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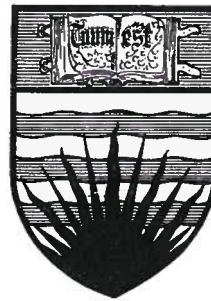


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**U. B. C.
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| EDITOR: | Malcolm C. Cumberlidge, Med. IV |
| ASSOCIATE EDITOR: | Kaye W. G. Saunders, Med. III |
| ASSOCIATE EDITOR: | Roger N. Pickering, Med. II |

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FROM THE
 DEAN'S OFFICE



DEAN J. F. McCREARY

It is of interest to note the speed with which the concept of unification of the health sciences is growing in universities on this continent. Seven years ago when this philosophy was adopted for this university only a few centres had accepted unification of the health sciences as an ultimate goal and in no centre was unification complete. Today, in no less than 48 universities in the United States and Canada, the health sciences have been unified under a separate administration and in each of these institutions attempts are being made to consolidate the training programs of the various undergraduate professional groups.

The most recent of the administrative changes to embrace this goal occurred on November 9th, 1967, in Chicago. The Chicago Medical School, which has been one of the few schools in the United States that has not been part of a university, on that date became the University of Health Sciences. In addition to the medical school, it will include a School of Health Related Sciences and a School of Graduate and Post-doctoral Studies. It is anticipated that the new university will have an enrollment of 10,000 to 12,000 within the next decade and that all professional and technical aspects of health care will be taught.

The widespread acceptance of training professional and technical staff in the field of health together is undoubtedly due to the realization of our physician shortage. Expanding

the influence of the physician by making it possible for other professional and technical individuals to work with him is one step to be taken in meeting this shortage. The instruction of a team of people to work together should assist in broadening the physician's influence.

However, the mere fact of training groups together will not achieve the desired result. All professional groups in the field of health must be prepared for changes in the roles that they have played in the past. On no group will this fall harder than on physicians whose role has changed little over many years. An open-minded evaluation of the duties that can be turned over to individuals with less training will become one of the characteristics of the effective physician in the future.



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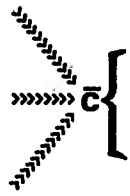
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Canada's North

JOHN CAIRNS, DAVID MARTIN, BILL SEIDELMAN — *Med. IV*
CAROL CHERTKOW, SHARON DOUGAN, DAVID WISEMAN — *Med. III*

In August, 1967, eighty medical students and about twenty doctors from across Canada participated in the second annual CAMSI summer school, held at Inuvik, N.W.T. and surrounding settlements in the N.W.T. and Yukon. Six students from U.B.C. attended, and their impressions and analyses of some of the problems are presented in the following article.

Construction Problems On The Permafrost

Inuvik is a "model" northern town of 2,400 people, located 100 miles inside the Arctic Circle, in the northern Mackenzie District. It exists on a 1,200 foot thickness of frozen ground known as permafrost. This permafrost is insulated from the summer warmth by a layer of topsoil and moss, and if this insulating layer is removed without replacement the permafrost will melt and sink. Therefore, in constructing Inuvik, the foremost problem was to preserve the permafrost and thus avoid sinkage of the town.

One of the major reasons for choosing the townsite was the presence of a large deposit of gravel which is both a good insulator and a suitable material for building roads and airport runways. The most important construction techniques used to cope with the permafrost are as follows:

(a) Large buildings are constructed on piles or stilts (thus the nickname "stilt-town"). These piles are placed in holes which have to be melted or drilled into the permafrost. They are left in the ground over a winter to

freeze and are then evenly trimmed. The building is then constructed on top. The result is an airspace between the building and the ground which acts as an insulator. One pile costs approximately \$70.00. A medium-sized home may require two dozen.

(b) Small buildings, mainly prefabricated single family dwellings, are built on a gravel pad and a wooden elevation, which provides an airspace. This method avoids the cost of piles but necessitates waiting for the gravel to settle.

(c) In this land, where the temperatures are below freezing for most of the year, it is necessary to keep the water and sewage from freezing in the pipes and at the same time avoid melting the permafrost. This problem has been solved by the creation of the *Utilidor*, an insulated structure resting on piles and containing pipes for central hot water heating, for sewage, and for potable water. The hot water for central heating keeps the potable water and sewage in a liquid state and the piles keep the *Utilidor* from sinking into the permafrost.

The *Utilidor* supplies one half of the town: the main buildings and the homes of government personnel. The

other half of the town is known as the "unserved" section. Homes here are serviced more primitively. Water may be delivered by truck or picked up from a central storage hut where it is warmed to a temperature above freezing. Oil heating is utilized on an individual basis. Sewage is collected in large plastic bags and left in a "honeybucket" for pick-up and disposal.

The majority of the people in the "unserved" section of the town are natives, as opposed to the white government employees in the serviced area. This inequality of services is interpreted by many as a form of segregation, and indeed this may be true. However, one must consider that although these homes do not yet enjoy the benefits of a *Utilidor* (which costs \$100.00 per foot), the present degree of sanitation afforded by these makeshift services is superior to anything which may have been available previously, and is a step toward solving one of the major public health problems of poor sanitation. With the development of a new form of *Utilidor* which is reputed to be far cheaper than the present one, further improvement and further integration should result.

The problems of the permafrost are many—only a few have been solved. Research into the nature of permafrost and into methods of coping with it is very active, particularly in Russia, where large populations live north of the Arctic Circle. It is from this work that answers to the problems will come, making northern life and transportation practical and economical.

WILLIAM E. SEIDELMAN, *Med. IV*

The People

Fifteen hundred miles north of Vancouver there is a flag. It flies over Tuktoyaktuk, a settlement of 400 Eskimos and 50 whites, perched on a spit of land which juts out into the Arctic Ocean. The flag is the red Maple Leaf. It jolts one into realizing that this unlikely place of cold winds and midnight sun, where reindeer antlers lie like bottle caps on the ground and half-starved huskies howl each night, is Canada.

One sits on the beach beside the bones of a dead whale, washed ashore in the spring, and sees, across the water, the DEW line station, rising from the rocks like a solitary moon-base. The settlement lies behind one, a collection of driftwood houses, canvas and packing-crate shacks, and the summer tents of those Eskimos who will leave in a month for the winter hunt.

Beyond the settlement is tundra. Flat land of barren rock and lakes, lacking even the matchstick trees of the Mackenzie Delta to break the monotony. This is the North. This is the land where even the sun cannot take the winter.

For a long time the Eskimo has known this land. He understands this land, where everything is extreme, where day becomes night in minutes, and summer becomes winter overnight. He is a fatalist who has learned to say "inuknuk" — "it can't be helped" — when problems become insurmountable.

It has been said that the Eskimo is "incapable of abstract thought". Rather one should say that living in a land where each day is just long enough to find food for the night, his culture is of necessity concrete and oriented to the needs of the present.

Abstract thought is the province of the man who has filled his basic needs.

The Eskimo is communally-oriented. He learned the hard way that cooperation and sharing is a necessary fact of life in the Arctic. Competition and individualism are foreign concepts: communalism is the basis of his life.

What of the popular stereotype of the smiling, chubby-cheeked extrovert? This idea is misleading, for the Eskimo from childhood learns to control his emotions. As a baby, the Eskimo is treated completely permissively—his actions are basically uncontrolled and there is no form of punishment. The birth of a sibling promotes the older child, now two or three years of age, to "adult" status. At that point he must begin to learn self-discipline. Seething inside over something you have said or done, an Eskimo will smile, and smile most agreeably—a real problem in transcultural dealings.

This tremendous emotional control is reflected in that part of Eskimo folklore called the Drum Dance. In the larger Dancing Igloo or Hut, and to the rhythmic monotony of the flat caribou-skin drums, they will dance for hours. The music does not rise to a crescendo and climax but maintains its monotonous beat. A dance ends abruptly — there is no gradual tailing-off. Emotional expression then is a matter of a gradual drain of energy rather than sudden release. One has a sense of tremendous power being kept under tight control.

Several hundred miles south, far below the treeline, in the region called the Sub Arctic, there is another village—Fort Rae. It is a community of Dogrib Indians of the Athabaskan

tribe, situated on the northern arm of Great Slave Lake. Its population, about 1,200 in summer, dwindles to 800 in winter when families go out on the traplines.

Dependent mainly upon fishing and hunting (primarily caribou), most village families live in small log houses with tipis and drying racks for smoking and curing their catch. Most use Rae as their "home base". Others live in the settlement only in summer, in tents with spruce-needle carpeting.

Classically, the Indian has been characterized as "dour and taciturn". However, as with the Eskimo, this is a superficial appearance soon corrected. Partly, this misconception is based on the general ignorance of the Indian languages among writers, for much of the Indian's communal life is centred about storytelling and verbal communication.

CAROL CHERTKOW, *Med. III*

* * *

Rightly or wrongly, we have thrust our value system, our religion, and of course, our vices, on the people of the north.

Whether or not these people want an eight hour day, the dollar bill has become a necessity. Living off the land is a dying art, indeed a dying possibility with the increasing lack of game. Now food and clothing are only assured by hunting down a member of that great herd of H.B.C. stores that cover the land.

Whether or not these people want to accept our God, we have ended the omnipotence and hence the value of their own religion. It has been replaced with one to which the majority of us pay no more than lip service.

Whether or not these people want to bury their troubled lives in alcohol, we will continue to make it readily available. A native-backed attempt to close the liquor outlet in Inuvik was quashed by the more realistic whites, who no doubt reasoned that the pub is a convenient place to cash the welfare checks.

These people were bound to come in contact with our way of living. It is senseless to suggest we should leave them as they were found—a primitive nomadic people. However, we did not have the grace to expose our wares and let the native adopt those which would be useful to him. Our basic premise seems to be that he is too stupid (perhaps "primitive" would less offend the senses) to help himself. Hence we have swept him into the arms of the Department of Northern Affairs to be nurtured, educated, doctored, and doled.

The result is the new generation of Eskimo and Indian. Through his school years he lives in a modern building complete with electricity, heat and plumbing. He becomes an English-speaking Christian, dressed like any other North American grade school graduate. An admirable achievement for a bureaucratic offspring! Admirable, indeed, if this momentum could be maintained. Herein lies the problem the North faces—what of his future? There are few men in his position who would be content to turn back—away from all the wonderful comforts of our civilization—back to the trap lines, tents, fish nets and open fire cooking. To attain the same things that his white contemporaries have, the man needs a job.

There is a great tendency among us to regard the Indian or Eskimo as a shiftless, lazy, unreliable workman incapable of holding a responsible job. This has arisen from the

old generation native's irreverence for the clock or for the future and from his periodic retreat to the old nomadic life of hunting. Obviously, these attitudes of the parents will permeate the new generation who have been so zealously "whitened" by us. However, the mere fact that it is an attitude means that it is changeable. Given the motivation and the opportunity, an Eskimo or Indian could surely work as well as any of us.

This brings back the major problem—even if these young people have the motivation, they certainly do not have the opportunity. Jobs in the north are not plentiful but when they do arise, they are usually filled by imported labor from the south. The native does not often wish to leave his homeland to work in the south—a foreign country to him.

The Government has tried various subsidized programs but few have survived and fewer still have become economically independent. The natives themselves have organized several cooperatives, usually producing handicrafts. These provide work and income for some communities but their maintenance depends on a fickle market much like that which the original fur trade relied on.

DAVID MARTIN, *Med. IV*

* * *

"Why should my child go to school?" Kidlak asks. "So he will be able to work beside the white man," you answer. "How soon will he get a job?" "Not soon", you reply, "perhaps when he is sixteen or so." And Kidlak smiles, more broadly, because you have said "perhaps".

His six year old son is then flown across the barrens to Inuvik to be taught the difference between Catho-

lic and Anglican, the taste of cafeteria food, southern discipline and the details of English-French strife in early Canada, while six thousand years of Eskimo history, art, language, folklore, are neglected or treated summarily as in the first eighteen pages of "The Great Adventure"—an elementary history text which summarizes the contribution of the native people of Canada to the white man as "... giving up this vast country without a fight."

Every text is in English, written for southern children with examples which northern children cannot understand. All teachers are from "the outside". In Greenland the Danes established schools with teaching by the best person available whether or not he had formal teacher's training. Spoken lessons and books were in Eskimo. Subject matter was related to making a better way of life in the local environment. Later a gradual transition occurred, with the introduction of combined language instruction and government support of capable graduate students to graduate from Danish universities.

The argument has been made that we would discriminate against the northern people if we did not give their children the same education as every other Canadian child.

This is a comfortable argument which allows one to avoid the effort required to make imaginative changes. The fact is that we must recognize the nature of the jobs available in the north and then train the young people to work as mechanics, carpenters, technicians, and secretaries, so that the natives may assume these responsibilities rather than southern immigrants. They must also learn the history of their people and come to respect it—and eventually themselves. What is required is

realism and understanding if our northern peoples are to be educated to take effective roles as Canadian citizens in the growing North.

DAVID WISEMAN, *Med. III*

* * *

Northern Health Services

Canada's north is a frontier country, underdeveloped in every sense of the word. Her native peoples in many cases live in primitive circumstances which we in southern Canada would judge intolerable in a backward country anywhere in the world. And yet the situation persists as our nation enters its second century.

The barriers to progress are many — harsh climate, small population units spread widely, inadequate communications and transportation, slow economic development, and primitive peoples in the midst of a social and cultural upheaval. The health problems of the north are similarly great, and their character is intimately related to the primitive state of social and economic development in a cruel environment.

Any consideration of the health problems of the north demands an appreciation of the environmental conditions before a realistic understanding of the genesis and possible solution of these problems can occur. Pneumonia is the most common cause of death in the north—injuries and violence are second. In 1961, deaths from infectious diseases and from respiratory tuberculosis were each ten times the national average. In 1966, the infant mortality was over three times the national average. This spectrum of disease and death is directly related to low standards of living — in particular, inadequate

housing and sanitation facilities. One need only walk through the streets of a northern Indian or Eskimo village, or through the native section of a model town such as Inuvik, to recognize at least some of the problems arising from poor housing and sanitation. One is not surprised that a neonate might not survive long in a pathetic tent house, barely heated by one small stove in the midst of an arctic winter, and perhaps too often neglected by alcoholic parents who have little of themselves left to give their children. One expects rapid spread of infectious disease in communities living with ten people in one room houses and with totally unacceptable sewage disposal. Accidents and violence are likely to be common amongst a people in the throes of a massive internal upheaval and loss of identity, using alcohol without responsibility, confronted by frustration and hopelessness at any thought of the future.

The health problems of the North arise out of the underlying pathology present in our northern civilization today — social, cultural, and economic. The North cannot approach national averages in health statistics, until the basic problems are managed.

The Northern Health Service of the Department of National Health and Welfare is responsible for the health needs of the Yukon and N.W.T. Within the confines of their limited budgets, the Northern Health Service has developed an extensive program of health care facilities in the north. The backbone of these facilities are the nursing stations in the Eskimo and Indian villages across the North. Each station is a compact acute care and public health centre, with usually two to six beds plus cribs, and adequate medical supplies to manage the day to day medical problems and emergencies in a vil-

lage. The stations are staffed by one or two full-time nurses who are experienced and competent to manage the medical care of a community including diagnosis and treatment of disease, normal obstetrics, minor trauma, and most important, health education. Referral hospitals are located at such places as Inuvik and Frobisher Bay to manage difficult surgical and long term cases. Fairly adequate communication is maintained between these centres and the nursing stations via two-way radio and when required, air transport.

The physicians of Yellowknife and Whitehorse are in private practice, but in general the doctors of the North are employees of the Northern Health Service. They are centred in cities like Inuvik, where a modern 100 bed hospital serves the needs of a large area of the northern Mackenzie District. Their influence is extended into the scattered small villages by the mechanism of "flying health service circuits" whereby regular trips are made by medical personnel to evaluate and manage the local medical problems.

The problem of a heavy staff turnover is severe. Fifty percent of the nurses and 80% of the doctors stay only one year. Many of the nursing positions cannot be filled even for one year, necessitating curtailment of vital public health programs. The Northern Health Service recognizes the urgent need to provide special inducements to recruit and retain medical and nursing staff for 3-5 years, but has been unable to get adequate support from the Federal Government. It takes at least a year for a newcomer to learn the basic ways of the North — the continuity and assurance of the northern health programs will never be maximal while the staffing problems persist.

There are some interesting programs being carried on in the North which demonstrate the interest and dynamic approach of the Northern Health Service. Community Health Workers chosen from the natives have been trained by the Health Service as health care liaison officers in a number of northern villages. Lay dispensers have been trained to handle basic medications in isolated communities. "Eskimo Family Medical Packs", containing basic medical supplies, have been widely distributed to very isolated individuals and groups. Specialists from southern medical centres are visiting the larger northern cities to provide education and guidance to the resident medical personnel. With some exceptions, such as the tuberculosis program, the record of the Northern Health Service has been admirable. This program of isolating active cases from their families for 2 or 3 years in southern hospitals has been inhuman and is unacceptable to the people. Efforts are being directed at modifying the program—drastically, we hope.

In only a few short years of intensive activity by the Northern Health Service, spectacular improvements have been made in infant mortality rates, T.B. death rates and life expectancy. Within the confines of limited budgets and inevitable bureaucratic errors, the Northern Health Service is tackling the terrible health problems of the North in an aggressive and imaginative way. Perhaps now they have come as far as they can. The health of a people can never be separated from their environmental conditions, yet Canada fails to recognize this in relation to her North. We cannot continue to battle aimlessly the health problems of the North while ignoring the glaring social and economic ills lying at the root of all other problems. An aggressive program of education, housing and sanitation, economic development, and social guidance must be undertaken to improve the life and health of our northern peoples. Canadians must become aware of the situation, then they must act.

JOHN A. CAIRNS, *Med. IV*



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OBJECTIVES OF MEDICAL EDUCATION

JAMES G. FOULKS, B.A., Ph.D., M.D.

From the students' point of view, it is perhaps natural to wonder if their teachers know "what they think they are trying to do". Various committees of the Faculty of Medicine repeatedly take their educational goals under review.

Usually their reassessment is in agreement with statements such as those of the Goodenough Professional Committee in the U.K. in 1944: that medical education "must help a student to acquire a scientific formulation for his professional work, an adequate knowledge of disease, a sound judgment, the ability to observe accurately, reason logically, and assess claims of new knowledge, to provide him with a proper outlook on the promotion of mental and bodily health, and with a sympathetic understanding of people and their environment."

In short, the objective of medical education is to produce a good physician, one with the desire and qualifications to offer excellent health care to his patients. All too often, repeated statements of good intention such as these easily fall into a pattern of clichés and platitudes and it is necessary to go behind the abstractions and generalities and deal with specific detailed problems for a meaningful discussion to result. In doing so, I will try to indicate directions in which I think we may see some future movement.

I. SUBJECT MATTER AND CONTENT AND METHODS OF ACQUIRING IT

It has been said that, in Flexner's day, the problem was to close the gap between science and education. This is now taken for granted and the major dilemma of modern medical education has arisen from the so-called knowledge explosion, the accelerating proliferation of factual information and the dilemma of the student who wants to be taught all he will need to know when confronted by a patient with disease, an attitude in which he may be abetted by willing instructors who are eager to convey all of their own knowledge to their students. The result is an overburdening of the student with factual information to be memorized and regurgitated on demand.

Unfortunately, much of the information and many of the concepts which basic science conveys to the student can only become meaningful to him when he actually encounters them as problems in patients with disease. The task of better integrating clinical material and basic sciences is still a troublesome one.

Of course, completeness in the coverage of present scientific knowledge is out of the question, moreover, facts are temporary; knowledge is dynamic, evolving and always incomplete. The most important aspect of teaching the scientific aspect of medicine is in the training to think, to use facts in the analysis of unexpected patterns, to be able to use principles and to apply methods of scientific practice. For these attributes it is necessary to have first-hand experience with the changing nature of facts, both in the laboratory and clinic, to see exemplified and to participate in the processes of observing, questioning, doubting, sorting facts from hypothesis in the spirit of true enquiry, weighing evidence and yet when the evidence is still not conclusive, learning to make the hard decision and to act (or not to act) upon them. Exposure to the attitudes and methods of science can give the physician insight into the uncertainty which constantly plagues his efforts. The rigorously scientific approach to medicine is not uniformly appreciated.

In an editorial in the July, 1967, journal, *Modern Medicine*, Dr. John W. Digby called attention to the fact that patients often feel they have been put through the mill by their doctors and says "much of the fault for this attitude lies with the medical schools. Their job is to produce qualified medical graduates and to promote research. The staff positions are chosen for their research and teaching skills. The trend now is to cloister these men into full time academic positions where they have little contact with patients other than as available models of disease. The patient is frequently manipulated according to the whims of the investigator rather than his personal needs. Investigation requires this type

of approach and without this there is no medical progress. The sinister by-product of this is that medical students have their training in this environment. At graduation the student is a highly programmed robot capable of emitting acceptable formulae for the investigation and treatment of most diseases. Unfortunately they look on the patient as some kind of obstacle in the search for true pathology."

Another physician has commented wryly, "It doesn't do much good to know all about DNA when you are looking through a proctoscope". This remark is cute but misleading. It may well be in years to come, as our knowledge of molecular biology extends, that an appreciation of the metabolism of DNA may be of vital importance to the physician who is visually inspecting a rectal carcinoma.

In the July, 1967, issue of the journal, *Pharos*, Dr. Harvey R. Butcher, Professor of Surgery at the Washington University School of Medicine in St. Louis, said: "Pre-clinical departments are also not performing with the proper sense of responsibility towards the needs, interests and primary aims of a great majority of medical students. Although I think that the role of preclinical departments in medical education should be primarily the installation of the concepts and principles of the scientific method, in at least the majority of students this aim is not accomplished. Students entering their clinical years can often regurgitate certain knowledge but rarely seem to have been exposed to the intellectual discipline one expects of those individuals who are to be extenders of knowledge. In this regard, I wish to read a statement made to me recently by an intelligent young man of 19 years:

When the young man of today decides to begin a career in medicine he is immediately confronted with a vast body of knowledge to be learned or memorized; the process of assimilating this mass of material may either be made an exciting one, or a crushingly tedious one. It seems to many of us that medical schools have the remarkable capacity to make it crushingly tedious. Among college and even pre-college people today the medical man is not regarded as a scientist. Instead he is seen as a technician — a technician doing a valuable service, but nevertheless merely a technician. He treats diseases; he cures people, but he doesn't think.

"This image is not only unfortunate, it is also absurd. No non-thinking physician can be expected to make reliable contributions to the care of his patients."

It is now generally stressed that the rapid pace of scientific advance requires self-educating physicians, even with the continuing medical education courses which are now available in many communities. It is clear that the production of scientifically minded, self-educating doctors requires that in medical schools, students have time free from didactic pressures to read and to think, and that such activities be promoted by more informal conferences and electives, including adequate time for laboratory and library research.

Considerable thought is being given today to reducing the required (lockstep) part of the medical curriculum to a smaller "core", and allowing studies in depth to be exemplified in more diversified exercises of a less formal variety, where students are encouraged to think things out for themselves and are motivated for

the process of learning, instead of being driven to stultifying rote memory fortified with the occasional mnemonic device.

Another important aspect of the attempt to achieve these objectives merits emphasis. Just as participation in research is considered essential for teachers in basic medical sciences, in order to maintain the attitudes and methods of thought with which they wish to infect students and to maintain their own fresh, enthusiastic and critical treatment of problems, so also this must have its counterpart in the clinical areas.

One of the greatest needs in medical schools today, and one for which ways are being found increasingly for implementation, is the provision of truly full time staff members in the clinical departments, that is, individuals who are free to divide their time between service, teaching and investigative activities on the basis of their own scholarly needs and professional interests without regard to the sources of their income. The realization of this objective, of course, is dependent upon adequate (i.e., large) budgets for the clinical departments of our medical schools.

II. TEACHING THE ORGANIZATION OF MEDICAL CARE

The consequences of the rapid pace in scientific medical advance in recent years are felt in matters of practice and in what has been referred to as a crisis of rising public expectation which challenges the capacity of the medical profession (and indirectly the medical schools) to provide the quality and quantity of care needed and demanded by our growing and aging population, i.e., where more old people need more care, or more elaborate and expensive varieties of care, and for whom

the economic barriers to complete and comprehensive care are being removed.

One consequence of this has been the rapid emergence of the predominance of specialization. Even those doctors who spend their entire professional life within a large medical centre cannot keep track of all pertinent recent developments except by limiting their scope to a sub-specialty. Twenty-five years ago only 15% of U.S. physicians practised as specialists. Today the figure is about one-third and furthermore, only 15% of present U.S. medical school graduates plan to enter general practice (the distribution between various fields being settled in a rather haphazard fashion). Perhaps this more than anything else is responsible for the relative shortage of "contact" physicians even in our cities where doctors are more concentrated. This probably accounts for the widespread general feeling of unavailability of physicians.

There are common complaints of the refusal of doctors to take on new patients; of doctors being unavailable on their days off and weekends, shielded by an answering service; of doctors unwilling to make home calls, especially at night; of short periods of contact and assembly line office procedures; of delay in securing appointments often for weeks; and of long waits in the reception room, leading it is reported to one "impatient patient" announcing as he departed without seeing his doctor that, he guessed he'd go home and die a natural death.

Today's general practitioner not only lacks the time but consequently often also lacks the ability to deliver a high quality of medical service. Too many physicians have not made the attempt, or find themselves un-

able, to keep up with the rapid developments in medical science, and brief refresher courses, critically important though they are in the present circumstances, are not really an adequate answer to the continuing re-education of physicians.

It is common knowledge that in the present circumstances the quality of practice is often less than ideal. One outstanding example is the prevalent misuse of anti-biotics (for which there are many reasons). Nevertheless, such practices tend to be perpetuated in training when too much reliance must be placed on unsupervised part-time personnel for clinical teaching.

This stresses another important impetus for the trend to more really full-time clinical teachers who not only have the time to keep up with scientific medicine but who retain the critique which is sharpened by contact, direct or indirect, with contemporary investigation and who can set examples and provide criticism to those part-time members of the teaching staff who must continue to contribute a vital role to clinical instruction.

In a study published over ten years ago in the *Journal of Medical Education*, which was jointly conducted by the Rockefeller Foundation and the University of North Carolina, it was estimated that the quality of practice by general practitioners was less than satisfactory in 40%, and uniformly poor in 15%. The Jack-of-all-trades cannot possibly be adept at every skill, knowledgeable in every field, and ready for every emergency.

I wanted my own children delivered by an obstetrician, cared for by a pediatrician as primary contact physician, operated upon by a pediatric surgeon for simple herniotomy,

and for the primary contact family physician we turn to an internist. Perhaps I am a snob. While I know that there are general practitioners who provide outstanding services and do not attempt to perform all kinds of complicated procedures themselves, nevertheless I believe that the cards are stacked against them.

I'll stick my neck out with the blunt assertion that solo general practice is, and should be, on the way out. Of course, there are contrary opinions. Dr. Digby, in the previously mentioned editorial, said "Today the overworked G.P.'s barely have time to assess the chief complaint before passing on to the next patient. The specialist limits the interview to his own area of interest and rigidly excludes any attempts on the part of the patient to expand the discussion beyond these limits. In both cases, the patient is getting the best of modern care for his disease." And according to the reporter for *The Vancouver Sun* who covered the recent convention of the College of General Practice in Vancouver, its executive director said, "Specialists are trained in a very narrow area but general practitioners are able to make a more accurate diagnosis on an overall basis" and further, "The aim of the College is to assist him to be able to perform more medical services himself such as emergency operations".

Modern authorities on medical education, e.g. The Coggeshall Report to the American Association of Medical Colleges, and the Millis Report to the American Medical Association, are in unanimous agreement that the future belongs to group practice rather than to solo practice, in clinics in which major specialties are represented in proportion to their need (and the more uncommon specialties are made accessible). Such

arrangements, in addition to assisting the physician to provide a better quality of medical care in ready consultation with his colleagues, including specialists, also offer great convenience to the physician in organizing his time (sharing off-duty responsibilities, with coverage by his associates for vacations or much longer leaves of absence, for extension of, or for refreshing his education without concern for loss of his practice.

The Millis report puts it this way: "The completely independent practice of medicine is no longer possible and even the maintenance of an individual office is steadily declining as more and more physicians seize the advantages of hospital, clinic and group practice. Specialists can cooperate most effectively if in spirit and in space they are working closely together.

"In a recent study by the U.S. Surgeon General's Consultant Group on medical education, two out of three medical students queried indicated their intention to practise in a group or partnership. When a mode of practice is advantageous both to the patient and the physician it is bound to grow in popularity. Future physicians should be educated on the assumption that they will practice in close association with other physicians, not in isolation."

The fact that group practice does not offer a panacea to all the problems which beset medicine today is indicated in the thoughtful letter by a medical student in the *New England Journal of Medicine* on June 15th, 1967: "The attack on the concept of the family physician is indicative of the unfortunate frame of mind so frequently seen within the medical profession today. As a second year medical student, I cannot claim long experience with the profession, but

I offer the following view of American medicine nevertheless.

"As I see it, there are too few physicians who possess an overview of the profession as a whole. Instead, we see the medical school dean extremely involved in building programmes, the basic science research man who can see no farther than the door of his laboratory, the physician whose interest in rare diseases make him unresponsive to the practical needs of his students and the teacher who is recruited from his laboratory because somebody has to teach.

"Medical students being at the bottom of this structure, are constantly confronted with 'teachers' who have an unbalanced view of priorities. That every man should consider his work important is indeed a necessary feature of life. Yet when men lose sight of the value of other men's work, we then have chaos rather than education.

"That group practice is an unusually creative approach to medical practice I cannot deny. But a walk through the slums of North Philadelphia tells me that the medical profession in this city of five medical schools and a college of osteopathy should hang its head in shame. I submit that one G.P. in the inner city is doing his share of medicine. I ask, how many group practices locate in the areas of greatest need? What is the profession doing to eliminate long lines at the clinics and the city hospitals? These areas of medicine are important, and I salute anyone who is trying to solve the problems located there.

"To think that group practice is the solution to all the troubles of a medical practice is tremendously narrow. It seems to me that we are not

asking the right questions in many areas of medicine. Until we do, let us not think that we have all the answers."

Mature remarks such as these from a second year medicine student should do much to promote a sense of humility.

While the proposition that modern medical care of high quality can only be made generally available in groups is finding increasing acceptance, there is considerable controversy as to the qualifications and role of the person who will replace the general practitioner in this set up. The Coggeshall and Millis reports call for what has been referred to as a "primary physician" whose specialty training is to include psychiatry and behavioural sciences, and preventative medicine as well as internal medicine and pediatrics. While not explicitly defined, the idea appears to be a person whose training in time is equivalent to that of other specialties but more diversified, i.e. a new specialty, based on something resembling a rotating residency.

Of course, the complement of physicians in groups should be supplemented by the services of all types of paramedical professional personnel in proportions appropriate to the needs of the population served and presumably under the supervision and guidance of physicians. These individuals may be able to carry out some of the less demanding, more detailed mechanical functions which now consume much of the doctor's time. There are even some who feel that screening and referral can be done by less completely trained paramedical personnel, although the preponderant view today is that this responsibility must be borne by physicians with upgraded rather than downgraded qualifications. There are

important doubts as to the desirability or feasibility of confining the role of the primary physician to screening and referral. Doctor Beidleman, in an article in the May 4th, '67 issue of the *New England Journal of Medicine* (which was referred to by the medical student above) had this to say: "General practice, as commonly defined, is becoming obsolete, although various commissions and committees are attempting to redefine, retrain, reinflate and refurbish the general practitioner into a 'personal family physician for primary medical care', a 'general medical specialist', or some similar euphemistically disguised reincarnation"; and says further: "There is no need for this effort." Dr. Beidleman feels that in multi-specialty groups, the various specialists themselves will each play the role of a primary physician as well as that of consultant in his own field of special competence. An editorial in the *New England Journal of Medicine* points out that: "A role which merely involves care between illnesses and during convalescence only and which does not involve the primary physician in diagnosis, therapy and care will not attract medical students and physicians", and agrees that narrowness of specialty often is over-stated. It shares the widespread belief that the primary physician must not be inferior in training, rewards, or status in comparison with other specialties.

Personally, I am inclined to the view that the role of the primary physician should be played by an internist for adults and by a pediatrician for children, both of whom should have good training in psychological and behavioural aspects of illness, and while these may in turn have particular areas of special competence (e.g. cardiac, liver, gastrointestinal, etc.) each will play out

his primary role treating a patient as a whole person for both physical and emotional illness with continuity of care; that is each should function as a truly personal physician in consultation with and receiving assistance from the various specialties and with access to hospital facilities when needed. The training needs for such personnel are still under discussion and are still emergent but they will clearly need to extend to undergraduate and well as graduate levels of medical education; and where patterns of practice are in transition, medical schools are expected to lead the way, to train physicians for the practice of the future, not the past.

In helping to upgrade the quality of medical care, schools must provide people trained to play emerging roles and must set an example which puts pressure on the profession to make the necessary changes (with due tact and persuasion) rather than the other way around. As Coggeshall put it: "Medical schools should provide a model which demonstrates how health care can best be delivered and in this connection, special consideration needs to be given to the organization and methods of group clinic practice". In my own medical student days one of the most useful experiences which I received was in the fourth year in which was called the Group Clinic.

In a two month assignment to this service, the medical student received patients referred from the outpatient department to the group clinic for more detailed work-up. Each morning the student received his patient in a small room containing a desk and an examination table and in complete privacy took a full history, carried out a thorough physical examination, and prepared recommendations for laboratory procedures. He also drew blood for routine

complete haematological examination, including an ESR. After lunch, the patient was seen again in the company of an attending physician who had been assigned to this service as a "general practitioner or personal physician". Together, decisions were taken as to which specialty consultations were needed and these were obtained on the spot from specialists available from the various services of this large city hospital.

Over the ensuing weeks, opportunity for follow-up of patients seen originally was provided. Perhaps something of this sort will emerge from our new family practice training plans which may place emphasis on interaction between various types of physicians, as well as between physicians and the other members of the health care team.

III. MEDICAL ECONOMICS

If we are indeed to try to prepare students for the practice of the future, we cannot ignore the trends in the financing and organization of medical care which determine much of our setting and the spirit within which medicine will be practised. While individual physicians have primary responsibility to provide good care to their individual patients, the profession as a whole has the responsibility for providing medical services to meet the needs of society. As Donald Anderson, a prominent American medical educator recently put it, medical education shares in the responsibility to "develop effective methods for making modern medicine available to all people in both developed and developing countries at a reasonable cost in money and manpower". Sergeant Shriver, a U.S. Government official (brother-in-law of the late President Kennedy), recently produced what columnist Marquis Childs described as: "appal-

ling figures to show that in affluent America with the highest medical standards in the world, roughly one-third of the Nation has little or no share in the benefits of medicine or dentistry".

Curiously enough, the United States, in spite of its affluence, ranks twenty-first in life expectancy at birth whereas Canada ranks eighth (behind Scandinavian countries, Holland and Switzerland). While this may partly be due to non-medical reasons, irremediable by medical means, e.g. automobile accidents, lung cancer from smoking, etc., the medical aspect (including nutritional) is reflected in the fact that the average life expectancy for coloured persons in the United States is six years less than for white people and the perinatal mortality also is correspondingly higher, a fact which among others underlies much of the racial unrest in the United States today.

The problems have been described in striking fashion by Dr. Phillip Lee, Assistant Secretary for Health for the U.S. Department of Health, Education and Welfare, in a recent article in *Pharos*: "Nowhere are the problems so formidable, so baffling and yet so challenging as those which concern poverty and the appalling health needs of the poor. There are too many areas with a glaring discrepancy between the rich — the people who have some of the best medical care in the world, together with the relatively good health that accompanies it — and the poor — the migrant farm workers, the young mothers in the slums, and the thousands of others who have little or no health care, and the ill health which is the inevitable penalty. Those who are physicians and students of medicine should be well aware of the geography of poverty. They should know that the areas marked by

poverty are likewise marked by disease, substandard housing, inadequate education, broken homes, and unemployment.

"They should be well aware of the pathogenesis of poverty. They should know that poverty and disease are irrevocably linked — that poverty contributes to disease, and disease contributes to poverty.

"They should be well aware of the signs and symptoms of this syndrome. They should know that the poor — not merely in the towns of the deep south, or in the stricken areas of Appalachia, but in scores or hundreds of squalid districts in even our most wealthy States — have more than their share of chronic disease, mental illness, mental retardation, orthopedic and visual impairments, and a host of other preventable and correctable conditions.

"These poverty areas have more births per hundred thousand inhabitants, more illegitimate births, more pregnancies with little or no prenatal care, and an infant mortality rate two or three times as high as in more affluent sections.

"They have higher death rates for tuberculosis, cancer of the cervix, cardiovascular-renal disease, influenza, pneumonia and home accidents.

"There are ample statistical data to document this record, but however meaningful the statistics may be, they cannot reveal the suffering, despair and apathy that we know exists in unmeasured quantity among the poor.

"One observer has written: 'It is bad enough that man should be ignorant, for this cuts him off from the commerce of other men's minds. It is perhaps worse that a man should be poor for this condemns him to a life of stint and scheming, in which there is no time for dreams and no

respite from weariness. But what surely is worse is that a man should be unwell, for this prevents his doing anything about either his poverty or his ignorance.'

"It is a tragedy — for which all must share in the responsibility — that the lives of millions of the poor could be quickly and dramatically improved without a single major addition to our knowledge of the science of medicine. The barriers here have been barriers in the delivery of services, in organization, in financing, in communications, and in utilization."

Similar considerations are applicable to the even more appalling and desperate plight of the poor in other parts of the world. According to a recent editorial in the *Johns Hopkins Alumni* magazine:

"Two thirds of the human race live in the underdeveloped areas of the world.

Most of these people suffer from hunger or malnutrition.

Most of them drink unsafe water, prepare food dangerously, dispose of wastes recklessly, and live in unfit dwellings.

In some parts of the developing world, half of the children born never reach their fifth birthday.

In some parts of the developing world, every living individual is afflicted with intestinal parasites.

Within the developing world at least 400 million people suffer from trachoma, a curable disease that causes progressive loss of sight.

Within the developing world, despite a massive campaign by the World Health Organization to eradicate malaria, 400 million people live in malarious areas where no eradication program is under way. In some of

these areas, most people have the disease.

Schistosomiasis, a debilitating parasitic disease, afflicts 200 million people — more than the population of the United States. In some areas, the chances of escaping the disease are only one in five.

Leprosy afflicts more than 10 million people; fewer than one in five are receiving any kind of treatment. In the countries where leprosy is prevalent, 740 million people are exposed to the risk of infection.

Cholera, a disease on the decline in the 1950's, is spreading. The number of reported cases tripled between 1960 and 1964.

Venereal diseases are spreading into the underdeveloped areas of the world, to an extent not yet measured.

This, in part, is the health situation amid two-thirds of the world's people. By the year 2000, if present demographic trends continue, it could be the story of four-fifths of the world's people."

In Canada today, it is generally accepted that medical care must be distributed and made available on the basis of personal ability to pay.

I am not sure how the responsibility of medical education in this area can best be discharged, although I feel that there is a responsibility to prepare the student to understand the issues which confront the profession in respect to the organization and financing of medical care and the background which has produced the present trend, as outlined for instance in the Hall Commission report.

The issues include: (1) How to provide care of comparable quality in rural, especially remote areas, and

cities, in view of the disproportionate distribution of positions and the necessity for centralized facilities for many modern services (2) How the profession can carry the burdens of the demands for service when these are not obstructed by financial barriers, in view of the relative shortage of personnel? In addition to the expansion of training facilities, more efficient and rational use of auxiliary personnel who require less extensive training clearly is an essential part of the immediate as well as the long term solution to this problem and increasing numbers of such personnel must be provided. They now comprise 80% or more of all those engaged in providing health care. A related issue which is being explored in several schools is the possibility of shortening, telescoping, or rearranging the various segments of premedical, medical and graduate education so as to reduce the total time in training, although great care must be taken that omissions do not delete aspects of training which are needed for the "product" to be fully equipped to provide a high quality of professional care. (3) The key question in this area is the respective role of government, private agencies, and "consumers" in the financial aspects of providing care. Dr. Digby is worried about this.

In the editorial previously referred to he said: "The news media have hardened their line on medical reporting, giving headlines to our professional liability and only limited reporting of medical progress. Government participation in medical insurance has been engineered by our politicians in response to public demand. We all have reasonable cause for concern because it will not be long before the politicians, in the name of the public, decide that doctors' incomes are too high and should be

equalized with the plumbers or barbers. We no longer even have to make that final test of our patients' confidence and respect as we can (and many do) submit our accounts directly to the insuring agency."

And an editorial in the *Orillia Packet and Times* recently republished in *The Vancouver Sun* said: "By removing the doctor/patient relationship from its purely personal and private contact and making it instead the subject of public legislation, complete to rate structure and courses of treatment, the people of this nation are destroying the whole concept of medical attention as a purely personal matter."

"Along with this they are undermining the whole professional status of medical doctors, and incorporating them into the structure of society as a sort of rarified department of the Civil Service, blood-letting and chest tapping division."

I think that we would be wise if here in Canada, as well as in the U.K., we left the form and scales of professional remuneration in the hands of the medical profession. I consider the panel system, as used in the U.K., to be cumbersome and not contributory to emphasis on the quality of service. I personally feel that the whole concept of fee for service is inappropriate to a proper physician-patient relationship, even if the fees are not being directly paid by the patient. As a salaried professional (as incidentally are nearly one-third of North American physicians), I do not feel very much like a Civil Servant, even though I am paid from public funds. This is because public education has retained its professional independence and, thus far at least, its freedom to conduct the educational process as it sees fit *within the limits of the total funds made available!*

I can see no reason why similar consideration should not apply in medical practice, although the problems which arise when the total funds are insufficient can be imposing, as witness the problems in higher education, including medical education, in British Columbia which are seriously cramped for lack of funds to do a proper job; to say nothing of the situation with respect to hospitals. This to me is the most serious problem of impending Medicare, and one which must be kept free of short-term political expediencies; perhaps by means (as advocated for universities) of an independent professionally-advised grants commission. To my way of thinking, this is far more important to the preservation and improvement of the quality of medical care than the administrative details of dividing the financial pie among those providing care in its various forms. The pie must be big enough, and we can as a society afford to see that it is. Although medical care is growing into the third largest industry in the United States in terms of dollar cost (not counting defence, it ranks behind construction and agriculture) and now consumes about 6% of the U.S. gross national product, and is expected to rise to 8 - 10% in the years ahead; nevertheless alcohol and tobacco now consume 5% of this economic product.

The enemy of the physician is not the Government, but disease, and the poverty, ignorance, prejudice, etc. which underlie much preventable illness. However, the physician's ability to conquer that enemy may be compromised if his misgivings about the professional drawbacks which he fears may accompany Medicare lead him into implacable opposition to the inevitable, making it difficult for him to influence the important issues of how professional independence and

the quality of medical care can best be protected in the transition which lies ahead, or if he lapses into apathy and plain hopelessness. Here one is reminded of the elderly Ozark farmer who liked to sit on his porch each evening and smoke an after-dinner cigar. When his wife called out to him "Land's sake, Elmer, your beard's on fire", he replied "Doggone it, Martha, I know it. Can't you see I'm sitting here praying for rain?"

IV. MEDICAL ETHICS

Another important item included in all lists of objectives of medical education is ethical attitudes. It is commonplace to point out that ideally physicians should be (to quote from various lists) compassionate, perceptive, have respect for the dignity, value and self-esteem of others, have sympathetic understanding of human needs and frailties, be worthy of trust, i.e., be reliable and responsible in caring for his patients' health needs, possessed of complete intellectual integrity, a candid recognition of his own qualities and limitations, etc.

Obviously such paragons of virtue are an ideal to be striven for and presumably we intend to foster these traits of character among our students, as well as hope that they are more apt to be present among cultured well-educated individuals who are selected for admission to medical schools, since it is generally recognized that it is impossibly difficult to screen for such traits.

A former teacher of mine, Dr. Richard Cross, recently said: "The quality of medical care a patient receives is determined much more by his income than by whether or not his doctor has recently taken a post-graduate course. Several studies of medical practice suggest that patients

suffer less from physicians' ignorance than from his hasty and perfunctory behaviour and unwillingness to ask for help. Most doctors know how to take an adequate history and do a reasonably thorough physical examination, but lack of time and economic pressure all too often cut short these fundamental steps. While it may be argued that personality characteristics are not amenable to change, it is now widely agreed that medical schools should and must be concerned with socio-economic aspects of medicine; the chief value of education should rest in its ability to influence the attitudes, beliefs and behaviour of the student; blind following of tradition is unworthy of an educational institution.

If our objective is to improve medical care, we must consider ways in which we can alter the behaviour of our students. Imparting knowledge is only one of a number of such ways and often a relatively ineffective one."

There have been several disturbing articles in the *Journal of Medical Education* over the past ten years suggesting that medical students as a group show a high incidence of neurotic handicaps and emotional disturbances, tend to possess attitudes, value systems, and psychological defences which are not consonant with the demands and gratifications appropriate to a service-oriented profession, and that in fact cynical qualities are enhanced and humanitarian attitudes weakened during progress through medical schools. Most of these studies have been conducted by means of questionnaires and the validity of some of them may be open to question. One author wondered if a science-oriented curriculum promotes depersonalized, dehumanized attitudes, or if the trauma of exposure to death, beginning with the cadaver in

first year anatomy, and human suffering on the wards, produces a reaction in the form of a "thickened skin" and indifference. This is hard for me to accept as inevitable, if such factors are indeed operative.

Some have suggested that the attitudes of physicians will inevitably reflect those of the society in which they practise, and there are many evidences that society today is characterized by social forces which tend to isolate people from one another rather than to draw them together in mutual concern for one another. This is a product in part of bigness and over-organization which affects school and medical students as well as the doctor-patient relationship. Again the way in which an educational role should be played is not obvious. We tend to leave this to precept and example on the part of individual teachers by means of bedside instruction on specific cases. One wonders whether or not some of the typical issues such as the philosophical basis of value judgments with regard to the quality of life and death, should not be assured coverage in some more organized way.

On a world scale, an expert on population explosion recently estimated that much of the underdeveloped world will be experiencing famine within the next seven to eight years as population growth outstrips steps now being taken to increase available food supplies, and suggests that we must learn to judge the quality of life in various countries, sustaining those deemed worthy with our limited food supplies and writing off the others. What will happen in the way of violent opposition from the unworthy in this event was not mentioned, but physicians cannot hold aloof from matters of this kind, which arise on an individual as well as an inter-

national scale, e.g., when to prolong life may have to be related to the quality of life left to the individual. "Methuselah lived 900 years, but who calls that living when no gal won't give in to no man with 900 years." And in a similar vein, the use of drugs which produce impotence as a side effect in the therapy of hypertension may raise the same issue in a different form.

Other issues with ethical implications include: when to permit abortions, the pros and cons of oral contraceptives, the circumstances of use of many other drugs, the professional example with regard to smoking, questions of patient confidence versus the obligation to the law in criminal trials, even civil disobedience or military disobedience when professional conscience dictates. One may cite the present birth control laws in Canada and the recent Court Martial of Captain Levy in the United States as examples of these problems. What is or should be the physician's responsibility to stop and give first aid to accident victims. Doctors have heard of charges of abandonment, neglect or malpractice arising out of such situations, giving rise to "Good Samaritan" laws in many States. Should we be concerned about the attitude of our colleagues toward their responsibility for inconvenient procedures which are not yet prevalent and therefore may not carry a legal threat of malpractice (such as testing infants' urine for phenyl ketonuria)? Should students be concerned with problems such as the reluctance of physicians to refer patients to specialists for fear of losing the patient, or the fear of the specialist to criticise delays in referral for fear of losing future referrals?

Hopefully this sort of problem should cease to be important when group practice becomes predominant.

The widespread recognition of the tendency toward self-protection on the part of the medical profession has led to the principle of "res ipsa loquitur" in many situations where the circumstances themselves may leave the burden of proof upon the doctor that an unfortunate consequence did not arise from his neglect. Should the profession assume a more active role in policing its own ranks? For instance should we set examinations for licence renewals every few years such as we do now for drivers' licences, as a step toward genuine retrieval on the part of those practitioners who practise poorly? Should students be acquainted with the ethical problems which arise in connection with the participation of physicians in the development of chemical and biological weapons? Perhaps there is a place for special lectures of high quality in this area.

As an outstanding example, I cite the lectures delivered by Professor Lasagna which appeared in the *Yale Journal of Biology and Medicine* in April, 1965, in a series entitled "The Mind and Morality of the Doctor." At what stage in their education should students be familiarized with the Declaration of Geneva as well as the Hippocratic Oath and be given a larger understanding of some of the implications of these statements? Perhaps some of these matters might be appropriate areas for student initiative and responsibility of the type which is now represented by the Student Research Club.

In my own days in medical school, the students at the Institution where I studied, organized what they called

a Student Forum where lecturers were invited to speak on many topics of general philosophical importance not being covered in the classroom. There has been a recent resurgence of student activities of this sort in North America.

An example is the Student Health Organization in New York, Chicago and Los Angeles, which received a \$900,000.00 grant from the U.S. Office of Economic Opportunity last summer for field work as "patient-advocates" in urban ghettos. A student-sponsored forum might furnish a healthy platform for conferences and discussions of economic and ethical topics for those students who are interested.

I have saved my apologia for the end, rather than setting it out in the beginning. I feel a great deal of diffidence in dealing with these subjects as a non-practising academician speaking from the shelter of the ivory tower, particularly in view of my well-known radical non-conformist tendencies (at least in those areas where my own comfort and prerogatives are not threatened). I would, however, like to make it clear that nothing I have said is intended to be invidious or adverse toward our own school or to my own dedicated colleagues. I realize that I have left many gaps in my efforts to cover a very broad field and some of the quotations I have given have been lifted out of context. I have tried to indicate some of the ideals towards which I think we should be striving and hopefully I have been provocative and have furnished you with some material for thought.

The Aggressive Behaviour of Animals

RICHARD HOOPER, *Med. IV*
and
BRIAN MARR, *Med. IV*

In this paper some observations of animal behavior will be presented, the behaviour of man will be briefly discussed, and some conclusions about the aggressive behaviour of animals including man will be made.

Konrad Lorenz, in his book *On Aggression*, describes his experiences as a diver off the coral reefs of Florida. He observed two main types of fish — the brightly colored and the drab. He noticed that drab fishes tended to travel amicably in schools, while the brightly colored fish, such as the Angelfish or Beau Gregory, swam alone. They mingled with the drab fish, paying them little attention.

When two fish of the same colorful species spied one another, there would be furious pursuit and displays of mutual intimidation if they came close to one another. In addition he noticed that colorful fish of *different* species paid little attention to one another. Thus he arrived at a hypothesis that a phenomenon of intraspecific aggression existed.

To test this, he used an aquarium into which he placed many species of different colored fish. There was more than one member of each species placed in the tank. The fish would fight one another only intraspecifically. That is, two Beau-Gregorys (not a Beau and an Angelfish) would fight.

It was not long before he noticed that this intraspecific aggression became less pronounced. He also noticed that certain fish would occupy particular areas of the tank. The weaker would have a small corner near the surface (a highly vulnerable position re: predatory birds) while the stronger would occupy a larger area away from the surface. If the weaker fish moved outside its area, the stronger would rapidly drive it back. If the weaker fish took a mate, the pair would be able to increase the size of the original territory by their cooperative aggression against the stronger but still bachelor fish of the same species.

Thus a seed was planted in Lorenz's mind and he expanded his work to include studies of numerous species, — birds, rodents, reptiles, dogs, and so on. His purpose was to see if this same pattern of behaviour existed in other species, and if some generalizations might be made. His work produced fruitful and consistent results, and the details are well set out in his book *On Aggression*. He concluded that in each species there

is a form of aggression which would be directed at other members of the same species.

When one sees two dogs fighting, it is difficult perhaps to see what possible good could arise. How could this ensure survival of the species?

In the main, this type of behaviour prevents overpopulation of a given area and consequent depletion of food reserves. The units of intraspecific aggression may vary from an individual fighting another individual, to a community of the species fighting another community. The community type of aggression is seen both in rat clans and in human societies.

An interesting observation was made by Lorenz in that the only times there was serious injury or loss of life in these duels, an accident had apparently occurred. While observing wolves fighting, he saw that there would be gestures of submission made by the loser. The loser exposes his neck to the stronger. The stronger animal makes symbolic tearing gestures just over the neck of the loser, but does not kill. Were death to result, the purpose of species preservation would be lost, and aggressive behaviour would be detrimental to the species. In animals equipped to kill, there are built-in inhibitions about killing healthy members of their own species. In man, if these inhibitions exist, technical advances in weaponry have outstripped the usefulness of the inhibitions.

The behaviour of man may now be considered. First, one does not have to think too hard to realize that it is mainly the males which show the most marked intraspecific aggressive behaviour. One can understand this by considering the patterns of family life in the early days of man's history. Man was primarily a carnivorous

animal who hunted for his food. If a community had the policy of taking women and children out on a hunting party, there would be many disadvantages. Women and children would slow the party down, the males would be distracted by the females, and the hunting party itself would require more food while on the hunt.

Thus the hunt could not cover large areas as quickly as could an all male party; the distracted, satisfied males would have less energy for the hunt and would be more susceptible to predators. Finally, babies born on a hunt would likely have a higher mortality rate than those born in a more stable environment. Generally a society with this policy would be less likely to survive than would one where the hunting parties were all male.

The women were given the family chores in relatively safe areas whereas the males went out into the forest where there lurked all types of danger from predatory animals to other human hunting troops. Those social groups which could survive these odds would of necessity have to have had strong aggressive males. A breeding process was established and present-day man is thus the product of the most aggressive tribes — to those tribes most capable of killing off the competition.

When we consider the wars that man has waged, in both past and present, we become aware immediately of a brutality seen nowhere else in the animal kingdom. Weapons have improved. How easy it is to press a trigger on your machine gun and watch dozens of people fall; how much more difficult it would be if you had to kill the same men with your bare hands. With the efficiency of modern weaponry, we are less able

to exercise any inhibitions we may instinctively have against killing members of our own species. The species preservation effect of aggressive behaviour has been lost in man. Now that same aggressiveness which allowed us to survive the early days of our life struggle may have become a curse leading to man's total self-destruction.

We as a species seem to be wholly unable to learn from the experiences of our forebears, as far as combat is concerned. We are unable to control our aggressiveness; we are easily roused to a state of militant enthusiasm where we are willing to give our lives "for the cause". This may not be true on an individual basis, but certainly seems so considering the species as a whole.

We as individuals could gain some

insight into our own aggressive natures by considering the way we react to our fellows where depersonalization occurs — for example on the highways. Nowhere is aggressive behaviour so obvious, and nowhere are the consequences so lethal. I am sure many of us have felt like running at least one person off the road for some trespass he has made on our rights (on our territory). We must be honest with ourselves and accept the facts. We must abolish our pride in being such unusual, intelligent animals, and realize what we are: just animals, and poorly controlled ones at that!

Is it possible that insight into our fundamental nature will enable us to curb our aggressive genocidal tendencies? Is it possible to educate the masses? Is it possible to obtain worldwide agreement? Is it possible?

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An Instinctual Basis for Aggression In Man

MYRON MacDONALD, *Med. IV*

In the accompanying article an argument for the nature and function of aggression in animals was presented. It would be reasonable, albeit probably not acceptable, to extrapolate this argument to man. But you would say man is different—he has reason, self awareness, the ability to abstract and conceptualize, morality. However, reason does not exist in a void and human action, either individually or as a group is only in small part the result of those faculties which are uniquely human. Even the most cursory examination reveals that the goals and aims of human behaviour are rarely, if ever, formulated in reason. Where then, are the roots of behaviour? It is my contention that the foundation of human aggressive behaviour lies in our animal endowment of inherited instincts.

Studying instinctual behaviour in animals other than man is comparatively simple, because of the controls we can exert on environmental parameters. Morality prohibits science from taking a group of human babies at birth and subjecting them to wire mothers and electric shocks, so in order to study the problem of human instinctual behaviour, it is necessary to approach from the periphery and try to draw logical inferences. It seems a worthwhile investigation, then, to consider the characteristics of man's evolutionary predecessors, and to examine which of these characteristics we are likely to retain.

The common root of all living primates is Proconsul, an ape that lived during the ten to twenty million years preceding the Pleistocene, that turbulent period of time which began about one million years ago and which we still live in. Proconsul was a generalized ape with arms like our own — shorter than our legs — who

pursued a terrestrial existence. That he was a generalist in the evolutionary sense and was still able to survive bespeaks of the gentle Eden-like period he lived in. The major morphological differences between humans and Proconsul are as follows: Proconsul had large incisors, and a small brain, capped by a skull that sported a thick sagittal crest necessary for firm attachment of huge masticatory muscles. We have a large brain, and have lost both the sagittal crest and the large canines.

About thirty years ago an evolutionary intermediate was discovered — by name — Australopithecus Africanus. Africanus was a light-boned creature who possessed morphological characteristics of both Proconsul and man. He lacked the sagittal crest and large incisors of Proconsul, and in that way resembled man, but lacked as well the large brain of the humans to follow him. He was a bit of a runt, in fact, and stood

only four and a half feet tall. We have in Africanus what appears to be an evolutionary failure, neither strong nor especially fast, who possessed no morphological specialization such as fighting canines or long claws and no big brain to allow him to cope with what has to be called the mean depression years of earth's ages. The Pleistocene, was, and is, a very turbulent period marked by wild swings of climate and punctuated by moving sheets of glacial ice. How then, could Africanus survive? — for not only did he survive — he thrived — and because little Africanus was such a huge success, man evolved. The evidence indicates that Africanus survived because in short — he was an aggressive killer.

The Makapan caves of Southern Africa are filled with fossils — the bones of all manner of Pleistocene animals lie in silent testimony to the excellent cuisine enjoyed by Africanus. Notable among the fossils are a large number of baboon skulls — all of which have had their heads caved in. These skulls all exhibit similar fractures: a description at autopsy by a contemporary pathologist would read "Death caused by a blow from a double-headed instrument which fractured the right parietal bone." Further exploration reveals that there are a significant number of antelope humeri in the caves as well — and it is redundant to say that the distal end of the antelope humerus matches exactly those double indentations found in the baboon skulls. The only creature then living capable of wielding these weapons was Africanus. We have then, in the Australopithecines, creatures that were methodical hunters and killers — very aggressive predators in fact, who would attack routinely a formidable creature like a baboon. Here then is interspecific

aggression in our forbears. The argument for intraspecific aggression in Australopithecus lies in the fact that these attacks were not limited to other animals and more than one Australopithecine met his end through one of these skull fractures. As Konrad Lorenz writes in his book *On Aggression*, "Obviously, instinctive behaviour mechanisms failed to cope with the new circumstances which culture unavoidably produced even at its very dawn. There is evidence that the first inventors of pebble tools, the African Australopithecines promptly used this new weapon to kill not only game, but fellow members of their species as well" and he goes on "Peking man, the Prometheus who learned to preserve fire, used it to roast his brothers: beside the first traces of the regular use of fire lie the mutilated and roasted bones of *Sinanthropus pekinensis* himself".

Is it likely that we have inherited this "carnivorous mentality?" For the last part of this rather simple argument I will turn to Darwin, writing on "Instincts" in *The Origin of Species*. "Instincts are important as corporeal structures for the welfare of each species, under its present conditions of life. Under changed conditions of life, it is at least possible that slight modifications of instinct might be profitable to a species; and if it can be shown that instincts do vary ever so little, then I can see no difficulty in natural selection preserving and continually accumulating variations of instinct to any extent that was profitable. No complex instinct can possibly be produced through natural selection, except by slow and gradual accumulation of numerous slight, yet profitable variations." Stated simply, if a characteristic has been of benefit in adaptation to environment it does not tend

to be discarded during evolution. And the question is put to you — would aggressive behaviour be a profitable attribute to have in an evolutionary sense? The question is rhetorical. The argument arises that with the evolution of intelligence man was able to discard his open ended instincts. This would have to be a very rapid bit of discarding, since we have only controlled our environment to any extent for the last 10,000 years. When one considers that our life heritage goes back 2 billion years, one would have to postulate divine intervention.

Summarizing then, what is now generally accepted as our immediate evolutionary precursor was an armed aggressive creature who in all likelihood was able to survive because of this characteristic. It is interesting to note that the use of weapons — not randomly, but with foresight — preceded the enlargement of the brain.

There is a fragmentary argument then for an instinctual basis for aggression. It is an incomplete answer, but one to be considered along with the unquestionably numerous factors which contribute to a complex behaviour pattern such as aggression.



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AN APPRIASAL OF THYROID FUNCTION TESTS

STEPHEN C. THORSON, B.Sc.(Med), M.D., F.R.C.P.(C)

Because so many factors can influence the individual parameters of thyroid function it is not surprising that at the present time there is no single test of thyroid function that will adequately define in all instances clinical states of hypothyroidism and hyperthyroidism. Thus the clinician is often called upon to use a battery of thyroid function tests to reach a diagnosis that is reasonably certain. There are a large number of tests currently used in ordinary clinical practice. The most common tests utilized are the serum protein bound iodine estimation (PBI), the butanol extractable iodide estimation (BEI), the T₃ resin uptake test, the 24 hour I¹³¹ uptake test, the T₃ suppression test, serum thyroxine estimation and estimation of serum free thyroxine.

Before embarking on a description and a discussion of the shortcomings of the various tests, it is extremely important that one appreciates the basic physiology of thyroid hormone production. Thyroid hormone consists essentially of thyroxine which comprises some 90% of the output of the thyroid gland. Small quantities of triiodothyronine are secreted and comprise some 5% of the gland output, but for practical purposes we consider the thyroid hormone as being thyroxine. Thyroxine is essentially an insoluble substance in aqueous solvents and, to be transported to the tissues, must bind to some other substance that is freely soluble. It has been known for some years the thyroid hormone, thyroxine, is indeed bound to certain plasma proteins, namely, thyroxine binding globulin (TBG), thyroxine binding prealbumin (TBPA) and thyroxine binding albumin (TBA). In the euthyroid individual approximately 70% of the serum thyroxine is carried by TBG

and approximately 20% is carried by TBPA, almost negligible quantities being carried by TBA. Thus there are 3 orders of binding protein, only two of which appear to have any real importance in thyroxine transport. It is of more than academic interest that the binding capacity or concentration of TBG determines the concentration of serum thyroxine, and for this reason decreased or increased concentrations of TBG can independently lower or increase the serum concentration of thyroxine regardless of how much hormone is being turned over.

It should be appreciated that while almost all the thyroid hormone is bound to serum protein this quantity is in fact in equilibrium with a very small concentration of free thyroxine. All evidence to date would indicate that it is the free thyroxine that is utilized by the peripheral tissues and suppresses the pituitary secretion of thyrotropin.

1. *The serum protein bound iodine estimation (PBI)*

In most instances measurement of the serum PBI will accurately reflect the amount of circulating thyroid hormone and give a fair indication of the clinical status of the patient. Unfortunately the PBI will also measure any inorganic or organic iodide present in serum. One usual method of quantitation involves the precipitation of serum proteins followed by ashing of the precipitate which is then added to a chemical system in which ceric sulphate is converted to cerous sulphate in the presence of arsenous acid. Inasmuch as iodide acts as a catalyst for this reaction which involves a color change, the colorimetric change can then be used to quantitate the amount of iodide present in the ash. The normal values for this test are generally between 4 to 8 micro g%.

There are many causes of a misleadingly elevated PBI. Most important are the ingestion of inorganic iodide and the ingestion or injection of iodinated dyes used in certain x-ray procedures. Usual therapeutic doses of Lugol's solution or potassium iodide solution will generally cause a marked elevation of the PBI for periods of up to one month following the cessation of their use. Iodinated dyes are used for intravenous pyelograms, myelograms, arteriograms, cholecystograms, and cholangiograms. Generally the PBI will be falsely elevated to marked degree for up to 3 to 4 months following these procedures. Not infrequently the ingestion of iodinated drugs can cause a false elevation of the PBI. Diodoquin is one of these and will give a falsely elevated PBI for periods of up to 10 days following its discontinuation.

It is commonly known that during pregnancy, the concentration of TBG

is increased and that this will effect an increase in the PBI value. Thus it is not uncommon to see PBI estimations during pregnancy of up to 10 and even 12 micro g% in patients who are euthyroid. Marked increases in TBG concentration are also seen in the newborn, following estrogen administration, following the ingestion of certain drugs, namely, perphenazine (Trilafon) and on rare occasions, with idiopathic increases in TBG.

All of these conditions can give rise to marked increases in the PBI estimation.

Misleadingly lowered PBI values are encountered infrequently and for the most part involve decreases in TBG concentration. These may be seen in the nephrotic syndrome, in acute liver disease, following androgen administration, following the use of large doses of Dilantin and very infrequently as an idiopathic anomaly. Mercurial injections will cause a false depression of the PBI for periods of up to 72 hours, mercury apparently inhibiting the reduction of ceric sulphate. Minimal decreases in the serum PBI may be seen following acute febrile illnesses, severe wasting diseases and the use of certain drugs such as salicylic acid and its congeners, dinitrophenol and even penicillin. These minimal decreases are apparently related to decreases in the concentration of TBPA.

2. *The serum butanol extractable iodide (BEI)*

This test was evolved to obviate the contamination of serum with inorganic iodide. The procedure for the estimation is essentially the same as that for the PBI estimation except that following ashing of the serum protein precipitate, the ash is then dissolved in butanol which theoretic-

ally dissolves only thyroxine. Iodide, monoiodotyrosine, diiodotyrosine and thyroglobulin, substances which may be secreted into the circulation during the course of thyroiditis, are not dissolved in butanol hence the test is sometimes useful in diagnosing thyroiditis. Unfortunately organic iodides as used in x-ray procedures are also dissolved in butanol so that if serum is contaminated with iodides from such sources a misleadingly elevated BEI will be the result. In fact even with inorganic iodide ingestion, significant amounts of inorganic iodide are actually redissolved in the butanol so that there is always some false elevation of the BEI value. Normal values are generally between 3.5 to 7.5 micro g%, that is, approximately 1 micro g% less than the PBI value. The test is still discussed in most textbooks of medicine and thyroidology but is used only in some centres and then to very limited extent.

3. The 24 hour I^{131} uptake test

The usual test procedure consists of giving the patient an orally ingested solution containing I^{131} in quantities ranging from 1 to 20 microcuries. Prior to ingestion the I^{131} dose is quantitated insofar as radioactivity is concerned. Twenty-four hours later a counting device is placed over the thyroid gland and the radioactivity counted. By making appropriate calculations the amount of radioactivity present in the thyroid gland can be calculated as a percentage uptake of the original dose. Normally this 24 hour uptake value is between 15 and 45%. Values of 45 to 60% are suggestive of hyperthyroidism and values in excess of 60% are almost certainly the result of hyperthyroidism. The test is most useful in diagnosing the hyperthyroid state, and great caution must be used in diagnosing hypothyroidism because the ingestion of minute quantities of iodide

can significantly depress the uptake of iodide by the thyroid gland. Thus in most instances a low I^{131} uptake is only suggestive of hypothyroidism. Conversely, however, normal values would exclude the diagnosis of hypothyroidism.

The 24 hour urine excretion rate of I^{131} has been used extensively in the past and is occasionally used at the present time in certain clinical situations. In the normal individual 35 - 65% of the administered dose of I^{131} will be excreted in the urine over the subsequent 24 hours. A value of less than 30% has been found to be consistent with the diagnosis of hyperthyroidism and values of over 80% are generally consistent with the diagnosis of hypothyroidism. In normal individuals, the urine excretory rate plus the epithyroid count are in excess of 86% of the ingested dose. A value of less than 70% is suggestive of ectopic thyroid tissue, functioning metastatic carcinoma of the thyroid or struma ovarii.

A serious defect in the 24 hour I^{131} uptake test lies in the fact that if one compares the 24 hour uptake test of a population of normal and a population of hyperthyroid patients, one will find that at the end of 24 hours, there is a considerable overlap between the upper limits of normal of the euthyroid group and the lower limits of the hyperthyroid group.

As already indicated, values of the I^{131} uptake between 45 and 60% while statistically abnormal, really fall into this range of potential overlap. It has been found in most cases of hyperthyroidism that the maximal uptake of I^{131} will occur within the first 12 hours. If one measures, say a 3 hour epithyroid uptake there is little or no overlap between the hyperthyroid and euthyroid groups.

Thus, it is desirable even in routine I^{131} uptakes to perform a 3 or 4 hour epithyroid count.

The causes of false or misleadingly elevated I^{131} uptakes are many. Among the most important are hypiodinism which gives rise to goiter formation and is frequently associated with uptakes of over 60%; following injury to the thyroid gland as following subtotal thyroidectomy or therapeutic doses of I^{131} in the treatment of hyperthyroidism; in situations where there is an excessive loss of hormones from the body as in the nephrotic syndrome; in situations where there is a rebound increase in iodine uptake such as occurs following treatment with anti-thyroid drugs and occasionally following treatment with thyroid hormones, iodide, ACTH, Cortisone and during the recovery phase from subacute thyroiditis. Misleading elevations of the I^{131} uptake can occasionally occur in non-toxic nodular goiter, Hashimoto's disease and those genetic causes of hypothyroidism. In rare instances one may find an elevated I^{131} uptake in patients who are clinically euthyroid and whose PBI is within normal limits. Failure of the gland to suppress with T3 (see below) and the subsequent course of the patient will usually reveal that hyperthyroidism is in fact present but not yet manifest clinically.

The causes of a misleadingly low I^{131} uptake are much more numerous in frequency and importance and consist for the most part of those situations in which the extra-thyroidal iodide pool is increased with consequent dilution of the I^{131} used in the test procedure. Such a dilution and subsequent decreased uptake may be found when inorganic iodide has been ingested as in the use of iodinated dyes for x-ray procedures, with

the excessive ingestion of iodized salt, following the application of certain sun tan lotions, following the application of certain nail polishes, following the ingestion of cough medicines containing iodide and following the use of vaginal suppositories containing iodinated compounds.

It should be emphasized that the I^{131} uptake will be suppressed with quantities of iodide gained by these means in amounts that will be far less than those required to falsely or misleadingly elevate the PBI. Anti-thyroid drugs such as propylthiouracil and methimazole will also suppress the I^{131} uptake. In addition the ingestion or injection of cortisone, ACTH, the ingestion of phenylbutazone, cobalt, lead, arsenic and mercury may suppress the I^{131} uptake.

4. The Triiodothyronine (T_3) suppression test

Even with the use of 3 hour epithyroid counts, there are still many instances when the I^{131} uptake is equivocally elevated and the PBI estimation for one reason or another invalid. In cases of hyperthyroidism, the thyroid gland is secreting thyroid hormones at an accelerated rate, and this rate is almost always completely autonomous insofar as pituitary regulation is concerned. This fact is utilized in what we commonly call the T_3 suppression test. This procedure is one of the most useful diagnostic aids the thyroidologist possesses. To perform the test, triiodothyronine is given at the rate of 100 micro g daily for a period of 1 week. Prior to and following administration of this compound, the 24 hour I^{131} uptake test is performed. In the normal individual, the administration of T_3 results in a marked suppression of the pituitary secretion of thyrotropin which in turn causes a marked fall in the I^{131} uptake. The autonomously

functioning hyperthyroid gland, however, will not respond to this depression of TSH secretion so that at the end of a week's administration of this drug, there will be little or no suppression of the I^{131} uptake test. One must emphasize that there are many instances, as can well be seen from the preceding discussion, wherein PBI estimations and I^{131} uptake tests can be affected by a variety of things. Therefore when the clinician suspects hyperthyroidism and has reason to believe that these basic tests are invalid, he can in many instances "clinch" the diagnosis by utilizing the T3 suppression test.

5. *The T3 Resin Uptake Test*

This test has proven very useful in diagnosing hyperthyroidism in those situations in which the PBI is falsely elevated and I^{131} uptake test falsely depressed. In the original procedure as outlined by Hamolsky, 5.0 ml of whole blood was taken from the patient and suitably anti-coagulated. A small amount, in the order of .12 micro g, of labelled triiodothyronine was added to the blood which was then incubated and shaken for a period of some 4 hours. The radioactivity contained in the whole blood specimen was then quantitated in a well counter. The blood was then centrifuged, the supernatant decanted and the red cells washed several times with normal saline. Following the final washing, the radioactivity contained in the red cells themselves was counted in the well counter, and this count was expressed as a percentage of the initial count. A correction for the haematocrit value was necessary in the final calculation. This original procedure has given way to what we now call the T3 resin test which differs from the red cell uptake of T3 in that, instead of whole blood, all that is required from the patient is

a several milliliter aliquot of serum. A piece of resin sponge is inserted into the serum to act as a T3 acceptor in the same way as the red cells had done in the original test. The principle of the test evolves upon the fact that triiodothyronine has a high binding affinity for a variety of substances including red cells and certain resins. Highest affinity is for the thyroxine transport proteins present in serum. It is currently felt that triiodothyronine does not compete with thyroxine for any of the protein binding sites in serum and hence occupies only those protein binding sites that are unoccupied by thyroxine; hence in those situations wherein the concentrations of unbound binding sites is decreased, such as occurs in hyperthyroidism, the availability of binding sites for T3 is decreased; hence more of it will then bind to a secondary binding site such as the red cell or the resin sponge. Thus, in cases of hyperthyroidism, the percentage uptake will be increased and, conversely, in hypothyroidism, the percentage uptake will be decreased. The normal range lies between 15 - 35%. Originally it was thought that the test would be useful in differentiating both hypothyroidism and hyperthyroidism from the euthyroid state. Clinical use over the past decade, however, has indicated that the test is a very sensitive measure insofar as hyperthyroidism is concerned but is practically useless in defining hypothyroidism from the euthyroid state. Not infrequently cases of severe myxoedema are seen wherein the T3 resin uptake test is within normal limits.

6. *Estimation of Serum Total Thyroxine*

The estimation of serum total thyroxine is now being performed in certain centres across the land but is not at the present time available

for general use. The procedures used obviate the contaminating effects of both inorganic and organic iodides and give a true measure in every situation of the serum thyroxine concentration. One defect in the test is its inability to designate those cases of transport protein abnormalities which might cause a misleadingly elevated or lowered thyroxine concentration. However, these situations are relatively infrequent, and one can usually remember to ensure that pregnancy is not present and that estrogens have not been ingested.

7. *Estimation of Serum Free Thyroxine*

This test, like the estimation of serum total thyroxine, is still not available for general use. Studies to date indicate that this is the most useful single test available to define hyperthyroidism and hypothyroidism. The concentration of free thyroxine appears to parallel the actual secretion rate of thyroxine from the thyroid gland and appears to be unaffected by any abnormalities of the transport proteins. When this test becomes generally available, there will probably be much less need for the more complicated I^{131} uptake and T³ suppression tests.

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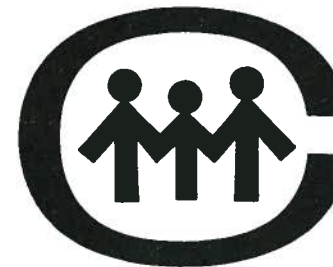
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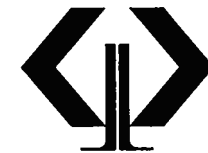
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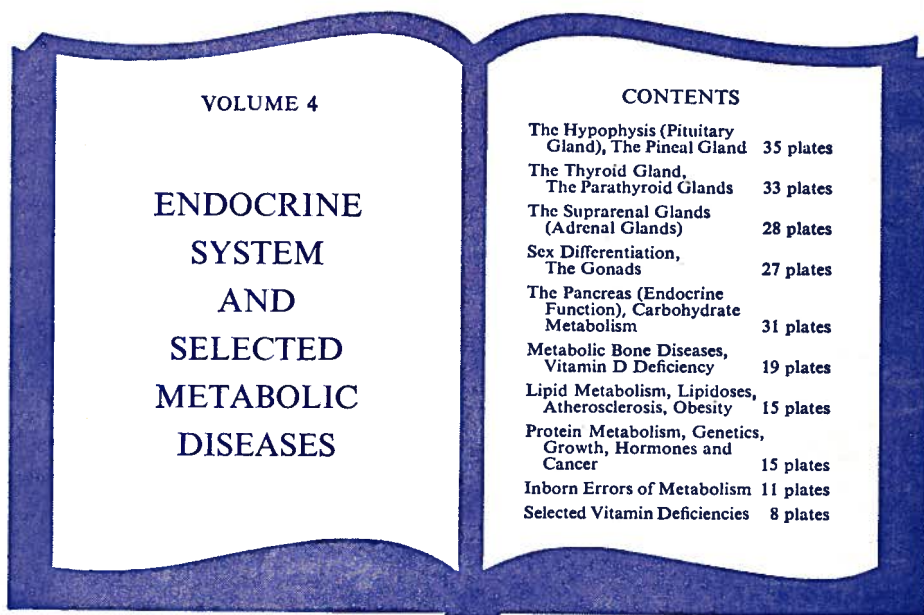


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