

The Design of a Leprosarium (Hay Ling Chau, Hong Kong)^{1, 2, 3}Olaf K. Skinsnes and Neil D. Fraser⁴

The majority of well-developed leproseries are institutions, often having histories of several decades' activity, that were built as asylums and evolved into treatment centers with the advent of sulfone and other effective therapy. The ongoing developments in therapy have made possible a trend toward treating patients with leprosy as outpatients in clinics associated with general hospitals and permitting reconstructive surgery to be performed also in the facilities of such hospitals. Nevertheless, some communities possessed of significant problems relating to endemic leprosy may find it advantageous and necessary to create specialized institutions as part of a program designed to meet these problems.

When, in the decade 1949-1959, the situation in Hong Kong made necessary the development of a leprosarium on the island of Hay Ling Chau ("Isle of Happy Healing")⁵, it was found that there was little recorded as to the needs and design of such an institution. Cochrane⁽³⁾ and Muir⁽⁸⁾ presented some useful guidelines in their textbooks. These books, however, were published before the effectiveness of sulfone therapy of leprosy was apparent and before the potentials of the use of reconstructive surgery in this disease were

realized. Questions relating to the size of the institution needed, the relationship of effectiveness to size and problems of management, and the proportion of infirmary beds to ambulatory patient housing found no ready answers. No recent guidelines for this type of problem have appeared.

The experience gained and the design⁶ worked out in relation to Hay Ling Chau are here summarized as a matter of record that may be useful to others. Subsequent visits to the institution by both writers, who collaborated for several years on its major development, serve as useful points of evaluation of the effectiveness of the development.

The problem. No facilities for a meaningful survey of the incidence of leprosy in the community being available and no estimate of such incidence having been made, a private evaluation of the magnitude of the problem was made from a number of considerations over a period of two years. This led to the conclusion that there were perhaps 6,000 persons with leprosy in the Hong Kong population then estimated at 2.36 million.⁽⁵⁾ It was a rapidly expanding population which by the census of 1961⁽⁶⁾ numbered 3.19+ million.

Persons with leprosy often gravitate to urban areas, and this is especially so if means of treatment are there available. Furthermore, Hong Kong is geographically and ethnologically related to Kwangtung Province, China, and Kwangtung is known to be an area of considerable leprosy endemicity. Indeed, fear was expressed that

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⁵ Hay Ling Chau is a Hong Kong community and government supported development in cooperation with and under the sponsorship of The Leprosy Mission, London, operating through its Hong Kong Auxiliary.

⁶ Much of the design work, especially for the medical center, its furnishings and its laboratory facilities, was made possible by a research and development grant from the American Leprosy Missions, Inc., New York.

development of treatment facilities for leprosy in Hong Kong might attract patients from Kwangtung (as it has) and that the incidence might thus be increased.

It was concluded that the magnitude of the indigenous problem, its likely aggravation by the reservoir of contiguous disease, the slow response to specific therapy in leprosy, and the need for special facilities for reconstructive surgery, physiotherapy and occupational therapy, all called for the commitment of considerable resources to the combatting of leprosy.

Outpatient versus institutional care. The magnitude of the problem in itself precluded, as it must in many areas, the possibility of providing institutional care as the major means of treatment, even if that were desirable. Likewise evident was the probability of a major rehabilitation problem being created by the necessity of returning considerable numbers of treated patients to a community, in which there was considerable unemployment, after they would have relinquished home and work for several years in order to receive treatment. Social opprobrium associated with leprosy (^{11, 12, 13}) in this community would markedly enhance the problem.

Acid-fast stains of bacilli from patients who had been under sulfone therapy for four or more months demonstrated marked morphologic changes in the organisms suggestive of degenerative changes (1954 observation). It was postulated that a bacillus of low initial virulence and infecting ability would probably be even less infective when debilitated or poisoned by therapeutic agents. This concept was reinforced by the readily demonstrable decrease in the number of bacilli in the tissues of treated patients.

For these reasons it was concluded that the major portion of patients with leprosy should be treated on an outpatient basis and that they would continue to live in their usual abodes, on the assumptions that their contagiousness would progressively decrease and that the major portions of their careers as infecting agents would therefore have already been spent. Subsequent electron microscopic studies of acid-fast bacilli tend to substantiate the signifi-

cance of the degenerative change seen in these organisms.⁽¹⁰⁾

Recently a study in Hong Kong has been published⁽¹⁴⁾ which was made possible by the adoption of this policy. Children of leprosy parents treated at home were surveyed after a period of 10 years and it was found that of children born to these parents after therapy was begun, none have developed the disease.

It was also reasoned that in areas of significant leprosy endemicity, specialized institutions for leprosy treatment were still necessary for a number of cogent reasons, among them the following:

1. General hospitals are reluctant to commit their beds to single patients for the long period still required for treatment of leprosy and such use of hospital beds is prohibitively costly. Furthermore, the demand for hospital accommodation is, in many areas, in excess of beds available.
2. The patient populations of general hospitals share their society's fear of leprosy, and a time of stress, such as illness requiring hospitalization, is not a happy period for reorienting their thinking and combatting their prejudice by shock exposure to the subjects of their opprobrium.
3. Therapy is accompanied by a significant incidence of lepra reactions which can be hazardous and which may require hospital care for their management.
4. Relapses following therapy can be expected and may present special problems of management requiring institutional facilities.
5. For patients, handicapped through crippling or destitute as a result of their disease, the long period of therapy presents the need for occupational facilities to engage their attention while under treatment and, hopefully, to better fit them for gainful occupation on their return to the community.
6. Increasing application of the techniques of reconstructive surgery to the problems of leprosy requires effi-

cient operating theater facilities and associated nursing care (1).

7. Growing appreciation of the potentials of physiotherapy for pre- and postoperative care as well as other deformity treatment in leprosy calls for the development, use and study of appropriate facilities.

It was concluded, accordingly, that a full program for meeting the leprosy problem called for outpatient care of the majority of patients together with a specialized medical institution to provide treatment facilities in depth for the care required by a lesser number of persons. As a result there are now 14 outpatient leprosy clinics, operated by the government medical services, with a total registration of over 3,000 patients. There is also the Hay Ling Chau leprosarium with 540 bed capacity, working in liaison with these clinics.

The location of the leprosarium. The tendency to locate leprosaria on islands or other out of the way places has long been decried as an undesirable by-product of society's fear of leprosy. It was recognized that in a particular situation such as Hong Kong, where much of the land is made up of islands, such siting need not be regarded as stigmatization. Nevertheless, strenuous and extensive search was made for a site within Hong Kong boundaries that would have more convenient access than an island. Land shortage together with social reaction against neighborhood siting of the leprosarium, however, resulted in an island site being made available by the government with no alternative possibilities.

Certain advantages of the island location, about eight miles west of the central harbor facilities, have become apparent.

1. Adequate land on the island and freedom from encroachment by neighborhood activities has permitted development and expansion of activities as needed and desired.
2. The island location has significantly lessened restlessness and the temptation for patients to visit and roam the streets of the metropolis.
3. The control of patient population and visitor flow (up to 2,500 in a year) has been facilitated.

4. Also facilitated has been the control and elimination of the use of narcotics on the part of some patients.
5. The beauty of the island site has materially aided in overcoming the prejudice of some visitors and has provided a varied, healthful and delightful place for staff and patients to live.
6. Sea transport, requiring about one hour and fifteen minutes, provides a pleasant relaxation for visitors and staff and helps enhance the feeling that the leprosarium is a pleasant and happy place.

Distinct disadvantages of the island site are also apparent:

1. Cost of sea transport, running as high as 5-7 per cent of the total maintenance budget apart from capital and replacement costs of necessary motor launches.
2. The necessity of initially developing independent water and electricity facilities for the institution.
3. The necessity of maintaining "in town," separate office and storage facilities for community liaison, visitor information, and supply purchase and maintenance.
4. No apparent lessening of desire on the part of many staff members to visit the metropolis, but distinct inconvenience and time loss in requisite transport. Similar inconvenience and time loss for voluntary workers serving the institution.
5. Necessity for staff members' school age children to attend boarding school with increased attendant cost. In some instances the necessity arises for staff members to maintain residence in town for the family with resultant inconvenience to family life.
6. A tendency to isolation of the medical staff from professional community contact and from participation in giving public lectures respecting leprosy as part of the general education effort. This results from difficulties in arranging off-hour transport back to the leprosarium or alternate inconvenience in finding over-night accommodation in town.

7. The virtual impossibility of utilizing the institution's specialized facilities in physiotherapy and reconstructive surgery for other community medical problems, such as outpatient leprosy patients, that could benefit from them.

On balance, it is clear that an island, or other relatively inaccessible siting is economically more costly to the supporting community.

Basic purpose of the leprosarium.

1. To provide facilities for treatment of leprosy which will keep pace with advances in such treatment as they develop.
2. To provide basic facilities for clinical and laboratory research in leprosy.
3. To engage in training and teaching activities directed toward disseminating knowledge and treatment skills as related to leprosy.
4. To provide for the general welfare, educational growth and spiritual care of resident patients.
5. To promote the rehabilitation of patients cured of leprosy by every available means, including an insistence on the crippled patients' right to any community facilities for other persons of like debility resulting from causes other than leprosy. (For example, persons blinded as a complication of leprosy need not become a permanent resident of a leprosarium, but should be allowed the community facilities for caring for the blind.)
6. To lead the way in attacking society's misconceptions regarding leprosy and its maltreatment of persons suffering from leprosy by means of a program of dissemination of information concerning all aspects of this disease.
7. There is no good medical reason why these specialized facilities can not also be used for other diseases.

Summary of major leprosarium design facilities. Within limitations set by terrain, siting requirements and costs, the institution was planned and developed as follows.

1. The whole island complex is a community with housing facilities for am-

bulatory, severely crippled, and bed-ridden patients with appropriate ease of access to the central medical "work-shop."

2. Ancillary facilities include:

- a) Staff housing
- b) Power plant, with machinery maintenance services.
- c) Water reservoirs and distribution system.
- d) Supply storage and distribution, and a patients' cooperative shop.
- e) Handicrafts production and training areas.
- f) Carpenter work-shop.
- g) Animal husbandry.
- h) Agricultural activities.^(4, 5)
- i) Re-forestation.
- j) Physical plant maintenance together with road making and repair.
- k) Child and adult education.
- l) Patient recreation facilities (movies, stage facilities, athletic grounds and equipment, etc.).
- m) Social service facilities.
- n) Visitor entertainment and information (staff center so utilized as needed).
- o) Church.

The general plan and siting of these facilities is indicated on Figure 1. It is to be noted that areas set aside for staff residences are only regional designations. No fences or other contrived barriers are used or needed.

Much of the essential work of the institution is carried on by the patient population which provides dressers, farmers, cooks, maintenance and construction workers, carpenters, teachers, evangelists, handicraft workers, and apprentices in these and other categories.

This participation by the patients in the work of the institution is more than occupational therapy designed to pass the time. The goal is to develop a village community with all its normal activities, and to a large measure this has been achieved. A patient who comes to Hay Ling Chau, sometimes in despair and the depths of depression, finds a warm welcome from fellow sufferers and is pointed to opportunities for making

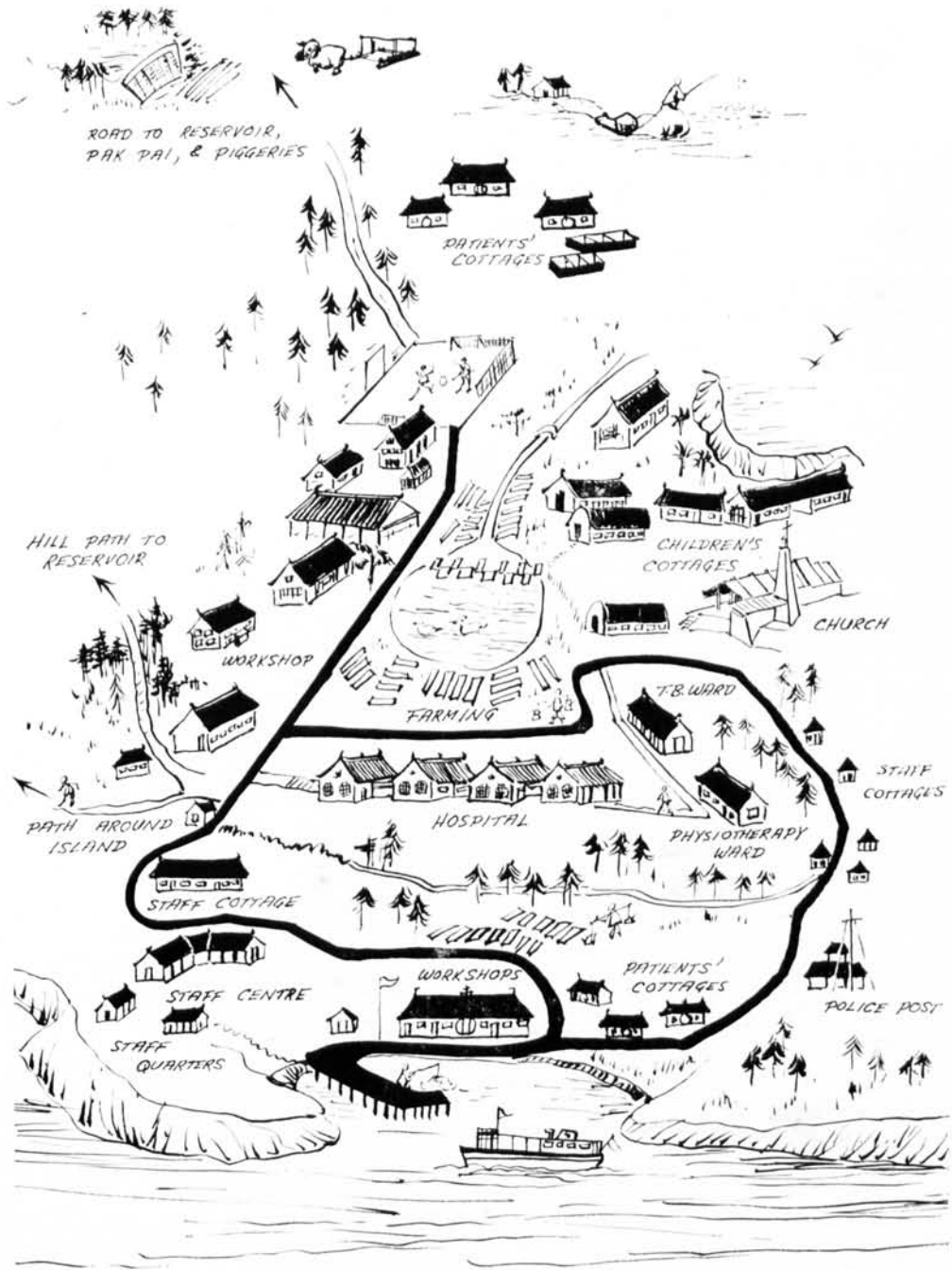


FIG. 1. Siting of facilities at Hay Ling Chau.

valued contributions to the welfare of the whole community. As they participate in the program, there is a growing feeling of restored self-respect and of confidence in their ability to again contribute to society. The general lay-out of the buildings and their relationships to each other has been developed to facilitate developments along these lines.

With the increasingly rapid patient turnover, resulting from cumulative treatment effects and from advances in therapeutic methods, the same dependence on the patients' contributions to the maintenance of the essential services of the institution cannot be maintained. In partial compensation, more cured patients are retained for a time as "ex-patient staff," a step which also often helps in their rehabilitation and later employment away from the leprosarium.

Architectural design and patient housing distribution. A Chinese architectural⁷ motif was employed throughout the leprosarium because it is indigenous to the area, is picturesque and attractive, and because it is practical.

Ambulatory patients were housed in a number of cottages scattered on suitable sites with a view toward convenient relationship to areas of various activities. Each such cottage was designed to house twenty to twenty-eight patients, usually in double-deck bunks.

Two large, dormitory style blocks, one for men and one for women, were located near the medical center. These were planned to house the more crippled patients conveniently near medical services. Either, or both, could be used to supplement the infirmary beds in case of some epidemic or other unexpected emergency. Other dormitories were provided for married couples with individual rooms for each couple. Children's cottages were conveniently located near school facilities and were specifically designed for the needs of the youngsters.

Individual kitchen facilities were provided for each dwelling. This was found

to be more convenient and satisfactory than trying to establish a single central cafeteria.

The design of the medical center ("Maxwell Memorial Medical Centre"). No figures were available regarding the proportion of infirmary beds to general beds that might be needed for a modern therapeutic center at a leprosarium. Initially the medical center was built with a 25 bed capacity (institution population about 300) but with laboratory and other facilities for the whole patient population. When the patient facilities of the leprosarium were increased to 540, additional beds were added to the medical center to provide a total capacity of 50 beds. This has proved a satisfactory proportion in view of the fact that an adjacent cottage with 12 beds was provided for the isolation of patients who also have tuberculosis.

It thus worked out that the institution required infirmary bed capacity for about 10 per cent of its total patient population. These beds were not counted in the total bed capacity of the institution because the patient retained his cottage bed when he entered the medical center for special care and returned to his cottage or dormitory place as soon as feasible. At the institution there are, therefore, 540 patient beds plus 50 infirmary beds. The 540 has the following approximate patient distribution: males 400, females 100, children 40, there being some flexibility possible in their use assignment. Subsequent pressures to increase the institution's patient capacity to 750-1,000 were strongly resisted as being an expensive diversion toward the asylum concept of patient care. The outpatient clinic program development proved to be a far better answer to the problem than the institutional expansion would have been.

Indeed, at the present (about 19 years after the institution was begun) only about three-fifths of the institution's beds are utilized. Progressively proportionate increase in early cases and the development of the outpatient facilities have rendered the need for institutional care less pressing. Hong Kong, however, is a unique locale. Should there be a relaxing at the Hong Kong-China border control, there may again occur a period in which the full bed capacity may be needed.

⁷The late G.A.V. Hall, F.R.I.B.A., rendering service without remuneration as honorary architect, and his associate H. T. Wong are to be commended for their design execution.

MAXWELL MEMORIAL MEDICAL CENTRE

HONG KONG LEPROSARIUM, HAY LING CHAU

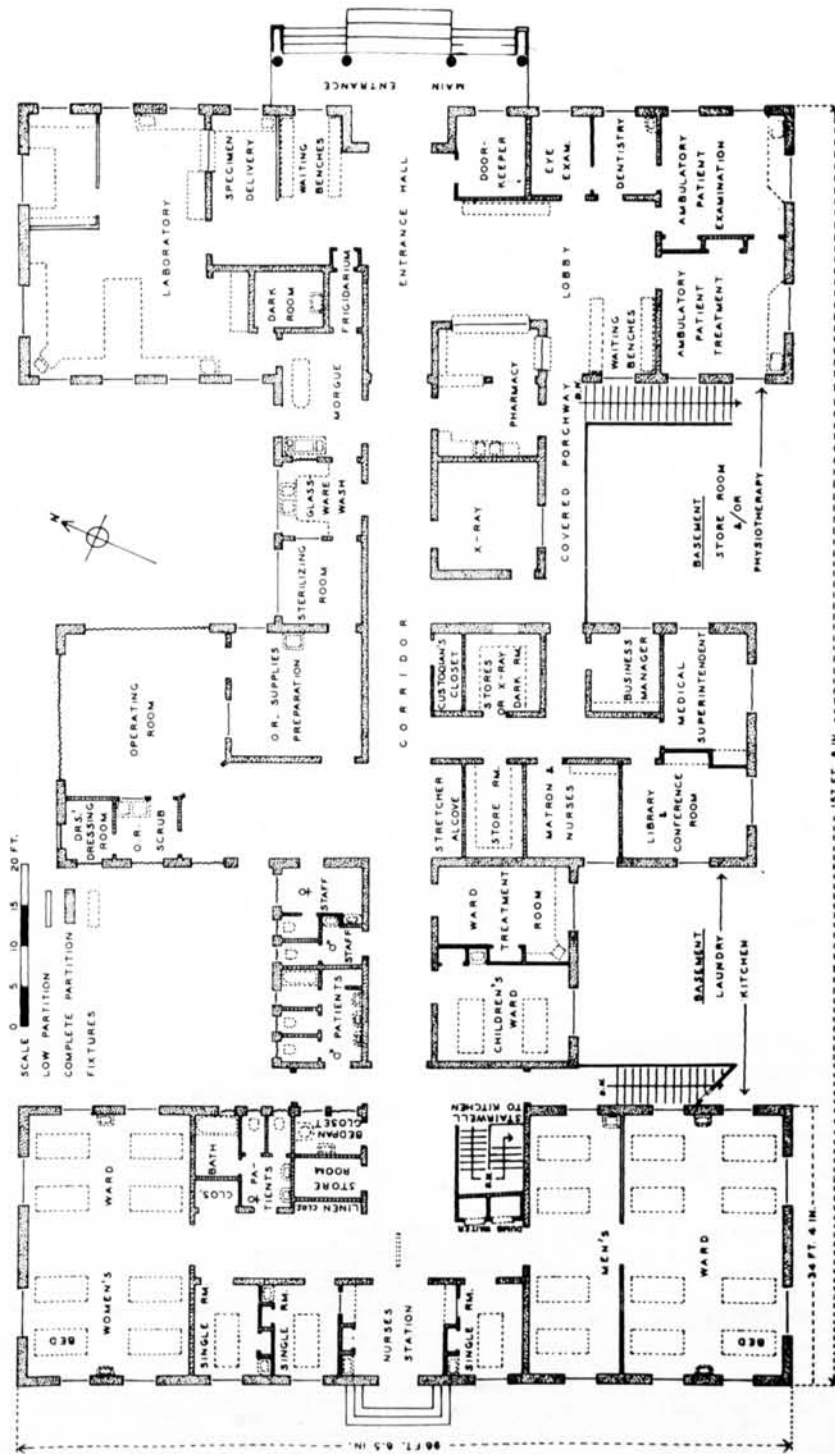


FIG. 2. Floor plan, Maxwell Memorial Medical Centre.

The medical center, as it was originally designed (Fig. 2), was built in the form of the Chinese character "Chu", meaning "principal," with its long axis lying north and south due to the lay of the most suitable site.

The eastern section of the building, Figure 2, where lies the main entrance, is largely devoted to the care of ambulatory patients. It has a large waiting hall which provides ample room also for the use of the paraffin hand bath. Two treatment rooms together with a dental room and an eye room, equipped with a slit lamp and other equipment, provide treatment facilities. It will be noted from the floor plan that the large pharmacy delivery windows are so located as to allow easy patient passage with egress to the side. Easy, covered, balcony access is also provided from this point to the x-ray room and to the administration wing without it being necessary for patients to use the main, central corridor of the hospital.

The laboratory lies on the opposite side of the waiting hall from the treatment area. It has by its entrance a "Specimen Delivery" cubicle, separated from the waiting lobby by a seven foot high partition. This ensures privacy for the patient when multiple skin smears, blood counts or other procedures are performed and it makes it unnecessary for the patient to enter or loiter in the laboratory. All specimens taken here are conveniently delivered into the laboratory proper through a large delivery hatch. This area has proved a very satisfactory station and work area for a patient technician.

The laboratory itself includes a small office, largely for histopathologic slide study, and has shelves for books, slide containers and records. The main table in this room is designed to be large enough for drawing work such as is done in the preparation of charts, graphs and other illustration. The commodious main laboratory room has conventional laboratory furnishings and is large enough to provide ample work area for several technicians or students. The central work bench is large enough to serve as a conference table or histopathology slide review area for an in-

structor and several students. The laboratory area includes a small photographic dark room. It also includes the morgue, a room designed primarily for postmortem examination, but useful also for examination of surgical specimens and for the preparation of the deceased for burial. The included refrigerated chest has heavy cork insulation and was cooled by a kerosene burning refrigerator unit which was salvaged from a large kerosene refrigerator before constant electrical supply was available. Despite the qualms of the makers, this unit worked reasonably well for over 10 years, cooling a 64 cubic foot volume to less than 10°C. In the semitropical climate of Hong Kong this refrigerated space served to keep one body at a time cool enough to prevent deterioration while awaiting arrangements for postmortem examination and burial. Between such use it served as a useful storage for a few of the more volatile chemicals.

The morgue facilities were deliberately included in the laboratory unit since detached mortuary units usually attract undue attention. The location has been eminently satisfactory and convenient.

Adjacent to the necropsy room is the glassware wash-up room. It serves as a dividing point between the laboratory facilities and the operating theater area and is conveniently located to receive bottles, glassware and other materials needing cleaning from laboratory, pharmacy and operating theater. Between this clean-up room and the operating supplies preparation room lies the sterilizing room. The preparation room is useful also for preparing and storing bandages and other supplies for the treatment rooms and supplies sterilized material to these areas.

The operating theater was equipped primarily for reconstructive surgery. The installation of the electric power plant made available air-conditioning and adequate operating light for the operating suite. A "scrub" room adjacent to the operating room provides visual observation of the operating room through a large window as does also the preparation room.

Provision of an x-ray unit, with fluoroscopic screen, capable of extremity and chest penetration has proven adequate and

MAXWELL MEMORIAL MEDICAL CENTRE

EXTENSION WING

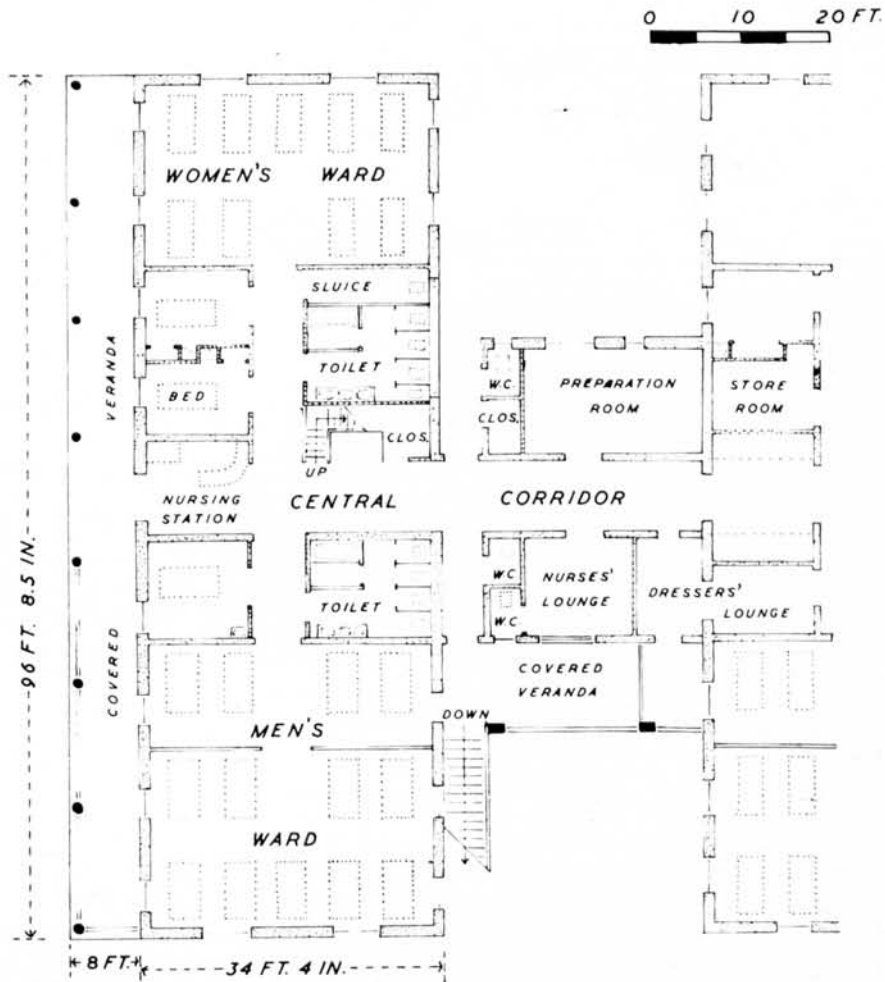


FIG. 3. Added patient wards in extension wing of Maxwell Memorial Medical Centre.

has allowed the buildup of a valuable x-ray library of the development of bone lesions in leprosy (^{2,9}) With the installation of this unit a slight remodeling, envisaged as a possibility and prepared for in the original structure, was made in the x-ray area. This consisted of moving the west wall of the x-ray room so as to enlarge the room and join it to a space used as a store room which had originally been planned as a possible x-ray dark room.

The medical center includes a center administrative wing. On the main corridor

side of this wing there is a rather unusual alcove arrangement which permits the storage of a stretcher and wheel chair convenient to the operating theater and main corridor, but tucked out of the way of the flow of traffic. This alcove is low and roofed over by an overhung area which serves as part of the adjacent store room.

The floor plan for the patient area, Figure 2, is largely self-explanatory. When the patient population of the leprosarium was increased, added infirmary beds were readily provided by the erection of an addition-



FIG. 4. Architectural appearance of Maxwell Memorial Medical Centre. Other buildings on Hay Ling Chau reflect the same general motif.

al wing as shown in Figure 3. The present appearance of the medical center is as shown in Figure 4.

Noteworthy is the fact that the inpatient and ambulatory patient sections are separated from each other by the central portion of the building. Each of these areas is also separated from the central area by swinging half-doors at either end of the main central corridor. This has been all that has been necessary to stop continuous through traffic of patients from one side to the other and preserves the central area of the building as a relatively quiet and free area in which the staff can work. There are adequate side entrances to the wards to permit entrance for visiting patients.

The inpatient wing is served from the underlying kitchen by both a staircase and a dumb-waiter. Food is then readily distributed by trolley to the beds and each bed has an over-bed table on wheels.

The west end of the present building has a covered veranda for the patients. It also opens out to a broad plaza which, on the

same level, leads to the nearby physiotherapy building and the tuberculosis ward. Both these latter facilities are thus a part of the medical center though physically detached.

In its essence, the general design and facilities provided by the medical center and its adjuncts have proved convenient for the specialized care now developing for the problems of leprosy. It has proved adjustable to developments and it provides the basic facilities needed for contributing to research into the problems of leprosy.

Research and the leprosarium. The high costs of research have been impressed on the general public and it is difficult to persuade individual supporters and supporting bodies of leprosarria that these institutions have a responsibility also in this area. Often the opinion is expressed that some "other" institution should carry such responsibilities.

It should be recognized that the basis of research that can be done in a leprosarium is related to good clinical and laboratory

care of the patient with adequate records related thereto. If this is provided, as it should be, the basis for the addition of more sophisticated laboratory and treatment facilities can be readily justified when needed, and will further enhance research facilities.

In a number of leprosaria that have been observed, one difficulty in promoting laboratory research is that the space allotted to laboratory work has often been essentially inadequate for even routine laboratory care, let alone other procedures that might be useful in research.

The basic medical center plan here presented recognizes this difficulty, and recognizes further that often it is more difficult to obtain additional laboratory space in an established institution than it is to provide more direct patient care facilities such as wards, physiotherapy or operating rooms. In the basic plan, therefore, the laboratory space was made apparently generous and was protected from future encroachment by its location and surrounding design. The space provided could provide for considerable research investigation and teaching activity if imaginatively used.

SUMMARY

The design of a leprosarium in the context of its functions as visualized under therapy potentials available in the mid-twentieth century is presented. This is based on and illustrated by the recent development of the Hay Ling Chau Leprosarium in Hong Kong.

RESUMEN

El diseño de un leprosario dentro del contexto de sus funciones visualizadas tomando en consideración el potencial terapéutico disponible a mitad del siglo veinte se presenta. Esto se basa y está ilustrado por el desarrollo reciente del Leprosarium de Hay Ling Chau en Hong Kong.

RÉSUMÉ

On présente le concept d'une léproserie, dans le contexte du rôle qu'elle doit jouer, tel qu'il apparaît à la lumière des possibilités thérapeutiques disponibles en cette moitié du vingtième siècle. Ce concept est tiré du récent développement de la léproserie Hay Ling Chau à Hong Kong, qui l'illustre bien.

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