respiratory diseases.[11] In 1878, the French architect Emile Trélat, at that time President of the Société de Médecine Publique et d'Hygiène Professionelle, presented a paper on workers' housing, 'Cités ouvrières, maisons ouvrières', to the first International Hygiene Congress. He stressed the need to provide an improved standard of housing for the rapidly expanding French urban working class. He also effectively used tuberculosis statistics to demonstrate that a lower rate of infection was present among a working-class population that had been rehoused in new ''hygienic'' dwellings.[12] Such attempts to provide good social housing as an aspect of public health coincided with the emergence of architectural modernism.[13] Both originated in the impact of competitive industrialization on European and American society throughout the late nineteenth century. Architectural modernism based on practical design requirements and supported by the exploration and exploitation of new materials and technologies, such as reinforced concrete and steel-frame construction, was well suited to the fulfilment of a more hygienic lifestyle.

Following a pressing need for urban renewal after the First World War, innovative modernist architects in Europe devised progressive design solutions for low-cost social housing, and the eventual building of Lloyd George's ''homes fit for heroes'' was instrumental in transforming many industrial towns and cities. The Swiss-French modernist architect and radical design thinker Charles Edouard Jeanneret, known as Le Corbusier (1887–1965), supported the idea that social deterioration was the result of a too rapid process of urbanization. In *Urbanisme* (1924), later translated as *City of tomorrow* (1929), he expounded his radical ideas on town planning and house building to promote good health and sound morality.[14] Among his prototype designs was an innovative basic house cell, the *immeuble-villa* (1922) later to be developed as a solution for high-density urban living in Marseilles.[15]

In Germany, several very different experimental houses designed by other leading European modernist architects were built for the *Weissenhof Seidlung* (white housing) exhibition in Stuttgart (1927).[16] By 1933 with the rise of National Socialism, there was

[11] N Bullock and J Read, *The movement for housing reform in Germany and France 1840–1914*, Cambridge University Press, 1985, pp. 350–1.

[12] R Burridge and D Ormandy (eds), *Unhealthy housing: research, remedies and reform*, London, E & F N Spon, 1993, pp. 311–12.

[13] See Bullock and Read, op. cit., note 11 above, pp. 371, for reference to the garden city and *cité jardin*.

[14] Le Corbusier, *City of tomorrow: and its planning*, transl. Frederick Etchells (from the 8th ed. of *Urbanisme*, Paris, Editions G Crès, 1924), 3rd ed., London, Architectural Press, 1977, pp. 215–16.

[15] While Le Corbusier regarded the house as a ''machine for living in'', the machine concept was not confined to French modernism, as in the USA, ''machine aesthetics'' referred to a popular description of products manufactured between 1920 and 1940. This period is also termed as the ''Machine Age''.

[16] In 1927, an exhibition of houses intended to demonstrate the environmental advantages of modernist functional design (*Weissenhofsiedlung*) was organized by the Deutsches Werkbund, an organization that promoted German design and industry. The director-general of the project was Mies van der

a physical and cultural dispersal and many radical design thinkers and educators left Germany. At first some found refuge in Britain before moving on to America where modernism was able to flourish in a young affluent society. Among these were Walter Gropius, Marcel Breuer, and Ludwig Mies van der Rohe, who taught architecture at Harvard and the Illinois Institute of Technology, where modernist ideas were stimulated by their original teaching methods.[17] Modernism in France was expressed through the individualistic and rationalist approach of Le Corbusier. In Finland, however, Alvar Aalto developed a more humanistic interpretation of functionalism: at the tuberculosis sanatorium at Paimio (built 1929–33), the personal needs of patients and staff were emphasized. In the Netherlands, the Dutch modernist movement De Stijl as expressed by architects and designers such as Willem Dudok, Jan Duiker and Gerrit Rietveld, propounded a more philosophical attitude towards modernism.[18] Duiker's design for the concrete construction method and layout for the Zonnestraal sanatorium had greatly impressed Aalto and influenced his design for Paimio. In the 1930s, modernism began to trickle into Britain.[19] Up to that time, modernist architecture had little impact other than as pastiche of some superficial Art Deco elements exploited for their ''Moderne'' interpretation in such buildings as department stores, cinemas, hotels, and roadhouses, that were principally associated with the new commercial and leisure demands of modern life.[20]

Yet Britain was not completely devoid of progressive design thinking. Several architectural and design groups, which included like-minded industrialists and manufacturers as well as painters and sculptors, aimed to establish some integrity for British modernism.[21] As a founding member of the Modern Architectural Research Group (MARS), E Maxwell Fry, who had collaborated with Gropius during the latter's stay in England, was aware of European progressive architectural thinking.[22] Indeed, he had a road to Damascus moment: ''Suddenly I saw this comprehensive new architecture accepting the full range of possibilities open to it, the answer to years of doubt and hesitation''.[23] The MARS group was

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Rohe; included among the designs were some by Gropius and Le Corbusier.

[17] Walter Gropius (1883–1969) was the first director of the progressive school of design and architecture at Weimar, the Bauhaus. Ludwig Mies van der Rohe (1886–1969) was the third director of the Bauhaus. Both later settled in the US. Mies coined the minimalist phrase ''less is more''.

[18] In the Netherlands, modernism was identified with a commitment to the efficiency and precision of the machine. The ideals of the movement were published in its journal, *De Stijl* (The Style), but Dutch modernist architecture and design were also overlaid with a theosophical mysticism.

[19] Britain retained an architectural loyalty to the Arts and Crafts movement and, despite many innovative features, Charles Holden's King Edward VII Sanatorium, Midhurst, Sussex (1903–4), was indicative of this adherence. *Architectural Review*, June 1906, **19**: 278–82.

[20] ''Moderne'' was the term used to distinguish purist modernism from stylistic corruption.

[21] British modernism was represented by the Twentieth Century Group (1930), Unit One (1933) and the Modern Architectural Research Group (1933). Members of Unit One included artists such as Paul Nash, Barbara Hepworth, Ben Nicholson and Henry Moore and architects Colin Lucas and Wells Coates; they published *Unit One: the modern movement in English architecture, painting and sculpture*, ed. Herbert Read, London, Cassell, 1934. The Modern Architectural Research Group (MARS) was led by Wells Coates, Maxwell Fry and Frederick Yorke. Other members included Amyas Connell, Basil Ward, Colin Lucas, together with *Architectural Review* contributors, Morton Shand, John Gloag and the poet John Betjeman. Later, in the 1930s, Berthold Lubetkin, Serge Chermayeff, John Summerson and the art critic Herbert Read joined the group. MARS exerted an important influence on British architecture from 1933 to 1957.

[22] E Maxwell Fry (1899–1987) was trained at the Liverpool School of Architecture, whose director was the forward thinking C H Reilly.

[23] E Maxwell Fry, 'Harmony out of discord', *RIBA Journal*, Dec. 1979: 526–9, p. 527.

not, however, simply a theoretical debating association; its principal aim was to identify practical problems connected with modern architecture and seek acceptable methods for mass housing. Among the industrialists who supported modernist ideas were P Morton Shand and Jack Pritchard, who by their practical involvement injected a radical pragmatism into theoretical design thinking.[24] Pritchard was the driving force for what is now regarded as one of the pioneering examples of modernist functional living in England, the Lawn Road Flats (Hampstead, 1932–34). During the 1930s, two architecturally significant apartment blocks were constructed in London; Highpoint (Highgate, 1933–36), by an émigré Russian architect, Berthold Lubetkin, and Lawn Road Flats, designed by the architect Wells Coates.[25] Both buildings displayed the architectural signatures of modernism: flat roof, balcony and terrace, and were built of white-painted concrete. During the 1930s, several cultural refugees such as Gropius and the Hungarian furniture designer and architect Breuer stayed with Pritchard at Lawn Road; while there they collaborated with Pritchard and his Isokon Company on several modernist projects before moving on to the United States of America.[26] Pritchard's own flat included a bentwood recliner, Breuer's ''long chair'' (Figure 2).

Throughout Europe, Britain and America at this time, new tuberculosis sanatoria and infectious diseases hospitals, where tuberculosis patients were also treated, were being constructed. These included the Klinik Clavadel (1931–33) in Davos, the Southwest Finland Tuberculosis Sanatorium (1929–33) at Paimio, near Turku, and Zonnestraal Tuberculosis Sanatorium (Hilversum, 1928–31), and were described in leading architectural magazines such as *Architectural Review* and *Architects' Journal*.[27] Young British architects, fired with enthusiasm for the *avant-garde*, also knew these seminal examples from visiting Switzerland, Finland and the Netherlands.[28] Many of the modernist architectural features such as white-painted concrete construction, balconies, and standardized, factory produced components such as metal window systems, were used in speculative low-rise housing in new suburbs and for pilot low-cost social housing schemes.[29]

[24] Jack Pritchard (1899–1992), an economist and engineer and a passionate proponent for modernism, was the founder of Isokon, a progressive furniture design company. In 1934, he and Philip Morton Shand were responsible for assisting Walter Gropius's escape to freedom from Germany to England.

[25] In 1932, Lubetkin designed a chest (TB) clinic (not built), the East Ham Chest Clinic for Dr Philip Ellman and the Finchley Health Centre (1935–8), where the Tuberculosis Clinic occupied one complete wing of the ground floor. Peter Coe and Malcolm Reading, *Lubetkin and Tecton, architecture and social commitment*, London, Arts Council of Great Britain, 1981, pp. 112–13; and Malcolm Reading and Peter Coe, *Lubetkin and Tecton: an architectural study*, London, Triangle Architectural Publishing, 1992, pp. 40–1.

[26] Between 1934 and 1938, Walter Gropius was involved in a number of projects with Maxwell Fry, including the Impington Village College, Cambridgeshire (1936–9).

[27] These buildings were discussed and illustrated in *The Architects' Journal*, 24 June 1937, p. 1152.

[28] A deputation of medical staff, administrators and architects visited Switzerland to inspect ''the latest sanatoria in Davos'': Mary P Shepherd, *Heart of Harefield: the story of a hospital*, London, Quiller Press, 1990, p. 48. Among the best British modernist sanatoria of this period were Infectious Diseases Hospital in Hawkhead Road, Paisley, Strathclyde (Tuberculosis pavilion G), by Thomas Tait (1935–8), Sully Tuberculosis Hospital, Glamorgan, South Wales, by William Pite, Son and Fairweather (1931–35) and Harefield County Sanatorium, Middlesex, designed by a team of Middlesex County Council architects (1935–37).

[29] Metal window frames were produced by Crittall Manufacturing Company, a firm with modernist ideas. See F J Mead, *Silver End: the making of an Essex village*, London, North East London Polytechnic, 1989.

Figure 2: Living room with the ''long chair'' by Marcel Breuer in Jack and Molly Pritchard's flat, No 32 Lawn Road, Hampstead, London. (The Pritchard Papers, University of East Anglia.)

Modernism: Light, Air and Sun

Tuberculosis-carrying cough droplets or sputum, although dried, are still infectious and can survive in household dust. In the early twentieth century, public awareness of this fact was reinforced by a familiar catch phrase: ''Thirty years in the dark but thirty seconds in the sun''. Sunlight, good for the treatment of rickets and other vitamin-deficiency diseases and for new-found leisure activities, was also thought to destroy the tubercle bacilli. Tuberculosis specialists like Auguste Rollier and Sir Henry Gauvain advocated sun treatment, *heliothérapie*, but this was mainly for non-pulmonary forms of the disease.[30] Proto-modern architecture quickly reflected this new environmental concern. In 1908, the Austrian architect Otto Wagner was commissioned to design a clinic with large decked terraces at Entwurf, and Rollier claimed that Le Corbusier's use of this design feature was the result of having seen these at Rollier's Leysin clinic in Switzerland.

A Dutch tuberculosis sanatorium, built between 1928 and 1931 near Hilversum and a seminal example of architectural modernism, was—as indicated by its name: Zonnestraal

[30] In 1903, Rollier set up a tuberculosis clinic at Leysin, Switzerland, for sunlight therapy. Gauvain, who was medical superintendent of Lord Mayor Treloar's Home for Crippled Children, Alton, advocated the therapy for cases of ''surgical tuberculosis'', mainly bones, joints and the skin (*lupus vulgaris*). See Bryder, op. cit., note 1 above, pp. 188–90.

(sunbeam)—a homage to a belief in the regenerative power of the sun. This was a contemporary reference to the transcendental theosophical ideas of the Dutch theosophist and mathematician, M H J Schoenmaekers, that were also prevalent in the aesthetic theories of the Dutch modernist art and design movement De Stijl, and supported by the Dutch architect for Zonnestraal, Jan Duiker.[31] As De Stijl aesthetics dictated a spiritual freeing of the structure from any obvious weight, Duiker interpreted this notion in his approach to functional and economic design as a way that

> this spiritual economy leads to the most appropriate construction, depending on the material used and evolves steadily towards dematerialisation, spiritualisation ... It is undoubtedly the intrinsic economy of the material that enables us to achieve more and to satisfy higher spiritual demands more truly than our forefathers were able to do.[32]

Anti-tuberculosis publicity slogans commonly urged, ''Always sleep with the window open''. This dictum can be linked to ''light and air'' (*Licht und Luft*), a phrase much used by late-nineteenth-century sanitary and housing reformers to promote health and hygiene.[33] According to De Stijl aesthetics, Duiker aimed to make his buildings appear as light and airy as possible.[34] At Zonnestraal, he expressed these ideals through the use of open, well-lit interiors, large areas of glazing and glass blocks and external bed areas for each patient. He also attempted to free the interior space from the dark, claustrophobic, germ-harbouring rooms of traditional Dutch housing by painting the interior spaces pale blue and cream.[35]

Symbolic associations of healing light, air or sun might be thought of as passing medical fashions, similar to the superstitious use of gold that was also prevalent at this time,[36] but light and air, and specifically sunlight, were influential in the interpretation of modernist hygienic ideas for the design of flat roofs, balconies, terraces and recliner chairs.

Flat Roofs

Flat roof construction has well-established classical origins. While it developed from a traditional post and beam method of building, it also became one of the predominant

[31] M H J Schoenmaekers was a Dutch theosophist and mathematician, influential through his theoretical writings such as *Het nieuwe wereldbeeld* (The New Image of the World) on De Stijl, Neo-Plasticism (*nieuwe beelding*) and the work of Piet Mondrian. Jan Duiker (1890–1935) was one of the leading exponents in the Dutch New Movement whose principal belief was that modern architecture could have a positive effect on society, and its aim was to create good functional housing.

[32] J Duiker, 'Berlage en de ''Nieuwe Zakelijkheid'' ', *De 8 en Opbouw*, 1932, **1**: 43–51, cited in Aimee de Back, Sabine Berndsen and Camiel Berns, *Een zeer aangenaam verblijf: het dienstbodenhuis van J Duiker op sanatorium Zonnestraal. A space of their own: the servants' house by J Duiker at Zonnestraal sanatorium*, Rotterdam, 010 Publishers, 1996, p. 15.

[33] The phrase *Licht und Luft* was first used in the eighteenth century by the German poet, Gottfried August Bürger in his sonnet *Der versetzte Himme* ('Licht und Luft des Himmels zu erschauen'). Later, in 1898, the phrase was used by the German novelist Paul Scheerbart in *Ver Sacrum*, the progressive Viennese journal of the breakaway design group, the Secession.

[34] De Back, Berndsen and Berns, op. cit., note 32 above, pp. 13–15, 20.

[35] For example, see the new approach to social housing by the Amsterdam School at Spaarndammerbuurt neighbourhood in Amsterdam west with blocks by Michel de Klerk (1915). Maristella Casciato, *The Amsterdam School*, Rotterdam, 010 Publishers, 1996, pp. 20–6, 156–70.

[36] Frank Ryan, *Tuberculosis: the greatest story never told*, Bromsgrove, Swift Publishers, 1992, pp. 92, 245.

architectural signatures of modernism, being associated with Mediterranean vernacular influences on early-twentieth-century Cubism.

There is a direct association between Le Corbusier, the development of the Davos flat roof (*Davoserflachedach*) and tuberculosis.[37] Between 1872 and 1875 because of climatic and sociological factors peculiar to this Swiss resort, several experiments in flat roof construction were conducted. After the arrival of the first visitors in 1865, the twin towns of Davos Dorf and Davos Platz rapidly became a busy cure and holiday location. Situated in the valley of the river Landwasser on the south-facing slopes of the Schatzalp, ribbon development was established along the principal thoroughfare, the Promenade, lined with public buildings, hotels, shops, cafés and churches. In 1881, as a civic improvement, pavements were installed to protect pedestrians from road traffic in summer and sledge traffic in winter. However, in the early spring months, melting snow and, more seriously, long sharp icicles frequently fell from the overhanging roofs, injuring people passing below. The Davos flat roof developed to prevent such injuries was based on a system devised some thirty years earlier (1851) by a Silesian builder, Samuel Haussler, according to a German art historian, Erwin Poeschel, writing in the progressive Swiss architectural journal *Das Werk*.[38] In two more articles on the flat roof system, 'Das Flache Dach im Davos' (1928) and 'Das Flache Dach im Hochgebirge' (1931), Poeschel stated that the flat roof had existed in Davos long before it was adopted as a significant modernist feature.[39] He observed that there had been no serious debate or publicity about the flat roof until it became one of the essential elements of modernist architecture.

During a visit to Athens in 1909, Le Corbusier made detailed studies and drawings of the Parthenon and its ideal proportions, and the Parthenon provided the model on which his modernist aesthetic was based. Le Corbusier's ''Five Points of Architecture'' included a free plan, a free façade, *pilotis*, a terrace, and long horizontal sliding windows. It was the Greek vernacular house, however, that provided the notion of the outside room, whether as a terrace, flat roof or solarium. When combined, these elements achieved their most sophisticated interpretation in his design for the Villa Savoye (1929–31) at Poissy (Figure 3).[40] In 1924, Le Corbusier considered the possibilities of achieving bodily health while living in a city flat, and concluded that the "harmonious functioning of vital organs" was essential.[41] He therefore designed flats each with its own garden terrace, while a kilometre running track was included on the roof of the apartment block, "on which to run in the fresh air". He also provided sun parlours

[37] See Eduard Neumann, *Davos und seine Privatsanatorien*, Bern, 1917, and Gesellschaft für Schweizerische Kunstgeschichte (ed.), *Inventar der neueren Schweizer Architektur: INSA: 1850–1920*, Bern, Die Gesellschaft, 1982/83, p. 355.

[38] Erwin Poeschel (1884–1965), a German art historian and jurist who lived in Davos from 1913 to 1927. The diagrams show a pitched-roof extending upwards as an additional story, with the roof space ventilated above the joists. A 2 cm thick layer of cork between the ceiling and the roof provided insulation. The roof has a fall of 1 in 200, draining to an internal pipe. This meant that, when the snow melted, instead of dripping down to the gutter and creating either a mini-avalanche or a dagger-like icicle, the water ran off safely inside the building.

[39] Erwin Poeschel, 'Das Flache Dach im Davos', *Das Werk*, Zurich, 1928, **15**: pp. 102–9, *idem*, 'Das Flache Dach im Hochgebirge', *Der Baumeister: Monatshefte für Architektur und* Baupraxis, 1931, **29** (1): 38–44.

[40] See Le Corbusier, *Towards a new architecture*, transl. Frederick Etchells (from 13th French ed.), London, Architectural Press, 1970.

[41] Ibid., p. 215.

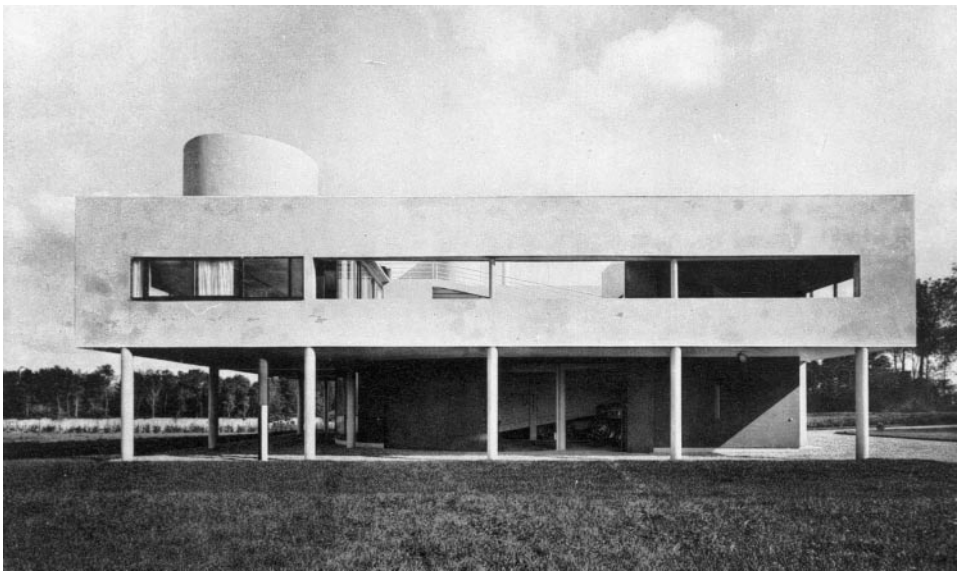


Figure 3: Le Corbusier, Villa Savoye, Poissy, 1928, FLC L2 (17) 4. (© FLC/ADAGP, Paris and DACS, London 2004.)

noting that they had "proved so successful in the United States in combating tuberculosis".[42]

Swiss by birth, Le Corbusier was familiar with this type of roof construction; for his ultra modernist Villa Savoye, he had achieved a degree of architectural perfection, the design of the flat roof that included a solarium. In 1934, he recorded Poeschel's observations in his sketchbooks (Figure 4). Later he demonstrated how the roof terrace area, whether on a house or a block of flats such as the Unité d'Habitation in Marseilles (1953), could be used for physical exercise and open-air relaxation.

However, his architectural ideas on health and hygiene were not exclusively aimed at wealthier clients. As a young man, Le Corbusier had worked for several months in Peter Behrens' Berlin office. While there, he may have experienced something of the concern Behrens had for alleviating tuberculosis through architectural design.[43] In 1922 Le Corbusier's *immeuble-villa* design with auxiliary bedrooms and roof-terrace gardens was used for the Pessac social housing estate near Bordeaux (Figure 5) and later for the experimental housing that was his contribution for the 1927 Weissenhof Siedlung Werkbund Exhibition in Stuttgart.[44] Likewise, Behrens for his experimental housing unit

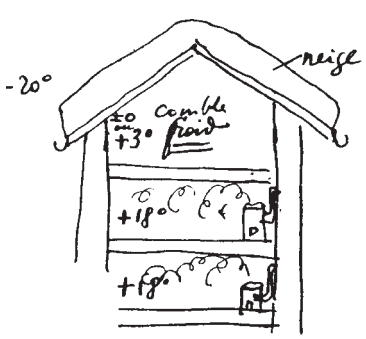
[42] Ibid., p. 216.

[43] Peter Behrens (1868–1940), architect and industrial designer, strongly influenced several leading modernist architects, including Walter Gropius and Mies van der Rohe. Karin Kirsch, in *Weissenhofsiedlung: experimental housing built for the Deutscher Werkbund, Stuttgart, 1927*, New York, Rizzoli, 1989, p. 177, notes that few ''critics perceived and mentioned Behrens's principal concern, the promotion of health: the healing of so great a social evil as tuberculosis through building reform''.

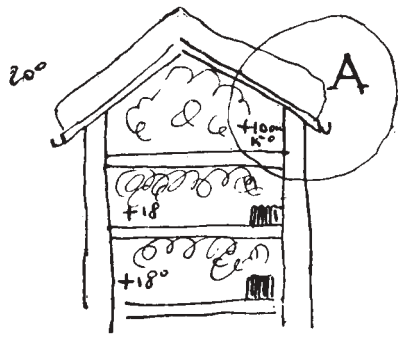
[44] *Weissenhofsiedlung* or *Weissenhof Siedlung*: both forms are used.

ainsi: sur trois mètres de hauteur à partir de la gouttière, la tuile était enlevée et remplacée par du zinc ou du fer blanc.

J'en conclus: depuis des siècles un comble traditionnel supporte normale-

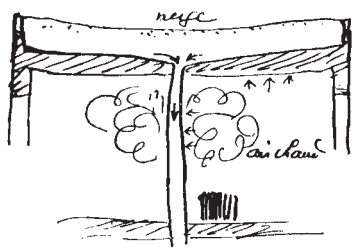


MAISON DE TYPE TRADITIONNEL AVEC CHAUFFAGE PAR POÊLE DE FAIENCE. LA COUCHE DE NEIGE SUR LE TOIT DEMEURE ET CONSTITUE MÊME UN BON ISOLANT.



ON INSTALLE LE CHAUFFAGE CENTRAL DANS LA MÊME MAISON. LA NEIGE FOND AU CONTACT DE LA TUILE ET L'EAU PÉNÈTRE DANS LA MAISON EN A.

ment l'hiver avec sa couche de neige, tant que la maison est chauffée avec des poêles. Dès l'instant où le chauffage central est installé, le comble traditionnel



BON. — LA TOITURE EST EN CUVETTE ET L'EAU DE FONTE DE NEIGE S'ÉCOULE AU MILIEU DE LA MAISON.

ne convient plus. *Le toit ne doit plus être en bosse mais en creux. Il doit rejeter ses eaux à l'intérieur et non plus à l'extérieur.*

Vérité irrécusable: *les climats froids imposent la suppression du comble*

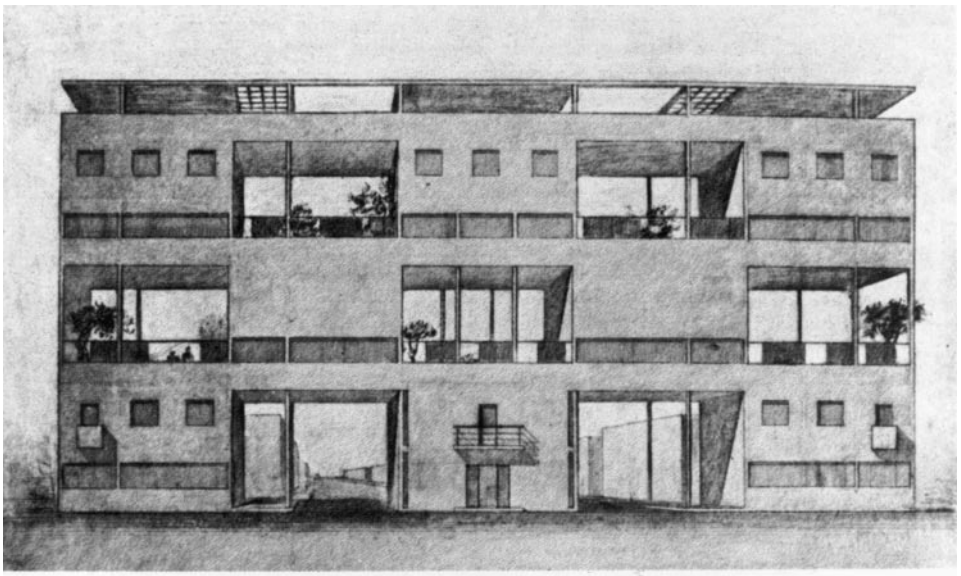
— 15 —

Figure 4: Le Corbusier, 'Où en est l'architecture', *L'Architecture Vivante*, Portfolio 1, Text, page 1. Edition Morancé, FLC. (© FLC/ADAGP, Paris and DACS, London 2004.)

at the same exhibition, designed ''a conglomerate of single, two, three and four-storey apartments, which are fitted together in such a way that the flat roof of the lower apartment offers the terrace to the one lying above and behind it''.[45]

The fashion for flat roofs was not confined to continental European practice. When Behrens designed New Ways (1923–5) in Northampton for the English industrialist

[45] Peter Behrens, *'Terrassen am Haus: Deutscher Werkbund', Bau und Wohnung*, Stuttgart, 1927, quoted by Alan Windsor, *Peter Behrens, architect and designer 1868–1940*, London, Architectural Press, 1981, p. 164.



« Nouveaux quartiers Frugès » à Bordeaux.
Un premier groupe en construction.

Figure 5: Le Corbusier, Pessac, Quartiers Modernes Frugès 1925, plan FLC 19879. ''Un fragment de lotissement 'Alvéoles' pour cités-jardins. Ce groupe constituera l'entrée des 'Nouveaux Quartiers Frugès' a Bordeaux'', extract from *Urbanisme*, 1925. (© FLC/ADAGP, Paris and DACS, London 2004.)

and engineer, W J Basset-Lowke, the flat roof was concealed behind a parapet.[46] In Scotland, a flat-roofed, semi-detached house was patented in 1924 and a number of these were built as social housing for Glasgow Corporation. In 1927, following a visit to the Weissenhof Siedlung, an enterprising Glasgow builder, John MacDonald, enthusiastically promoted the advantages of flat roofs, sun terraces and roof gardens for his range of ''Sunlit Homes''.[47] By the 1930s, the flat roof was a commonplace feature in Britain for speculative housing, as it was for fashionable department stores with roof gardens such as Derry and Toms in London. For the home management of respiratory tuberculosis, however, as well as for drying clothes and sunbathing, a simple flat roof or roof terrace sufficed.

Terraces and Balconies

In 1914, Barry Parker (1867–1947), the Garden City Movement architect, had a sleeping porch constructed to the top floor of his Letchworth house, Crabby Corner. A

[46] New Ways was Britain's first modernist private house. See also Louise Campbell, 'Patrons of the modern house', in *The modern house revisited*, Twentieth Century Architecture 2, *Journal of the Twentieth Century Society*, London, Twentieth Century Society, 1996, pp. 43–50.

[47] Tim Dawson, 'Bright ideas for stylish housing', Ecosse supplement, *Sunday Times*, 24 Aug. 1997, p. 12.

contemporary photograph of the interior shows a single bed placed directly under the open corner, but it was also intended that one could sleep out in the open air. This feature was similar to the open-air sleeping cabins requested for the Californian beach house at Newport, designed in 1922 by the modernist American-Austrian architect Rudolf Schindler for the health-fanatic Dr Philip Lovell. Schindler's health views coincided with those of his client, and writing in Lovell's weekly column for the *Los Angeles Times*, 'Care of the body', he recorded:

> Our high mechanical development easily controls our living conditions. Our knowledge about our own bodies releases us from slavery and Nature becomes a friend. The house and dress of the future will give us control of our environment, without interfering with our mental and physical nakedness. Our rooms will descend close to the ground and the garden will become part of the house. The distinction between indoors and out-of-doors will disappear . . . He will sleep in the open.[48]

Later as occupants found that getting wet was one of the disadvantages, the open sleeping balcony/cabins were glazed in. Lovell later commissioned Richard Neutra, another émigré Austrian architect, to design the ''Health house'' (1927–9) in the hills of Los Angeles as ''an object of demonstration to a multitude of visitors . . . in its use-requirements it sounds the note of today's inclination for the out-of-doors''.[49]

While these measures were a middle-class response to maintaining good health, more rudimentary methods were employed in the management of respiratory tuberculosis. Archive photographs from the Royal Victoria Hospital in Edinburgh, for example, show a female patient resting beside the open window on a sink top covered with a wooden plank and a mattress (Figure 6).[50] Such contraptions were assembled by the Dispensary nurses who supervised poorer tuberculosis patients.

However, open balcony or open window measures were not exclusive to the treatment of tuberculosis. To relieve chronic housing needs in rapidly expanding cities such as Paris and Berlin, some modernist architects explored the use of a stepped-terrace system to permit adequate sunlight and air to penetrate each house-unit. Early examples included the *maisons à gradins* (stepped or graded houses) for a Parisian apartment block in rue Vavin (1912–14) by the French architect Henri Sauvage. Later, he designed a block of flats in the rue des Amiraux (1923–4). This was built as a reinforced concrete pyramid faced in blue and white glazed tiles with terrace gardens and a public swimming pool.[51] Experimental housing schemes like these influenced another functionalist development by the modernist German architect, Richard Döcker, with his *Terrassentyp* blocks (1927). Submitted as his contribution to the Weissenhof Seidlung, these showed

[48] Rudolph Schindler's contributions to Dr Lovell's column, 'Care of the body', *Los Angeles Times*, Sunday Magazine Section, between March and May 1926.

[49] Although born and trained in Vienna, Richard Neutra (1892–1970) went to the US in 1923 and worked for a short period with Frank Lloyd Wright. His architecture epitomized ''international Modernism, European Modern Movement and American freedom''. See Richard Neutra, 'Aesthetics and the open air', *The Studio*, 1930, **99**: 79–84, p. 82. See also Elizabeth A T Smith and Michael Darling (eds), *The architecture of R M Schindler*, Los Angeles, Museum of Contemporary Art, and New York, Harry W Abrams, 2001, pp. 12, 120–2; and Barbara Lamprecht, *Richard Neutra 1892–1970: survival through design*, Cologne and London, Taschen, 2004, pp. 22–7.

[50] Royal Victoria Dispensary, 'The consumptives' home under care of the Dispensary Nurse', University of Edinburgh Library, Medical Archive, T.B. slides, No. 23.

[51] Professor Jacques Gulber (Lausanne), 'Henri Sauvage', a paper given to the Architectural Association, June 1979, and printed in *Architectural Design*, 1979, **49** (2): 70–2.

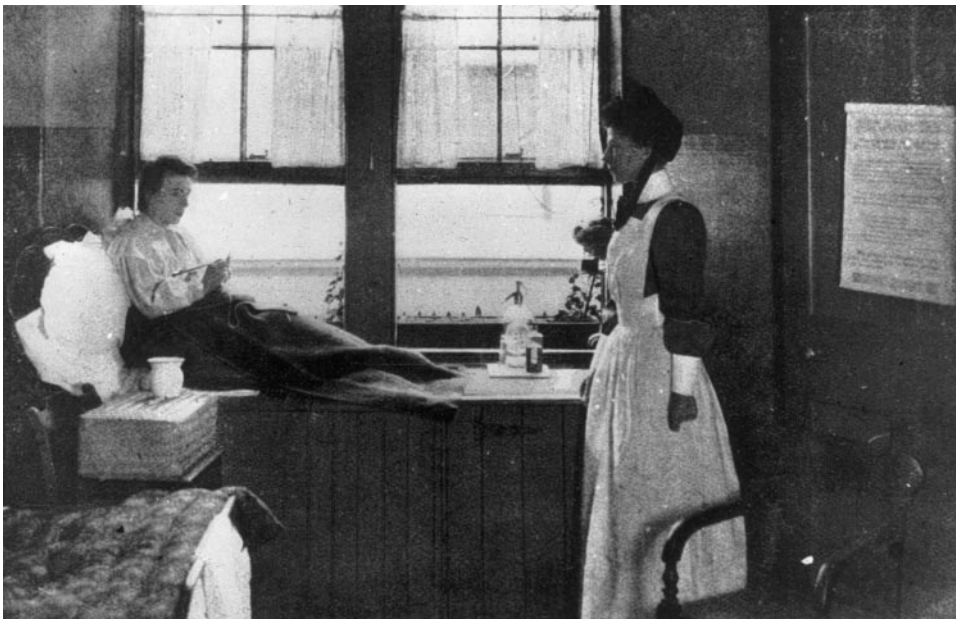


Figure 6: 'At home by the open window', Edinburgh Dispensary Scheme (1911), T.B. slides No. 23. (Lothian Health Services Archive, Special Collections Division, Edinburgh University Library.)

how additional light and air could enter high-density, urban housing schemes.[52] In 1925, Döcker had already successfully built an extended terrace arrangement for the patients' block of a tuberculosis hospital and sanatorium at Waiblingen in Württemberg and in 1930, the Dutch De Stijl theorist Theo van Doesburg noted that among other advantages, Döcker's terraces humanized modern housing and had a therapeutic use in hospital design.[53]

Throughout the 1930s, many tuberculosis sanatoria incorporated this feature. It was not new, however, as such external extensions are a noticeable and practical feature of the traditional European timber chalet. In the late nineteenth century, wealthy tuberculosis patients, when recuperating in the Swiss health resorts such as Davos, Arosa, Montana or Leysin, spent extended periods living in such chalets, where the gallery around the upper floor provided an outside room and sleeping porch for the *Freiluftkur*. Balconies were added or planned as an essential feature of the numerous hotels, pensions and apartment blocks built in these Swiss resorts, to accommodate the increasing numbers of tuberculosis patients and their families. In Davos, the extent of these alterations can be appreciated by observing the changes that took place over an extended period to several villas used by tuberculosis patients attending private day clinics. When a local architect, Gaudenz Issler, altered Haus Caselva in 1905 in the *nationalen Romantik* style, cast-iron balconies with

[52] See Richard Döcker, *Terrassentyp*, Stuttgart, Akademie Verlag, 1929.

[53] Theo van Doesburg, *On European architecture*, transl. Charlotte I Loeb and Arthur L Loeb, Basel and Boston, Birkhäuser, 1990, pp. 313–16.

Figure 7: Cast-iron balconies, Haus Caselva (1905), formerly Villa Merula, Davos, Switzerland (author's photograph).

inclined floors and dimensions sufficiently deep to take a bed or recliner-chair were added to each of the upper floors (Figure 7).

There was active debate as to the comparative merits of a room with a balcony or one in which the window wall could be fully opened and the bedroom itself would form a loggia, which also was a saving on floor space. Dr Karl Turban, one of the first specialist tuberculosis physicians in Davos, considered such deep balconies to be unnecessary. In his view: ''Balconies and resting verandas in front of living rooms and sleeping quarters have such a detrimental effect on air and light that they have to be dismissed; it should be

possible at any time to transform the room into a loggia which the suggested construction allows perfectly''.[54]

Turban and his architect, Jacques Gros, devised an ingenious form of folding sliding window (*Fensterkonstruktionsvorschlag*) that allowed the complete window wall to be fully opened to the outside. A version of Turban's shallow balconies was used at the King Edward VII Sanatorium, Midhurst, Sussex (1905). Full-length folding-sliding French doors with additional top-hung opening windows on the south wall and wall opposite, together with slatted shutters, provided through ventilation day and night. This system also created a shallow, chair-deep, balcony space within the room; it meant that patients could rest in the open air but remain shielded from the harmful effects of the direct sun or wind. At Sully Tuberculosis Hospital, Glamorgan (1931–35), the architects incorporated a Turban-inspired loggia-style fenestration for the design of the promenade walkways. ''Balconies generally have not been provided, as the wards themselves become virtually sun and open-air spaces.''[55] By providing an illusion of additional space, Turban's system was the forerunner for an important modernist design solution to make the small house or flat appear larger. This extra floor area not only provided private out-of-doors facilities for sunbathing and other healthy recreational activities, but could also be used for open-air therapy required by a family member with tuberculosis.

By the 1930s, these external features of modernism were commonplace in low and high rise blocks of flats, both in exclusive owner-occupied apartment blocks such as Napier House, Edinburgh (Figure 8), and Lawn Road, London, and in social housing such as the Karl Marx Hof (Vienna, 1928), and Quarry Hill municipal housing schemes (Leeds, 1938).

Revolving Summer Houses

The summer house or garden house, teahouse, shelter or gazebo has been known in Europe since the late medieval *gloirette* pavilions found in paradise gardens. These structures were used for courtly ceremonial or recreational purposes until the late seventeenth century when garden houses became used for taking afternoon tea. This pastime was much enjoyed by the elegant and affluent Dutch middle class in their *theekoepels* and *theehuisje*. At Schepenmakersdijk, Edam, in the Netherlands, examples of these teahouses can still be seen in the canal-side gardens. However, near the Zaanse Schaans open air museum, in another canal-side garden of a former nineteenth-century Dutch fisherman's house, now used as a weekend home, there is a small dark green painted wooden garden hut set at a distance from the main house. Although similar in situation to a *theekoepel*, this hut was originally used neither as a summer house nor a teahouse, but rather to isolate a family member suffering from tuberculosis.[56] By the 1920s, the garden or summer house was an extra room for outdoor leisure activities, storing deck chairs and other paraphernalia needed for such fashionable heliotherapeutic pastimes as sunbathing and callisthenics,

[54] Y J Oswald, 'La Montagne magique crepuscule de la belle époque: l'univers sanatorial de Davos avant la grande guerre', unpublished PhD thesis, University of Strasbourg, 1993; his illustrations 28 and 29 explain this feature.

[55] 'Sully Tuberculosis Hospital, Glamorgan', *Architect and Building News*, 11 Jan. 1935: **141**: 40–4, and *Architect's Journal*, 22 Oct. 1936, **84**: 555–60, ibid., 24 June 1937, **85**: 1132–34, p. 1134.

[56] Margaret Campbell, 'Awfie cauld an' awfie lonely', *Things*, Summer 1998, No. 8: 32–47.

Figure 8: Napier House (1934), Colinton Road, Edinburgh, Scotland (author's photograph).

but it was also a necessary accessory for the Cure, whether conducted in a private garden or a purpose-built or colony sanatorium. Because the patient could experience a constant flow of fresh air, there was considerable demand for these inexpensive buildings. The specialist periodical the *Health Resort* noted: ''All that a consumptive requires in the shape of accommodation consists of a hut, which must have windows opening in every direction. In such a contrivance he can breathe air identical with that of the open country, and in no room of a building is this possible''.[57]

[57] 'The financial aspect of the open air treatment, *Health Resort*, 1903, **1** (5): 148–50, 149.

Yet in 1983, a letter to *Country Life* queried the purpose of a revolving summer house that had shutters to either side of the doors.[58] The subsequent reply indicated that like the Dutch summer house, a family member with pulmonary tuberculosis who had to be isolated would have occupied this structure. In the 1920s, this was a frequent and familiar use of the garden or summer house. However, with the decline and almost complete eradication of tuberculosis in the 1960s and 1970s, knowledge of this was forgotten.

The increasing demand for individual shelters resulted in many ingenious adaptations and improvements, rudimentary and sophisticated. In the 1870s, Hermann Brehmer had simple timber shelters installed in the grounds of his sanatorium at Görbersdorf. At the same time at the Nordrach *Colonie*, Otto Walther recommended his patients to stay permanently out of doors in huts, his view being that it was better for their recovery, and they were also less likely to disturb other patients. A more elaborate revolving rest hut or *Liegehalle*, just large enough to accommodate two single beds or couches, was designed by Gros to Turban's instructions for the Sanatorium Dr Turban in Davos; by 1900, many of these shelters had been installed in the grounds.[59] In Britain, similar revolving shelters were used, as at Preston Hall near Maidstone, Kent, where large numbers were set out in the grounds in regimented rows. In Edinburgh, outside the phthisis ward at the City Hospital for Infectious Diseases, two revolving huts with sufficient room in each for two beds were fixed to concrete bases (Figure 9).[60]

In order to continue their open-air and rest regime, poorer tuberculosis patients who had benefited from these while undergoing sanatorium treatment preferred, or were advised, to continue using these shelters, away from what was often referred to as ''the gross insanitary circumstances of the average home''.[61] Such was the demand for inexpensive, lightweight huts, large enough to take a single bed but similar in function to the Dutch canal-side hut or the Turban-Gros *Liegehalle*, that they were commercially produced at competitive prices, specifically aimed at this new market.[62]

However, affluent middle-class patients could afford quality made structures, and enterprising manufacturers of greenhouses, chalets and huts quickly appreciated the financial profits to be had from this increasing demand. The advantages of revolving shelters were promoted in trade catalogues such as that of a Norwich manufacturer, Boulton & Paul (Figure 10). This firm claimed that their chalets ''enabled the most delicate to take the utmost advantage of fresh air and sunshine, whilst strong and cold winds are excluded''.[63] Expensively illustrated catalogues by garden and greenhouse manufacturers such as W Richardson & Company of Darlington[64] include promotional lists of illustrious clients

[58] *Country Life*, 10 Nov. 1983, **174** (4499): 1332.

[59] These shelters were also used at Sanatorium Schatzalp, and at Dr Hans Philippi's Internationales Sanatorium (1905).

[60] 'Revolving Shelter, City Hospital', University of Edinburgh Library, Medical Archive, T.B. slides, Nos. 99 and 101.

[61] 'Notes: Home treatment of the consumptive, *Br J. Tuberculosis*, 1912, **6** (3): 200.

[62] They were often made in separate sections so that the packaged shelter could be carried along narrow alleyways or up the tenement stairs to be erected in a backyard or on a flat roof; they had appropriate names, such as ''Street Shelter'' (1912) or ''Open-Air Room'' (1914). See Bryder, op. cit, note 1 above, p. 225, and M Campbell, op. cit., note 56 above, p. 38.

[63] See trade catalogues such as Boulton & Paul's *Shelters and Chalets* (1912). Boulton & Paul's company archives are deposited at the Norfolk Record Office, The Archive Centre, Martineau Lane, Norwich.

[64] This company is now Amdega Limited, Darlington.

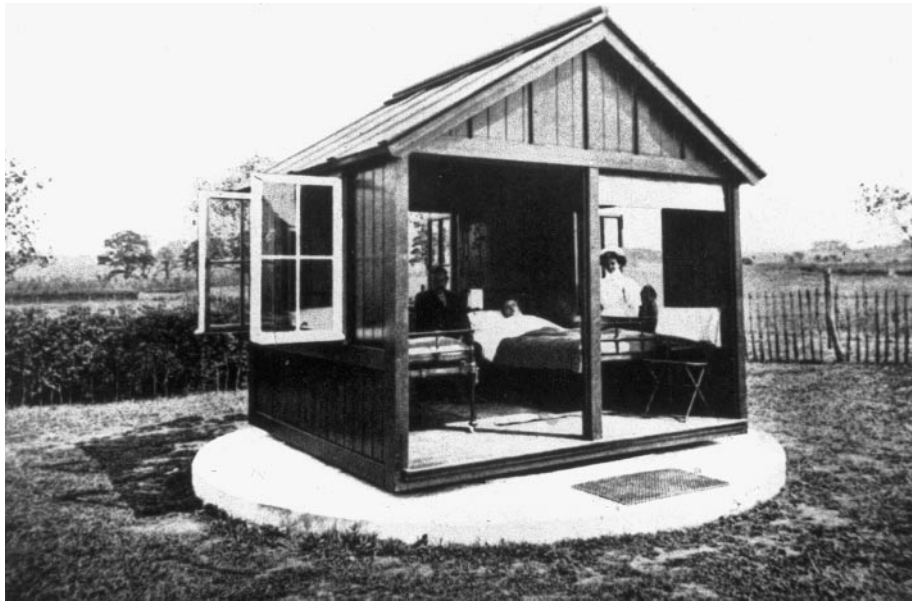


Figure 9: Revolving two-patient hut (1909), in grounds of the City Hospital for Infectious Diseases, Edinburgh, Scotland, T.B. slides No. 101. (Lothian Health Services Archive, Special Collections Division, Edinburgh University Library.)

to whom such shelters were supplied.[65] Advertisements by other manufacturers also appeared regularly in specialist periodicals such as the *Health Resort* and the *British Journal of Tuberculosis*.[66]

Unlike the other modernist architectural features discussed in this article, the summer house retained a vernacular Arts and Crafts appearance that belied its fashionable, therapeutic role. It was the inexpensive flat-pack shelter with no historicist pretensions that pointed the way to late twentieth-century DIY, home-assembly, prefabricated units that range from furniture to garden sheds.

Reclining Chairs

In the early twentieth century, reclining chairs appear in their modernist guise constructed of bentwood, laminated wood or chrome.[67] Many were designed by architects such as Aalto, Breuer and Le Corbusier, and were considered appropriate relaxing chairs for the modernist house. This elegant form of leisure seating had originally appeared in Greek, Etruscan and Roman times, later to be revived in the fashionable Greco-Roman style in the late eighteenth and early nineteenth centuries. However, to satisfy the demands of the new

[65] The Richardson Archive is held at the University of Newcastle.

[66] Firms such as the Portable Building Company of Fleetwood, Speirs and Company of Glasgow, Boulton & Paul of Norwich, and Brown and Lilley of Reading.

[67] Margaret Campbell, 'Therapy or leisure; the chaise-longue, a versatile recliner', *Journal of Design History*, 1999, **12** (4): 327–43.

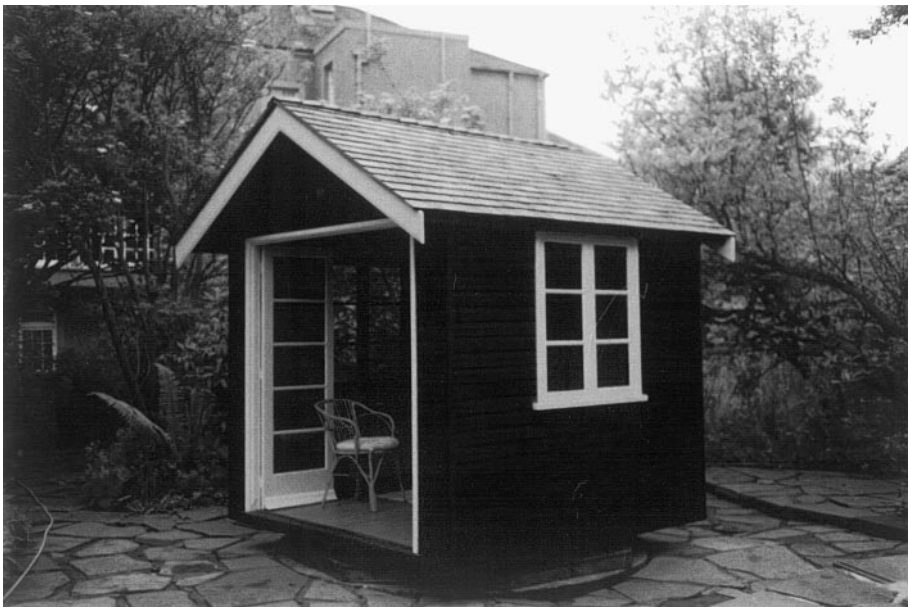


Figure 10: Revolving summer house (1925) in an Edinburgh suburban garden (1998) (author's photograph).

leisured class, reclining chairs or chaises-longues were mass-produced in affordable quantities by many European furniture manufacturers.[68] Principal among these were the Viennese firms of Gebrüder Thonet and Jacob & Josef Kohn who from the 1860s provided many different styles of seating for domestic and café use including reclining chairs.[69] The inexpensive beech chairs also found a ready market as ''Cure chairs'' and are frequently shown in contemporary drawings or photographs of rest halls (Figure 11).[70] Furniture for tuberculosis patients had to be robust, able to be thoroughly cleaned and disinfected, and shaped with a concern for the patient's anthropometric requirements. In split cane and bentwood beech with adjustable back and footrests, they were ideal for sanatorium use. The financial success of such chairs encouraged

[68] The concept of the ''leisure class'' was expounded by Thorstein Veblen (1857–1929), an American economist of Norwegian parents. In his influential book, *The theory of the leisure class* (1899), he introduced the concept of ''conspicuous consumption'' and the notion that the leisured class maintains its identity through a distinctive mode of relaxation.

[69] By 1869, Gebrüder Thonet was the largest of the Viennese manufacturers of bentwood furniture, despite the non-renewal of the patent that it had taken out in 1856. Its main rival, the Viennese furniture manufacturer Jacob & Josef Kohn, was well established by 1870. By 1900, it had matched Kohn's production capacity of 4000 pieces a day. See Christopher Wilk, *Thonet: 150 years of furniture*, Woodbury, NY, and London, Barron's Publishing, 1980, pp. 22–8, 49–9, 88–90; G Candilis, A Blomstedt, T Frangoulis, M I Amorin, *Bugholzmöbel = Meubles en bois courgé = Bent wood furniture*, Stuttgart, Karl Krämer, 1984, pp. 6–24, 88–90; Ghenete Zelleke, Eva B Ottilinger, Nina Stritzler, *Against the grain: bentwood furniture from the collection of Fern and Manfred Steinfeld*, Chicago, IL, Art Institute of Chicago, 1993, see p. 74 for *Schlafsofas* as used in TB sanatoria, and Eva B Ottilinger, 'Bentwood furniture production', in ibid., pp. 25–41.

[70] For further information about other Central European manufacturers of bentwood furniture, see *Furniture History*, 1992, **28**: 188–93.

Figure 11: Patients resting on cane recliners (1892), BASF sanatorium for consumptives (Dannenfels, Germany. BASF Aktiengesellschaft, BASF AG.).

competition with good and not-so-good variations. One of these, the Davos couch (*Davoser Liegestuhl*) (Figure 12), continues to be manufactured as a sun lounger for use by winter and summer holidaymakers on Davos hotel and chalet balconies.[71] The overall appearance has changed little since Thomas Mann eloquently described it in his novel *The magic mountain*:

> The frame—a little old-fashioned, perhaps, a mere matter of taste, for the chair was obviously new—was of polished red-brown wood, and the mattress was covered in a soft cotton material; or rather, it was not a mattress, but three thick cushions, extending from the foot to the very top of the chair-back. There was a head-roll besides, neither too hard nor too yielding, with an embroidered linen cover, fastened on by a cord to the chair, and wondrously agreeable to the neck. Hans Castorp supported his elbow on the broad, smooth surface of the chair-arm, blinked, and reposed himself. . . . ''What sort of chairs are they? If they are to be had here, I'll buy one and take it to Hamburg with me, they are heavenly to lie in. Or do you think Behrens [the senior doctor] had them made to his design?''[72]

Rather than the red-brown described by Mann, the frame is sometimes painted bright yellow and the adjustable backrest can still be folded forward to allow for more compact storage when not in use. Mann also described a ''fur-lined sleeping-sack'' for ''use on cold

[71] The Davos family firm of Graf now manufactures this recliner: Heinrich Graf, Talstr.12, Davos-Platz, Switzerland.

[72] Thomas Mann, *The magic mountain*, transl. H T Lowe-Porter, 2 vols, London, Martin Secker, 1927, vol. 1, pp. 87–88. This recliner and the sleeping sack are included in a permanent exhibition in the Blauer Heinrich Museum, at the Berghotel Schatzalp, Davos Platz.

Figure 12: The Davos couch, Schatzalp Sanatorium (1900), Davos, Switzerland (author's photograph).

days''—one of many methods by which patients kept reasonably comfortable in all weathers during the hours of open-air rest.[73]

However, Aalto and Breuer dramatically changed the overall design of the recliner with their economical and elegant modernist versions. Between 1929 and 1933, when Aalto came to design the furniture for the sanatorium at Paimio, he undertook a detailed study of the specific needs of patients with pulmonary tuberculosis.[74] The resulting ''scroll'' was a ''cure chair'' intended to be used only in the communal rest hall (Figure 13). In Finland, because of the climate, less time was spent in the open. Aalto knew the chair would be used indoors for the two-hour rest or ''Cure'' period, and he considered that, as the patient's legs did not need to be raised off the ground to avoid cold draughts, no footrest was needed. However, as periodic sweats are a characteristic symptom of the disease, the 110 degree angle of the chair back was intended to ease the patient's breathing and the slats in the upper part of the back provided ventilation for the sitter's neck. The front curve of the armrest also provided a steadying grip for physically weak patients when getting out of the chair. The laminated chair frame and continuous scrolled seat and back panel were made from lacquered natural birch plywood. This meant that the chair could be thoroughly cleaned and disinfected.[75] The scroll chair was an early experiment in the use of laminated birch wood and elastic or springing elements. But because it was

[73] Ibid., p. 85.

[74] This sanatorium was the internationally acclaimed modernist building by Alvar Aalto (1929–33).

[75] The scrolls were Aalto's version of a coil spring that added resilience to the plywood structure.

Figure 13: Alvar Aalto, 'Cure' chair (1933) for the Communal Rest Hall, Paimio, Finland (author's photograph).

also a comfortable chair to use, it soon became identified with modernist domestic interiors rather than exclusive use in tuberculosis sanatoria.[76] Aalto also designed a true recliner for patients resting on the sun terraces at Paimio. This was an all-weather metal-framed rest seat constructed with a white stove-enamelled, tubular steel frame and foot-rail; to provide variable adjustment to the backrest, a ratchet fitting was incorporated into the semi-circle of the armrests (Figure 14). Having conceived the interiors at Paimio as for a large house, Aalto considered that alternatives to laminated beech or birch, such as chrome or painted steel to be too clinical and impersonal in character for indoor use, but for the all-weather Cure sessions, it was a practical solution.

As a temporary refugee in England from 1935 to 1937, Marcel Breuer, who had trained at the Bauhaus under Gropius, designed the ''long chair'' (1935), which was an important experimental laminated wood construction recliner, for Pritchard's Isokon Furniture Company. It was manufactured in a variety of finishes including birch, walnut, and mahogany and like Aalto's scroll chair, has become a modernist design classic and continues in production.[77] Pritchard promoted it as being ''shaped to the human body'', claiming that ''ten minutes in an Isokon Long Chair after a meal is as good as any medicine''.[78]

[76] In Edinburgh in July 2004, a scroll chair (*c*.1936) was sold at auction for £7000.

[77] In 1935, Pritchard established the Isokon Furniture Company to manufacture designs for his various projects. Many of the original designs made and sold by Isokon are now produced and marketed by the Windmill Furniture, Chiswick, London. For further information, see Bridget Gillies, Michael St John and Deirdre Sharp (compilers), *The Pritchard papers: a guide to the papers of John Craven Pritchard (1899–1992)*, Norwich, University of East Anglia, 1998.

[78] The Pritchard Papers, University of East Anglia, PP18/4/5/26.

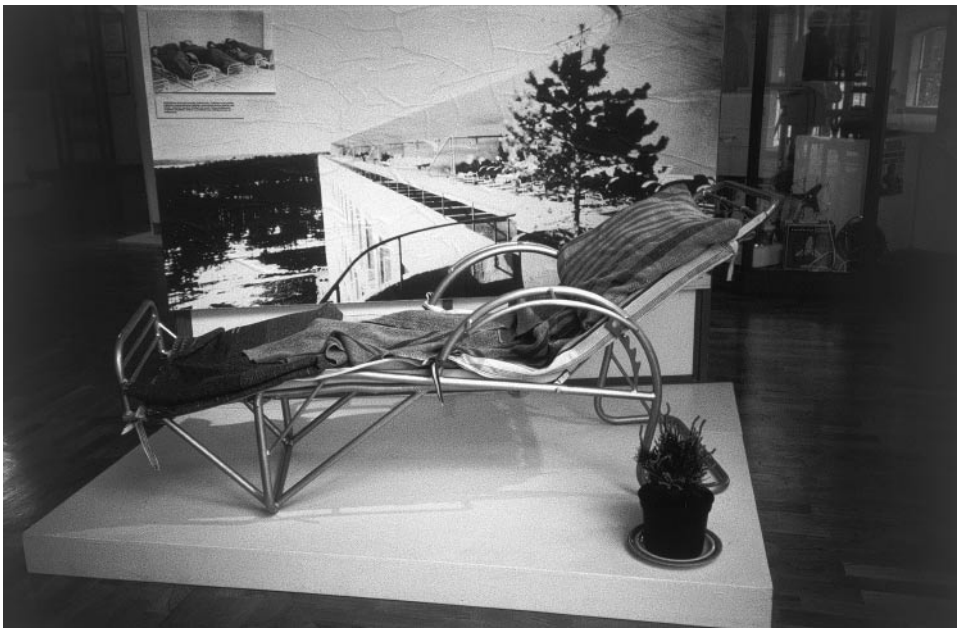


Figure 14: Aino and Alvar Aalto, metal frame recliner for sun terraces, Paimio (1937) (author's photograph).

The recliner that is generally considered to be an icon of modernism, and like the Long Chair was never used nor intended for use in a tuberculosis sanatorium, is Le Corbusier's LC1 (Figure 15). Designed in 1928, it was the result of a collaborative project by Le Corbusier and Charlotte Perriand, who worked in Le Corbusier's Paris *atelier*, for the restrained but elegant modernist interiors of the Villa La Roche, Paris (1923–5).[79] In 1922, the health-giving advantages of reclining in an anatomically shaped seat the *surrepos*, had been recommended by a French physician, Dr Pascaud.[80] It is known that Le Corbusier was familiar with this idea, as a press cutting of the advertisement is contained in the Le Corbusier Archives and a similar shape appears in two of his sketches for recliner chairs dated 1922–3 and 1928. The chrome steel frame and ebonized timber legs of LC1 which support a black leather hammock-like seat, were specifically shaped to provide an ideal relaxing position. The LC1 was exhibited on the *L'équipement d'un habitation* stand at the 1929 Salon d'Automne in Paris.

[79] There has been a long-standing debate about who designed LC1, but it is now acknowledged that Perriand was the innovator, with her *chaise longue à relage continu*, B306 (1928). Le Corbusier revised the design as B306–0 in 1930, when it was manufactured by Thonet-Paris.

[80] As no further references to this name have been found, ''Dr Pascaud'' may be a fictitious name used as a marketing device. Le Corbusier Archives, *L'Esprit nouveau*, Fondation Le Corbusier (FLC), Villa La Roche, Paris.

Figure 15: Le Corbusier, chaise longue, 1928, FLC L1 (20) 17. (© FLC/ADAGP, Paris and DACS, London 2004.)

Conclusion

Early twentieth-century modernism occurred at a time when the notion of healing by symbolic association rather than the application of scientific methods was still relatively unchallenged. Superstition, myth and subjectivity partnered modernist functional lifestyles that emphasized purity, hygiene, fresh air and sunlight. It was not until the triple drug therapy breakthrough in the 1950s that an objective treatment regime ruptured the direct association between architectural design, treatment, and physical recovery. But before this, in the 1920s, it was inevitable that the architecture of three leading modernists, Le Corbusier, Aalto and Duiker would figure prominently in this article. The Villa Savoye and the sanatoria at Paimio and Zonnestraal with flat roofs, terraces and precisely designed interiors and furniture, express the design theories of functionality and rationality that are identified with modernism.[81] Their work philosophically embodied the clean, white world that was so craved for after the carnage and filth of the First World War. Writing in *City of tomorrow*, Le Corbusier stated, ''Hygiene and moral health depend on the lay-out of cities. Without hygiene and moral health, the social cell becomes atrophied''.[82]

Aalto's design thinking for Paimio was focused on providing patients with as near a domestic environment as possible, while Duiker attempted to integrate the patient

[81] In the bathroom of the Villa Savoye, Le Corbusier installed a mosaic-covered bench with a similar profile to that of LC1 recliner.

[82] Le Corbusier, *City of tomorrow*, op. cit., note 14 above, p. 86.

with his natural surroundings at Zonnestraal. Although not for sanatoria, Le Corbusier's experimental and sometimes controversial designs for buildings and furniture, revealed his understanding of the way in which the disease could affect the house dweller. He commented:

> If you are dying of heart disease or consumption you are not likely to spend time doing five-finger exercises on the piano. Yet such words as Fatherland, Poetry, Ancestor worship, the Ideal, are eloquent phrases flung about by numbers of people occupied in writing for the papers, whose mission is to direct public opinion. But when it comes to a question of demolishing rotten old houses full of tuberculosis and demoralizing, you hear them cry, ''What about the iron-work, what about the beautiful old wrought-iron work.''

He wrote in 1925 that a house was not just a machine for living in but also ''a convenient place for meditation''.[83]

Balconies, terraces and flat roofs when used for patient recuperation, whether in Swiss chalets or urban social housing, were the inspiration for similar modernist features in owner-occupier apartment blocks and suburban housing where balconies could also be used as sleeping porches or open-air extensions of smaller living spaces. Such visible expressions of modernist design and healthy-living theories were eagerly adopted by an aesthetically aware middle-class society preoccupied with hygiene and industrial progress which then would be incorporated into publicly-funded housing for the socially deprived urban working class. Any additional health-giving advantages for the alleviation of pulmonary tuberculosis and other respiratory conditions were a bonus. The summer house, when commercially produced as flat-pack, plywood, panelled shelter, was an early form of prefabrication. Being relatively easy to manufacture and erect, its manufacture also provided appropriate sheltered employment for tuberculosis patients in working colony sanatoria as at Zonnestraal.[84]

The mass production of cheap cane recliner chairs for sanatorium use introduced the concept as comfortable relaxation for leisure. When adapted and interpreted by modernist designers through anthropometric data and exploitation of new fabrication techniques they became icons of modernism. While Aalto's scroll chair is regarded as a unique example of modernist furniture, the metal framed recliner for the Paimio sun terraces was the forerunner of several similar designs by Aalto and his wife Aino that were manufactured in laminated beech by Artek for domestic use.[85]

It cannot be claimed that the introduction and use of the flat roof, balcony, summer house and recliner chair were the direct result of early treatment methods for tuberculosis, but the popularity of these modernist architectural features in the pursuit of good health and hygiene, placed them in the annals of a therapeutic lifestyle that has been now been overtaken by new drug therapies and treatment methods.

[83] Le Corbusier, *L'Esprit nouveau*, N0 11/12, Fondation Le Corbusier, and *Urbanisme*, Paris, 1924, p. 641; ''le lieu utile pour la méditation'', comes from Le Corbusier, *Almanach de l'architecture moderne*, Paris G Crès, 1925, p. 29.

[84] Jan Molema, *Jan Duiker*, Barcelona, Gustavo Gilli, 1989, pp. 70–1. Similar occupational schemes were organized in many publicly funded British sanatoria and in Remploy factories. See Bryder, op. cit., note 1 above, chs 2, 6 and 8.

[85] The Finnish furniture manufacturing company, Artek, was established by Aalto to manufacture furniture to his designs for specific projects including those for the sanatorium at Paimio. The scroll chair was Model No. 41 and is included with others in Artek's current catalogue.