A TUBERCULOSIS SANATORIUM FOR ISTANBUL TURKEY

Submitted as partial fulfillment of the requirements for the
Degree of Master in Architecture
Massachusetts Institute of Technology

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Mr. William W. Wurster, Dean  
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Dear Dean Wurster:

I hereby respectfully submit my thesis  
"A tuberculosis Sanatorium for Istanbul, Turkey" in  
partial fulfillment of the requirements for the degree of Master in Architecture.

Sincerely yours,

Celile Berk
ACKNOWLEDGEMENT

I would like to take this opportunity to express my gratitude to Professor Aalto, Professor L. B. Anderson, Professor De Mars, Professor Rapson and other members of the staff of the School of Architecture for their guidance and advice.

I wish to thank my Father; the Department of Health in Ankara; Dr. A. S. Pope, director of tuberculosis division, Massachusetts State Department of Health; and, Dr. F. Dawson, superintendent of the Middlesex County Sanatorium, for the information they supplied me and for their suggestions.

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"THE LITTLE RED"
THE DISEASE

Tuberculosis

Tuberculosis has been called the white Plague. It is a disease caused by the tubercle bacillus, which belongs to the "acid-fast" group of bacteria, some of which are pathogenic and others quite harmless. But on the whole it has done more devastating work than any other destructive agent.

Up to about fifty years ago, the medical profession regarded tuberculosis as an hereditary, non infectious, necessarily fatal disease, and those unlucky enough to contract "consumption" as it was then called were expected to die.

Even as late as 1886 Hirsch set the number of hereditary cases as not less than 33.40 to 40% of the total and stated that contagion played a minor role in the spread of the disease. (1) In the nineteenth century in England George Bodington gave his patients fresh air every minute of the day and night. This seemed like madness to the drug-conscious medical corps and his sanatorium was seized and patients driven away. But many years later in Germany the sanatorium treatment of consumption was started by Herman Brehmer. With the help of Humboldt and Schonlein a sanatorium was built in the mountains of Silesia, a sanatorium which still exists.

(2) "Medicine Marches on" -- Edward Podolsky, M.D. Harper and Brothers publishers, New York 1934
Robert Koch identified the germ in 1882. One of the first rebels against the unsatisfactory kind of treatment was Dr. Edward Trudeau, a New York doctor who had watched his brother's death accelerated by these methods and who upon developing an active case of his own about 1872 went instead to the Adirondack Camp of his friend Paul Smith, mostly to end his days in pleasant surroundings, partly to indulge in the theory that plenty of fresh air and out-door excercise would prolong them. An Adirondack yokul who carried him upstairs to his room said: "Doctor, you don't weigh more than the dried skin of a lamb." But his theory proved good, and from his success with his own case, Dr. Trudeau developed the first successful American treatment of tuberculosis—a prescription of outdoor life and excercise in a high altitude. From a tiny beginning in a two-room shack known as "Little Red", Trudeau Sanatorium at Saranac Lake became the model for hundreds of other institutions.

Although a large proportion of the population become infected by the germ at some time, the majority of individuals have sufficient resistance to prevent the development of progressive tuberculosis. A world survey shows that tuberculosis tends to be widespread in densely populated areas linked by commercial and social ties with the outside world and is rare or absent in sparsely populated and culturally isolated communities. Many people still fail to recognize the disease as a public menace, for they are still ignorant of its dangers and for some reason or another try to avoid going to a hospital. It was found that only 3% of
the Senegalese soldiers summoned to Europe for the first World War were tuberculous, while numerous investigations carried out in the African and Asiatic "colonies and dependencies" of the European Powers show that primitive tribes living under their natural conditions are almost free from tuberculosis. It has been shown however, that the members of these primitive communities, on quitting their native surroundings and coming into contact with the "tuberculized" populations of Europe tend to show a marked susceptibility to tuberculosis.

It has also been shown that race is one of the factors for the incidence of tuberculosis. While the Jewish race is found out to be almost immune to the disease the negroes are very apt to catch it. "The total death rate for Negroes in the United States for 1943 was 2.75 times that of whites, and was higher in northern than in southern states." (1)

One of the major group of factors influencing the course of tuberculosis may be classed as environmental. This includes nutrition, housing, occupation, physical and mental strain, and war, which includes practically all of these hazards.

Nutrition

The importance of maintaining nutrition in the treatment of tuberculosis is mentioned in the earliest records of the disease and today remains as one of the essentials of sanatorium care. A good example for this is of Denmark in the first World War. (2)

(2) "The pathogenesis of tuberculosis"—A. R. Rich Springfield, Ill., C. C. Thomas, 1944 Page 224 Heiser
The principal industry of the Danes is dairying and meat production, and shortly after the outbreak of war the demands for these products by the combatant countries resulted in prices which almost completely took them out of the home markets. During this period of three years the tuberculosis mortality rate in Denmark rose over 25%, though the living conditions were practically unchanged. By 1917 the German submarine blockade had cut off practically all of this market and the Danes were forced to live on their own meat and dairy products. The results were dramatic for in 1918 the tuberculosis rate fell to the prewar level.

**Housing**

Although the aggravating influence of bad housing on tuberculosis is generally conceded, it is next to impossible to separate it from the other environmental factors with which it is associated. In short, poverty is the predisposing cause of tuberculosis. Overcrowding facilitates the transfer of infection from person to person, and that is probably the significant factor in poor housing. An interesting example for this is the Philippines. The Philippines "usually slept closely together in groups on the floor, they had superstitions concerning the contraction of the disease and an almost unshakable fear of night air." In such a case curing the people of their superstitions is as great a task as converting them to a new religion.

Occupation

The high incidence of tuberculosis in certain occupation was recognized long before statistical measures of incidence were available, and stonemason's consumption and potter's asthma were by-words in the respective industries. Certain occupations which involve continued exposure to silica dust carry a high morbidity and mortality from tuberculosis. Aside from specific hazards, tuberculosis is a disease which in greater or smaller degree permeates all industries, and the standards of living in industry unquestionably influence the level of tuberculosis.

War

Increases of 20 to 100% in the mortality rate of the combatant countries during the first World War seem to have been proportional to the privation experienced by the respective populations. In Germany, where tuberculosis had fallen sharply in the three years after peace was declared, the mortality again rose nearly to the war level in the economic depression of 1922-23. Under war conditions, malnutrition, fatigue, exposure and mental strain are combined with overcrowding and other conditions which favor the transfer of infection to such an extent that the influence of no single factor can be measured.

The full impact of World War II on tuberculosis cannot yet be evaluated. The British Ministry of Health has

(1) "Modern Attack on Tuberculosis" -- Pope and Chadwick
Page 32
(2) The Same
reported a total increase in 1940-41 amounting to some 16% of the prewar rates. Only clinical impressions are available from France and the Low countries, and these indicate an alarming rise in tuberculosis in children. According to one statistics, during the first six months of 1945 the Netherlands experienced a 300% rise in tuberculosis while, Mr. Truman, in one of his latest speeches stated that 85% of the population of Greece was tubercular.

In the United States as a whole the mortality rates continued to decline steadily through 1943, except for New York and Massachusetts, where there was a definite rise.
Tuberculosis in the United States:*  

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*Source: Hospital Source in the United States, 1945, J.A.M.A. 127-777-778, March 31, 1945

For some time the tuberculosis hospital patients have constituted about 1% of the total admissions to all hospitals of the United States. 80% of the beds for the tuberculous are in tax-maintained hospitals and are therefore free to
the patients. When it became apparent that private effort alone could not cope with the situation a nation wide movement for public hospital provision arose.

About 75% of the capital of institutions for the tuberculosis in the United States have come from tax funds.

Physical and mental strain

The role of unaccustomed physical exertion in the re-activation of quiescent tuberculous lesions is familiar to every doctor.

Dr. Trudeau proved that tuberculosis could be cured in the mountains. With this thought in mind, for years doctors advised patients "to go to the high mountains for a few weeks". But later Dr. Bowditch demonstrated that tuberculosis would respond to treatment equally well at low altitudes in Massachusetts. This opened a new era where sanatoriums began to be built near cities where they are easily accessible by the people. It was realized that effective control of tuberculosis hinged on isolating all known cases, including so called "hopeless" cases from the healthy population. From this point onward the tuberculosis sanatorium began to partake more and more of the physical characteristics of a general hospital and as provision for absolute rest became an even more important part of the treatment larger and larger buildings were employed in order to reduce the cost of providing required attention.

(1) "Modern attack on Tuberculosis" -- Chadwick and Pope.
THE PLACE

Location and Environment

Although the average bed patient merely goes to the hospital and returns home once, long trips to an inaccessible hospital consume time doctors need for their practice elsewhere. Therefore distance and transportation facilities enter into the question of location. But if after weighing all considerations it still seems advantageous to build the institution in a remote location provision of attractive environment is an important factor to be considered, for the treatment of tuberculosis is long and tedious and the patients must often lie for weary months or even years sometimes, looking out over the landscape and the grounds of the sanatorium.

Sulfa-drugs, penicillin, shadowless lighting, air-conditioned operating rooms may be some of the benefits medical science has recently made available to us. But still "the life of man in every part has need of harmony and rhythm"—(Plato). It is the architect's aim to create a pleasant environment for these patients who lead mostly a horizontal life. If he succeeds in doing this, then he becomes in effect, the chief doctor of these people who are constantly in touch with death.

The human body is a machine that holds together by virtue of certain vital functions, on the cessation of which it is dissolved. Some of these, like the circulation of

(1) "The sense of Beauty" -- George Santayana
New York, Charles Scribner's Sons. 1904
the blood, the growth and decay of the tissues, are at first sight unconscious. Yet any important disturbance of these fundamental processes at once produces great and painful changes in consciousness: "and the whole temper and tone of one mind, the strength of our passions, the grip and concatenation of our habits, our power of attention and the loveliness of our fancy and affections are due to the influence of these vital forces." They do not, perhaps, constitute the whole basis of any one idea or emotion; but they are the conditions of the existence and character of all. They are loose and unlocalized, having no special organ, or one which is internal and hidden within the body. They therefore remain undiscriminated in consciousness and can serve to add interest to any object or to cast a general glamor over the world, very favorable to its interest and beauty. It would be curious and probably surprising to discover how much the pleasure of breathing has to do with our highest and most transcendental ideals.

The land must be dry and well drained, preferably on land sloping from north to south, if located in the north temperate zone. It should be well exposed to south and west winds and if possible protected from north winds. If the hospital is in a level country it is advantageous to protect the northern exposure by planting a windbreak, preferably of trees. The site must have available to it water supply, sewage disposal, gas and electricity. If the hospital

(2) The same.
(1) The same.
is to be located in the suburbs or in the country, the cost of bringing these services to the site may be very high. In that case the question arises as to the expediency of generating one's own power etc. The site should meet not only present needs but future developments.

**Orientation and Daylighting**

Orientation not only controls the amount of light and sunshine the building will get but also its exposure to prevailing winds and its view of the surrounding country. The National Tuberculosis Association advises that the nursing wards should be located on the south side of the building in the northern parts, on the south-south-east towards the southern parts and almost due east in the tropical parts.

Good daylighting is of great importance for the following reasons.

1) Proper vision  
2) Psychological effect  
3) Protection from cross-infection

It is important for the doctor or the nurse to be able to read a thermometer readily, and to see abnormalities in color of skin, lips, wounds etc. But in a tuberculosis sanatorium the psychological effect is more important. An ordinary horizontaller spends about 60% and in severe cases 100% of his time in bed. "I have seen in fevers the most acute suffering produced from the patient not being able to see out of a window--I remember in my own case a nosegay of

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(1) Tuberculosis Sanatorium Planning.  
National Tuberculosis Association.
wild flowers being sent me, and from that moment recovery being more rapid. People say it is the effect of the patient's mind. It is no such thing; it is on the patient's body too," wrote Florence Nightingale.

The belief used to be that only unfiltered daylight was germicidal. In other words, daylight passing through ordinary glass was considered filtered unless the glass was of a special type which transmitted some ultra-violet light.

During the war, ground floor windows of English hospitals were protected against shrapnel by heavy brick walls which caused ground floor wards to be very poorly daylighted. In a letter I received recently from a British doctor who worked under these circumstances, he states that after a year even the doctor's had lost some of their resistance and had to be replaced by others and had to have ultra-violet light at times. The main effect on the human body of blocking the windows was respiratory infections.

The tubercle bacilli if not exposed to sunlight, which kills it in a few hours, may live for six months, writes Victor Heiser in his book "An American Doctor's Odyssey". The effect of the sun rays as a germicide is not really the ultra rays but the drying effect of the rays. It is well known that germs grow and live in damp places and any dry surface is their worst enemy. The former belief that sunshine was beneficial to the horizontalers has almost died out, for direct sunlight has been found to be destructive rather than constructive. However plenty of fresh air and
indirect sunlight is one of the important drugs of the disease. In the southern countries where sunlight is too intense several devices have been worked out to control the sun. We know that as early as the Roman times the Mediterranean countries built their villas around an inner court with colonnades surrounding it, to keep "cool shade", which gave to the building of these countries a typical architecture of their own. One of the earliest modern attempts of sun control devices was Le Corbusier's exemplified in his apartment house for Algiers. Lighting engineers, in experiments in Texas, Massachusetts and the middle West, have investigated the scientific control of natural light in order to offset its ill effects. Slotted aluminum awnings; polarized, anti-glare, and anti-heat glass; vertical movable louvers; projected trellises; glass louvers operated by concealed cables; roll shutters; mechanized, custom-built, metal sash and doors; vanes prefabricated of reinforced concrete; have all been used in the different parts of the world. Formal or naive all these devices have common principle: they stop the sun before it hits the glazing. They all have their good points and bad points.

Dr. Moore and Dr. Williams discovered the fact that the tuberculosis germ failed to grow in surroundings where the concentration of oxygen exceeded 80% and that after an exposure of one month to such conditions they were dead. (1) At the same time it has been proved that the forest air was

(1) "Medicine Marches on" -- Edward Podolsky, M.D. Harper and Brothers publishers, New York, 1934.
more hygienic because of its great purity. Forest air is free of smoke, particles of dust, and injurious gases which are found in the air of cities. The foliage of the trees acts as a kind of filter and retains the dust and other particles which are contained in the air that passes over a forest. The bacteria retained on the leaves are then readily killed by exposure to the sun. Ozone, which is usually absent from the air of cities, has been found in quantities in the forest, just as it is found in the mountains and on the sea shore. In the case of pine forests the tips of the fine needles of the pines form a natural ozoniser and under the influence of the electric discharge of ultra-violet rays in the air oxygen of the air becomes charged with 3 to 8\% of ozone; and ozone is a good natural sterilizer of the germs.

THE BOSPHORUS
THE RESIDENCE

The size of the Sanatorium: bed requirements and nursing units.

In choosing the number of beds for a sanatorium two contradictory opinions come into question. A mass treatment in large well-equipped well managed hospitals may be most economical. It was Mark Twain who advised "Put all your eggs in one basket and watch that basket". But on the other hand it is thought that mass treatment in large hospitals has a dehumanizing influence which so profoundly affected Arnold Bennett that he puts into the mouth of one of his characters in "Riceyman Steps" the statement that he would rather die than enter an institution where individuality is so completely lost by inelastic rules and lack of privacy.

"One well-equipped, well-managed hospital, not too large, is better than three or four pitiful makeshifts", writes Dr. (1) Goldwater. The Committee on Tuberculosis Sanatorium Standards of the American Trudeau Society, New York, January 20, 1944 recommends that "no institution be contemplated for construction with a bed capacity of less than fifty beds," but it is the further opinion of the Standards Committee that "for economy and efficiency of operation it is preferable to set this figure at 150". The smaller the institution the more top-heavy it becomes with overhead of salaries for heads of departments and it is impossible to have full-time men for smaller institutions and the consultations that

(1) "On humanizing the hospital"—S. S. Goldwater, M.D.
Modern Hospital 22:539-545 June 1924
are absolutely necessary for proper functioning are difficult or impossible to obtain. "The Puerto Ricans have a law against governmental hospitals of less than three hundred beds. In the State of New York the law provides that if a county does not have a sufficient population to sustain a tuberculosis hospital several such counties may combine and have the state build and operate one for them." (1)

But one of the points that have to be considered also in planning for a sanatorium is to determine the number of beds required to meet the needs of the population group to be served. When accurate vital statistics are available it may be estimated that two beds should be provided for each recorded annual death. In communities where case-finding agencies are active and the sanatorium has a public appeal, beds in the proportion of three per death may give more accurate results. (2) When vital statistics are unreliable, an approximate estimate of the bed requirements may be made on the ration of one bed per thousand population.

Research in recent years has shown that children with primary tuberculous infection do not ordinarily require institutional treatment. Few children under twelve years of age develop preliminary tuberculosis. "Tuberculosis is increasingly becoming a disease of older, occupied men" said Dr. Pope when I had an interview with him.

(1) The Tuberculosis Hospital -- Isadore Rosenfield Pencil Points, November 1946, Page 76
(2) Committee on Tuberculosis Sanatorium Standards of the American Trudeau Society, New York, January 20, 1944
Given a hospital of a certain capacity, what is its proper mass? Writers have attempted to show that for each hospital bed it is possible to establish a normal mass—so many cubic meters of construction for each bed and no more. Such a thing cannot be valid because of wide variations in the class or classes of patients, because of the range of service performed in hospitals organized upon different lines. Private room service for a given number of patients consumes more space than ward service and one hospital may properly have many private patients another few or none.

In parts of the United States, where hospital planning is regulated by local legislation, the minimum cubic space allowance for patients in public wards is only 800 cu. ft. This means that at least 70 sq. ft. be given to each patient. The American Hospital Association requires that beds be at least 4 ft. apart.

"You just have a touch of T.B." remarks a doctor and from then on a person becomes a patient in a sanatorium. Then his struggle with death begins. From the practical point of view, as the patient progresses, his treatment and

(1) Hospital planning; a study of its Economic Problems -- S. S. Goldwater, M. D.
Modern Hospital 33:57 - 64 August, 1929
care became simpler, so that the sanatorium can be maintained economically and efficiently by simplifying accommodations as much as possible. Psychologically, the patient is encouraged by his "promotion" and is benefited from change in surroundings and companions.

There are five groups of patient cases:

1) **Terminal cases**

   These are divided into two classes:

   (a) **Those about to die.** These are hospital cases. They should be isolated so that their dying will not depress or discourage those with a chance of recovery.

   (b) **The Chronically ill.** Their condition in general is good but they continue to have a positive sputum. They are ambulant cases as a rule and may live for ten years or more, so that their case is mainly "custodial for public protection."

2) **Acute or bed cases.**

   These are patients who are expected to recover but who must be kept in bed most of the time.

3) **Semi-ambulant cases**

   These are patients who have recovered sufficiently from the acute stage to be up part of the time, but who must spend a certain amount of their time in bed during the day. They can get up to go to

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(1) Hospital Planning -- Charles Butler and Addison Erdman
New York, F. W. Dodge Corporation 1946
dining rooms for meals and dayrooms for recreation. They are generally housed in 2-bed rooms, so that in case of a relapse, which frequently occurs, a room may be temporarily used as a hospital room with more accurate attention.

4) Ambulant cases.

These are patients who are well enough to enjoy freedom, being out of bed and dressed most of the time, and able to walk through the hospital grounds, go to the dining room and take part in activities arranged for their recreation. The proportion of each group varies very widely from district to district and have to be calculated separately for each region and hospital.

In every country it has been much discussed whether bedrooms ought to be limited to two beds depth or the three beds depth. This gives, respectively, four to six bed rooms as the largest type of bedroom, wards with more than six beds being no longer accepted. The building costs are approximately the same for both systems and whilst the three bed system achieves a more concentrated solution which may be an advantage, the 2 bed system provides more quietness. Some doctors think that two-bed rooms are not so good because it is difficult to find two patients so congenial that they will be contented to live together during weeks and months of treatment. But no one can prove that three people can get along well together. Once the following
The question has been asked: "If all the people in the world would die and only three women would be left, what would they do?" The winning answer was "Two of them would get together and gossip about the third."

The primary function of a hospital is to adopt itself to its patients. In case of a tuberculosis sanatorium it may be interesting and beneficial to divide the patients into groups small enough to develop a certain amount of esprit de corps during the more or less lengthy duration of the cure. The psychological relation between the individual and the group in a tuberculosis sanatorium is a very delicate one. Patients may be divided into several groups according to their character and psychology and with some care, the doctors could nurture the special character of each group, and by encouraging an easy transfer from group to group make it possible for each individual to find the most congenial milieu.

"The time seems opportune to direct attention to the underlying principles of hospital planning, namely utility, diversity, facility of operation, flexibility, health and economy" writes Dr. Goldwater.

(1) "Architecture and Furniture" -- Aalto
The Museum of Modern Art.
FROM THE ARCHITECTURAL RECORD, MARCH 1939
The following list has been taken from the "Tuberculosis Sanatorium Planning", National Tuberculosis Association.

1) Complete service facilities in each nursing unit will lead to economy of operation, because routine work and patients' calls can be attended to by short trips. However, this will increase the cost of construction.

2) In general, the same service rooms are required for semi-ambulant and for ambulant patients, in fact the two groups of patients may be housed in the same nursing unit.

3) No patient should be hospitalized above the second floor of a non-fire-proof building.

4) Circulation of all services plays an important role in the welfare of the patients and the efficiency of the hospital.

5) Separate nurses' stations are located at a central point in each nursing unit. The primary space requirements is for desk, chair and charts.

6) The toilet room for each infirmary unit should contain two water closets and two lavatories. A bathroom with one tub and one shower is usually enough for one unit.

7) Chemical analysis of the water supply should be obtained; corrosive reaction on steel, wrought iron, copper and brass should be determined and then the type of pipe that offers the greatest resistance to corrosion should be chosen. To facilitate the necessary repair work, piping may be placed either in regular pipe closets of a size large
enough to permit a man's entrance, or in smaller shafts with access doors at each floor level.

8) The required space for utility rooms is dependent upon the amount of equipment necessary to suit the definite case considered.

9) For semi-ambulant and ambulant cases, sputum technique stations should be provided, preferably in the patients' toilet sections. In most sanatoria today, individual paper sputum cups in a metal container are used by all but bed fast cases and a sputum technique station is merely a place where the used paper cups can be taken out and clean refills substituted in a convenient and sanitary way. In the larger sanatoria, sputum technique stations have been arranged so that each may serve two or more nursing units and are located in a separate room equipped with a sterilizer for the sterilization of the metal containers.

10) Cleaners' closets should be provided for each 200 feet of corridor space.

11) Ordinarily, a linen closet with space for at least two days' supply should be provided for each nursing unit preferably equipped with adjustable metal shelving 18" wide above the counter and 30" below.

12) Distributing kitchens are located close to an artery of transportation from the main kitchen to the various nursing units served. Attention should be made for sound-proofing and location, so that the patients will not be disturbed. If the main kitchen is not in a central location or
is in a separate building, heated food trucks are used for food distribution.

13) The rules of most sanatoria specify the amount of personal clothing which may be brought to the institution. The necessity for baggage storage room is dependent both on the amount thus mentioned and the possibility of placing all of the material in the closet or locker provided elsewhere. Otherwise a baggage room for the storage of excess clothing and baggage should be provided either on the same floor level with the nursing section and under the control of the nurse in charge, or in the basement under control of the head nurse.

14) Corridors from which patients' rooms open and those for wheeled traffic should not be less than eight feet wide.

15) In all sanatoriums all stairways should be enclosed with fire-walls; stairs should be of steel or concrete and constructed on a gentle rise for ease of travel.

To permit easy stretches traffic in emergencies stairways might be increased to at least four feet wide with landings six feet wide.

16) All elevators should be of size suitable for stretcher cases; therefore, the platform should be 5\(\frac{1}{4}\)" by 8' and the shaft equipped with two speed doors for clear width of 3'8" at the levels.

17) To provide for natural ventilation, the window area should approximate 30% of the floor space, although the exact percentage may vary. The height of the sill from
the floor should be considered from the standpoint of the patient's view from bed, safety and privacy. The top of the window should be as close as possible to the ceiling to insure natural ventilation and lighting of the rear of the room.

18) Door openings to all patients' rooms should be wide enough to permit the passage of 3'3" beds without interference.

19) Signal systems: 1) for communication between the patient and the nurse.

2) for emergency calls as from the surgical operating and anesthesia rooms.

3) Fire alarm system.

4) Doctors' call system. This call system is to be so wired as to be under the control of the telephone switchboard operator. This system may be of the land speaker or flashing light type, with calling stations so located as to thoroughly cover all sections of the hospital.
THE GOVERNMENT

Administration

The interest of most hospital superintendents in the old days, was centered on the physical hospital. "Considering my own experience and interest in the planning of hospitals, I should perhaps be the last one to decry the importance of the physical hospital plant. But actually the physical hospital is secondary in importance to the living hospital, the live functional hospital whose activities determine what finally happens to the patient", writes Dr. Goldwater.

A hospital which has achieved a physical beauty, which has been built securely and has been well furnished is not a finished hospital. At that point the scene has been set, but the play has not yet begun. Hospital administration is put to the test only when the first patient arrives.

"Some naturally gentle superintendent must have been sound asleep when an engineer in a city in Ireland, was permitted to erect a hospital in which mechanically ventilated wards were arranged side by side like so many crowded packing boxes in a storehouse, thus depriving patients in bed of any view of the wonderful world outside.

As its name indicates the administration department has jurisdiction over everything in the hospital. In it are

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(1) "The future of Hospital Administration" -- S.S. Goldwater, M.D. Hospitals: 12:15-22 Nov. 1938
(2) A letter received from the "Royal Institute of British Architects" runs: "The Irish Hospital to which you refer would appear to be the extension of the Royal Victoria Hospital, Belfast".
centered all the services having to do with the operation of the hospital. A good and talented medical and surgical staff of a modern well-equipped hospital can fail to fulfill its proper function in the community through an ill-conceived administration, for a hospital is in a way a human society and human society is merely an organized way of living and working together.
"Are you really perfectly healthy"? asked Dr. Krokowski. "Then you are a phenomenon worthy of study. I, for one, have never in my life come across a perfectly healthy human being". Dr. Krokowski might have been seeing only tuberculosis patients all his life up on one of the Swiss mountains, but he must have had taken great interest in all his patients individually. But among many wonderful doctors and nurses are some who have the defects of their professional qualities. However concentration on technical problems is not only a criminal offense, it is indispensable to scientific progress. Over the threshold of a German hospital the motto "Forget the disease and remember the patient" was engraved. Dr. Goldwater suggests that a better saying would be "Study the disease, but do not forget the patient".

Modern medical education requires a comprehensive program covering the entire professional life of the physician. Dr. Osler once said that the only way to learn medicine was from a textbook but that the only real textbooks were individual patients. A Physician in a sanatorium being one of

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(1) "The Magic Mountain" -- Thomas Mann.
(2) "On humanizing the hospital" -- S.S. Goldwater, M.D. Modern Hospital 22: 539 - 545 June 1924
(3) "The principle and practice of medicine" -- Sir William Osler.

Prof. of Medicine at John Hopkins University.
"Every sanatorium shall have a medical director who must be a reputable licensed physician, who has had at least three years of experience in a recognized tuberculosis institution" dictates the Committee on Tuberculosis Sanatorium Standards of the American Trudeau Society in the meeting on January 20, 1944.

"In institutions of fifty beds or more the medical director shall have full time, or shall, full time.

"There shall be, in addition to the medical director, at least one full-time resident physician for the first fifty resident patients and one additional full-time physician for each sixty additional patients or fraction thereof.

"For the care of bedridden patients the ratio should not be less than one nurse to five patients; for semi-ambulant cases the ratio should not be less than one to thirty.

"Regular medical staff meetings, which should include consultants, should be held for diagnosis and the determination of treatment to be followed at least twice a month".

Treatment

Rest, both mental and physical, is the keystone upon which recovery is built. Although much stress has been laid on controlled exercise and work, rest still remains the basic treatment. The diseased lung must be put as completely at rest as
possible and kept so, as long as the disease is active. If our stomach is upset we stop eating until our appetite returns. This principle applied to preliminary tuberculosis would mean "the cessation" of breathing, because during breathing the lung stretches and contracts and this necessarily irritates the diseased area.

Lately pneumothorax and "taps" treatments have been more and more widely used. This "surgical rest" is applicable where the disease is confined or almost confined to one lung. This treatment consists of collapsing the lung by the injection of air into the chest cavity to permit it to rest and recuperate. Before and after treatment, the patient's chest is periodically examined with the fluoroscope to determine the degree of collapse of the lung and look for complicating fluids. If fluid is found the "tap" room is then used; there the chest is tapped and the fluid removed.

Roughly, 40% of hospital patients with tuberculosis, 30% of sanatorium patients and 20% of tuberculous out-patients receive pneumothorax treatments. These percentages may vary, based on the type of patient, method of treatment and unpredictable changes in tuberculosis therapy.

On the average, two pneumothorax treatments are given per patient per week in a hospital. Approximately six pneumothorax treatments can be performed hereby at one pneumothorax station in a sanatorium. Treatment sessions are usually limited to four or five hours per day, usually between rest periods and meals.

(1) "The Modern Hospital" -- Vol. 58, No. 3, March 1942
Surgery.

In the Ether Dome of the Massachusetts General Hospital in Boston appears this inscription:

"On October 16, 1846, in this room, then the operating theatre of the hospital; was given the first public demonstration of anesthesia to the extent of producing insensibility to pain during a serious surgical operation. Sulphuric ether was administered by William Thomas Green Morton, a Boston dentist. The patient was Gilbert Abbott. The operation was the removal of a tumor under the jaw. The surgeon was John Collins Warren. The patient declared that he had felt no pain during the operation and was discharged well December 7. Knowledge of this discovery spread from this room throughout the civilized world and a new era for surgery began."

An entirely new era began when surgery was applied to tuberculosis. Up to the present day drugs have not succeeded in playing a major role in the cure. Rib-removal to permit relaxation of a tubercular lung, chest and lung surgery have all helped nature in repairing the "not just a pair of lungs."

Static electricity is the most dangerous cause of explosions, both inside the anesthesia machine and throughout the operating room. Static is created by friction, chiefly between non-conducting materials, including gases. When so created or deposited on a non-conducting surface, these static electric charges may develop potentials of several thousand volts. In general, the presence of moisture increases electrical conductivity and consequently results in the spreading or leaking off
of static changes.

The presence of adequate relative humidity (60 per cent for most materials) is enough to prevent or minimize the accumulation of static for nearly all materials commonly occurring in these rooms. However, friction between certain materials results in static which may be retained by these materials at very high humidities -- 85% or more. Hard rubber and wool are such materials.

Like moisture, the use of metallic conductors in intimate and closely adjacent contact with non-conductive surfaces will likewise provide means of dissipating static charges. If these metallic conductors are applied properly on all non-conducting surfaces which are likely to produce or hold static, they will be effective.

Grounding is an effective safeguard only if thoroughly and consistently applied. But all equipment and all parts of equipment and all persons have to be fully and properly grounded, something which is most difficult of accomplishment.

Sterilization of air of operating rooms is still in the experimental stage. The problem is the prevention of air contamination rather than the sterilization of contaminated air.

Lighting and sterilization are usually wanted to be combined together for ridding the air of bacteria. This is usually done by means of ultra-violet lamps.

There is a controversy between the doctors as to whether the operating rooms should have windows or not. "In one of the best hospitals in New York when the operating rooms were
first blocked out at the beginning of the late war, two principal surgeons fainted during an operation. A check of the ventilating system showed temperature, humidity and all other conditions in the operating room to be in perfect order. It was concluded that the surgeon fainted from claustrophobia possibly coupled with some unpleasant contrast.

But some doctors suggest that light coming from the window is liable to change and is always in one direction and therefore may cause shadows in the different positions of the surgeons, while the artificial light system being in the hands of producers of electric current, bulbs, tubes and fixtures, can be adjusted so as to give light in different directions.

Laboratory and Pharmacy

An instrument no matter how precise, is valueless unless used properly. The laboratory employs exact methods and instruments of precision, but the human being that uses them is far from being equally precise and not always inclined by nature to be equally exact.

Accuracy is what differentiates the work of the laboratory from other clinical work. For this, time, freedom from disturbances, constant checking is necessary.

In sanatoriums located outside big cities, the laboratories should be much more comprehensive and equipped for research.

(1) The Tuberculosis Hospital -- Isadore Rosenfield
Pencil Points, November 1946, Page 76
A hospital pharmacy is that department of a hospital which purchases and prepares drugs, medicines and medical supplies. It undertakes laboratory and research work, keeps necessary records and is responsible for poisonous, habit forming and dangerous drugs. "Hekimbasi", the first pharmacist to the king in Turkey had these words written on the door of the building "Burada her sey bulumur derde devadan gayri" which translated meant "you can find anything here except cure for ailment" or "You can find anything here for ailment except cure", according to the place one chooses to put the comma. That surely should not mean that the pharmacies should rest content in a "cubby-hole" with epsom salts, compound cathartics and quinine.

**X-ray and Fluoroscopy**

In tuberculosis x-rays are used not only in diagnosis but in checking on the progress of the disease. Moreover, x-ray pictures taken from different directions and viewed through a stereoscope locate the local points of infection, and the actual depth of penetration for tapping can be determined.

A fluoroscope is of great importance in a tuberculosis clinic. It gives the clinician a quick method of checking the progress of pulmonary lesions. It obviates the routine use of an x-ray film, thus saving both time and money.
THE BOSPHORUS

THE BRIDGE
"We live in order to eat so that we may live".

Even a healthy person thinks and reasons differently when he is hungry. Most of our daily lives are spent struggling for "something to eat". That person in the kitchen -- the cook--on whom the lives of all the patients depend is a mighty figure. If the architect is considered to be one of the chief doctors of the hospital, then the cook is his assistant. The body is greatly aided in its fight to overcome the infection, so a "mighty meal" is one of the best drugs for the tubercular patients.

Ovens, broilers, fryers, vegetable steamers, kettles will be all grouped under the main kitchen hood. The vegetable-mashing machines, egg boilers, a bain marie, and other equipment should be placed in convenient adjoining locations. The preparation space for meals and vegetables should be located at the receiving end of the kitchen and should be equipped with blocks or cutting benches for meat and fish, vegetable peelers and chopping and slicing machines. The bakery should adjoin the kitchen. Adjoining the bakery should be located the equipment for the manufacture of ice cream which is under the supervision of the baker. A diet kitchen is often necessary.
The dish washing rooms should be fitted with sterilizing dishwashers, with soiled and clean dish tables, glass and silver sinks, or washer, and racks for clean dishes. All patients' dishes should be washed in a separate room and kept separate from those of staff and employees.
UTILITIES

Laundry

Because of the noise of operation, it should be placed away from patients' quarters and because of its utilization of high pressure steam, close to the power house. Ventilation is important and sterilizing, washing, drying and ironing is the process.

Heat and Power

The building should preferably be located away from and to the rear of the patients' quarters so that noise from operation will be minimized and so that prevailing winds will not carry smoke over patients' quarters.

Whether the local utilities collect or do not collect the wet and dry garbage it is wise to burn them in incinerators.
COLOR, MUSIC, MATERIAL

Color

In the eye we have an organ so differentiated that it is sensitive to very subtle influence. "There seems to be in the interstellar spaces some pervasive fluid, for the light of the remotest star is rapidly conveyed to us." Many common observations, such as the apparent interval between lightning and thunder, make us aware of the quicker motion of light. The eye gives the mind instantaneous impressions dependent upon the presence and nature of objects.

The values of perception are those we call aesthetic and there could be no beauty if there was no conception of independent objects.

The effect of form and color - which are two synthesis of the seen, arise in the constructive imagination, and being purely sensuous, both become an element of beauty.

As sweet and pungent smells, as high and low notes differ from each other by their different stimulation of the senses, so also red differs from green and green from blue. As a high rate of vibration yields a sharp note to the ear, so a high rate of vibration yields the violet color to the eye. Some colors therefore give pleasure to the eye and some are depressive.

(1) The Sense of Beauty" -- George Santayana
New York - Charles Scribner's Sons 1904
Therefore the modern hospital uses yellow, green or violet because of their beneficial effect upon the brain and the nervous system, of these sensitive people living in it.

Formerly however the "hospital white" was synonymous with cleanliness, and gave the building a strictly "institutional" atmosphere.

Music

There is some justification in Schopenhauer's assertion that music repeats the entire world of sense and is a parallel method of expression of the underlying substance of will. The world of sound is certainly capable of infinite variety, and were our sense developed, of infinite extensions; and it has as much as the world of matter the power to interest us and to stir our emotions. Clinical experiments by quite a number of psychologists have also proved that music possesses positive powers which exerts themselves on our mental and physical well-being.

A German surgeon said he operated most brilliantly after attending a concert. Another doctor reported that music used when a patient is coming out of anesthesia helped induce natural and undisturbed sleep.

Material

However subordinate the beauty may be which a garment, a building or a poem derives from its "sensuous material",

(1) "The sense of Beauty" -- George Santayana
    New York, Charles Scribner and Sons. 1904
(2) "The Modern Hospital" -- Philip J. Jacoby
    September 1946
(3) The Same
yet the presence of this material is indispensable. Form cannot be the form of nothing. So if we ignore the materials of things and only look to their form we are leaving out one of the essential things of that object. Material enhances the form and gives to the beauty of the object a certain thoroughness and infinity which it otherwise lacks. The Parthenon not of marble and the stars not of fire would be quite different things.
THE PRINCES' ISLANDS FROM ISTANBUL
HEYBELIADA FROM BÜYÜKADA

A CLIFF ON ONE OF THE ISLANDS
THE COMMUNITY

A man lives not only his personal life, as an individual but also, consciously or unconsciously the life of his epoch, surroundings and contemporaries.

All sorts of personal aims, ends, hopes, prospects, hover before the eyes of the individual, and out of these he derives the impulse to ambition and achievement. "If the life about him, if his own time seem, however outwardly stimulating, to be at bottom empty of such food for his aspirations; if he privately recognize it to be hopeless, viewless, helpless, opposing only a hollow silence to all the questions man puts consciously or unconsciously, yet somehow puts, as to the final, absolute, and abstract meaning in all his efforts and activities; then a certain laming of the personality is bound to occur, the more inevitably the more right the character in question; a sort of palsey, as it were, which may even extend from his spiritual and moral over into his physical and organic past.

In a place that affords no satisfying answer to his "why?" and "to what end?" a man who is capable of achievement over and above the average must be of an exceptionally high vitality.

One of the troubles about a human life is the feeling of relatedness to some person or group of persons, the feeling of belongingness to a larger whole and of being of value to other

(1) "The Magic Mountain" -- Thomas Mann
men. The source of the most basic anxieties in human nature is a feeling of being alone and helpless in an unfriendly surrounding. Even science today teaches us the fact that we can understand the universe only in terms of relatedness, that things are nothing in themselves in isolation. "I have had personal experience with hospital buildings where I was able to discover that especially physical and psychological reactions by patients provided good pointers for ordinary housing" -- writes Prof. Aalto.

The main "object" in a hospital is the patient and to give me the best living conditions the following facts have to be well considered.

1) The relation between the single human being and his living room.

2) The protection of the single human being against large groups of people and the pressure of collectivity.

"Disease is a perverse, a dissolute form of life. The birth of the organic out of the inorganic is only another fatal stage in the progress of the corporeal toward consciousness, just as disease in the organism is an intoxication, a heightening and unlicensed accentuation of its physical state.

Some say that solitude is the best company. Their own rooms, the park, the books become their intimate associates. Yet, a tubercular patient being a horizontaller most of his time is very sensitive and temperamental and is very apt to get depressed now and again. He is very often left alone with

(1) "The Humanizing of Architecture" -- Prof. Aalto
"Architectural Record" - December 1940
(2) "The Magic Mountain" -- Thomas Mann.
his own thoughts, he is conscious of the miseries Nature has chosen for him, of many pleasures that are available to others. In the Magic Mountain" by Thomas Mann, Joachim says, "Down below, one goes through so many changes and makes so much progress in a single year of life. And I have to stagnate up here -- yes, just stagnate like a filthy puddle".

"God, Lord of the Universe" says La-otse, "heap worldly gifts at the feet of foolish men. But on my head pour only sweet waters of serenity. Give me the gift of the Untroubled Mind". (1)

The mind is very capable of exaggerating things and humanity therefore tries to invent, now and again, new reasons to hope even for the impossible.

Robert Browning once wrote, "The mind is in its own place, and can make a heaven of hell and hell of heaven".

The mind has to be led from hell to heaven, so that even with their half lungs, these patients can say as Stevenson once said it, "After all this world is so full of a number of things I'm sure we should be as happy as kings".

"Surement le jour est proche ou l'on revera d'un hopital ou tout sera "Beaute et Bonte", writes optimistically a French critic. Everything in the environment has to point out to the happiness of life, to the desire of living. And one way of

(1) A pre-confucian philosopher and meta physician of China
achieving this by creating variety in the monotonous life of the patients. The constant appeal to the same sense, the constant requirement of the same reaction, tires the person and he longs for change as for a relief. If the repeated stimulations are not very acute, he soon becomes unconscious of them; like the ticking of the clock they cease to exist in the mind.

Recreation of every sort - the kind that are suitable for the tubercular patients - has to be available for them. Painting, knitting, taking pictures, drawing, weaving, reading, music, writing, acting and othersmall handicraft - unhararmful to the disease - all help to form a suitable milieu for the right type of person, to give him the satisfaction of achieving something, and to create an intimate interesting atmosphere and time content which "make the time pass"; that is to say, shorten it whereas monotony and emptiness check and restrain its flow.
HEY 
BE 
li 
ADA,
THE PROBLEM

The two foremost problems of the Health Department of Turkey were and still are to fight against malaria and tuberculosis. In fighting the tuberculosis each infected individual had to be found out and sent to a hospital. The people could not recognize the disease as a public menace for they were ignorant of its dangers and for some reason or another tried to avoid going to a hospital. But today, they are becoming more and more aware of it and so, more and more of them are applying to hospitals for medical care. Often they are unable to get into, because of the insufficient number of beds. Each patient has to wait a long time for his turn. Expense of living, poor living conditions of most of the workers, poor nourishment, especially during the recent years, poverty, all helped for the increase of percentage of tuberculosis death rates.

The statistics below, furnished by the Health Department in Ankara show that the death rates from tuberculosis are very high. In the other parts of the country it is not better, even if not worse.

There are two procedures encountered in fighting tuberculosis:

1. The provision of adequate facilities for treatment of the infected.

2. The search for unwilling or uncooperative carriers of the disease.
The first is achieved by building hospitals with enough beds. The second by a well-organized social work system.
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<th>Other kinds of tuberculosis</th>
<th>Total</th>
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Istanbul is the largest and most densely populated city in Turkey, and lies in the most densely populated section of the country. It is divided into several parts by the Bosphorus and the Golden Horn. The section around "the Bridge" that spans the Golden Horn is the commercial and business center of the city, the seat of banks, post-offices, steamship offices etc. The part that lies to the south of the Golden Horn is the old City of Constantine, which was founded in A.D. 328 through the enlargement of the old town of Byzantium. The part lying to the north is the more recent and modern, while the Asiatic side is mainly residential, except for Uskudar, which is a continuation of the Bridge area.

"Few places in the world have exercised such a power of attraction for travelers as Istanbul. The severe classic art of Athens is not found here; nor the dignity of Rome; nor the exciting sullen spirit that permeates Peking. It is not gay like Paris nor learned like Berlin. An archeologist would be better pleased with Egypt. But this is the place before which Gautier, Loti, De Amicis and Lamartine wept with delight before they sat down to fill books with ecstatic praises" comments the National Geographic Magazine.

Along the two beautiful shores of the Bosphorus, small villages are scattered over the slopes of many hills, that are covered with oaks and birches, magnolias, firs and Judas — a sight which led Villehardouin, the chronicler of the fourth
Crusade to utter: "Il n'y a l'homme si hardi a qui le coeur ne fremit".

Towards the south-east of the city, about an hour and twenty minutes' by ferry-boat from "the Bridge" lie the four islands known as the Princes' Islands. It is said that if Naples has its Capri and Ischia, Istanbul has its Princes' Islands.

In choosing a sight for a sanatorium several parts of the city might be considered. The center of the city is almost out of the question because of its density of population, noise and dirt, and although the hills and shores along the Bosporus are very pretty and can be reached by ferry-boats as well as by car and buses, the weather is too hard and blusterous for the tubercular patients.

On the south-eastern side of the Asiatic coast there are two possible locations, one at Erenkoy and the other at Yakacik. In fact, today there is a preventorium in one and a small sanatorium in the other. But the access is not as easy, and the view is not as nice as the Islands on one of which I intend to locate the sanatorium. These islands are better populated so that one feels oneself still in a town, but with the bend of a road one enters immediately into the country side. The towns on these islands are centered around the pier where boats land about every three quarters' of an hour. The islands especially Büyükada (Prinkipo) and Heybeliada (Halki)
have all manner of shopping facilities, casinos, clubs, hotels and beaches. They also serve as summer resorts when every building is occupied from May to October.

Heybeli, the second largest of the group has an irregularly broken triangular shape. It is divided into three mountain groups that rise quite steeply from the waters. Though an island, its climate is warm and is one of the driest parts of the city. It is one of the warmest parts of Istanbul and often escapes the rains that fall over the city. The earliest flowers grow there and yellow mimosas, bougainvillae, wisteria, and carnations are its best known varieties, while pines and firs and "maqui" here and there cover the slopes.

The spot chosen for the sanatorium is on the southern shores of the island around a small bay. The place would not be much effected even in time of heavy south-west winds, which makes the Mediterranean and the little Sea of Marmara very rough. At the same time, it is well protected from the rough winds blowing from the Black Sea and the place is thought to be ideal for such an institution by quite a few doctors.

This sanatorium would not by any means end the problem of tuberculosis altogether, but it will be one of the first attempts of its kind towards its solution.

For Istanbul, the formulas, one bed per thousand population and three beds per annual death, do not give the same results because of the high rate of incidence and deaths from the
disease. Today there are five small sanatoriums, with sixty beds in most cases, the total number of beds being about 450.

The proposed sanatorium contains about 350 beds.
The Program:

Entrance hall
Porter, post office, telephone, wireless, magazines and paper sales place
Visitor's lounge
Recreation room and library
Recreation room for nurses

Administration:

Director's office
Office of his secretary
Records room
Office of the assistant director
Office of the superintendent of nurses
Office of her Secretary
Staff meeting room with moving picture facilities
Medical Library
Cashier's room

Nursing Units:

Single bed-rooms (some of these for very serious cases)
2 - bed rooms
4 - bed rooms
Nurses' stations
Bathrooms
Sputum technique stations
Washrooms, general cleaning and disinfection

Surgical:

2 operating rooms
Sterilizing room
Store room for oxygen tents
Room for "blood bank" refrigerator and storage space for plasma
Nurses' work room
Anesthesia room

Services:

Service entrance
Main kitchen
Diet kitchen
Dishwashing
Bread etc. storage room
Bakery
Dining room for patients
Dining room for staff and nurses
Dining room for employees
Housekeeper's general storage room
Dairy products storage
Meat storage
Fish storage
Garbage refrigerator
Distribution kitchens
Clean and dirty linen space
Patients' trunk and locker rooms
Day rooms

Medical:

(One full time resident for 50 patients
One additional resident for every other 60 patients
Therefore 6 residents, living quarters for them
House for the superintendent of doctors
2 dentist rooms
Ear and throat specialist room
Eye specialist room
Physiotherapy room (massage, bath..)
Occupational therapy room
Laboratory
Pharmacy: 1) room for drugs
        2) analysis room

Autopsy and morgue

1 fluoroscopy and 2 pneumo-thorax rooms
1 X-ray room
Dark room
Viewing room
Filing room

Laundry:

Sterilizing, washing and drying
Mending and ironing
Room for mattress sterilizing
Mattress storage room
Room for central storage of linen and blankets

Power Plant:

Fuel storage
Transformer and meter room
Engineer's repair shop
Nurses Quarters

One nurse for 5 bedridden patients
One nurse for 30 ambulant and semi-ambulant cases
3 head nurses
Living quarters for the above:
3 one-bed room for the head nurses
20 2-bed room for the nurses
One bedroom for the superintendent of nurses
7 2-bed rooms for 14 training nurses
Related services and facilities

Living quarters for 12 internes
Living quarters for about 100 employees

Doctors' residences:

A small residence for the director
A small residence for the assistant director
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