

THE CONSTITUTIONAL ASPECT OF HOST FACTORS IN DISEASE

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SYNOPSIS

Recent investigations have attempted to transform the subjective field of constitutional typology into an objective clinical technique. This endeavour, while not completely successful, has yielded interesting data on distributional patterns of body builds among healthy and diseased males.

Study of human physiques has been virtually restricted to western populations. The few reports on Oriental peoples were done on biased samples such as college students and hospital patients. These preliminary reports seem to have convinced western scientists that little variation occurs among eastern body builds which have been characterized as mainly of the ectomorphic or thin, linear type.

The present study attempts to stimulate constitutional research among Asian groups and suggests that more complete sampling procedures may yield as great a range of physical types as occur among westerners.

Valuable medical information may also be gained by investigation of eastern disease patterns with the view of identifying which constitutions show low risk and which ones are particularly prone to certain illnesses.

“Let him, on meeting a fellow-mortal, learn at a glance to distinguish the history of the man, and the trade or profession to which he belongs. Puerile as such an exercise may seem, it sharpens the faculties of observation, and teaches one where to look and what to look for. By a man’s finger-nails, by his coat-sleeve, by his boots, by his trouser-knees, by the callosities of his forefinger and thumb, by his expression, by his shirt-cuffs—by each of these things a man’s calling is plainly revealed. That all united should fail to enlighten the competent inquirer in any case is almost inconceivable.”

A. Conan Doyle

INTRODUCTION

Sherlock Holmes can serve as an apt model for the successful modern medical researcher. There are two categories of disease that benefit from the searching out of clues that, although inconsequential in themselves, may serve as markers of serious conditions. One such category of illness comprises the chief killers of man, heart disease and cancer. The other category consists of the many lethal, sublethal and debilitating Mendelizing traits where a wide range of apparently trivial attributes such as PTC tasting, electrophoretically variant enzyme migration patterns

and dermatoglyphics have contributed predictive value in genetic linkage studies.

In the etiology of supposedly non-Mendelizing afflictions such as heart diseases and the cancers, medical biologists have become increasingly aware of the large proportion of disease variance which can be related to the closely connected topics of epidemiology and host factors.

Important host factors in the prognosis of infectious diseases consist of variables such as age, sex, pregnancy, nutritional state, ethnic differences and previous medical history of other diseases (Bennett, 1962). Some of these have also proved important in other clinical conditions such as coronary heart disease (CHD) where constitution has, in a few studies, been suggested as an additional host factor worthy of investigation (Keys *et al*, 1966; Elliot, 1971).

Over the past century a rather constant state of flirtation has been going on between clinical medicine and constitutional research. Whether it will ever blossom into a full fledged love affair is another matter.

Rather than arguing either for or against the use of constitutional studies in diseases of man I will present a summary of some work that has been done in this field, but will not cover the *habitus* in heritable disorders such as Marfan’s Syndrome (Elliot, in preparation).

CONSTITUTION IN PERSPECTIVE

The chronicle of human constitutional study tells us that most workers have attempted to classify

man into two polar types. The basis of this approach was formed by the Greek physician Hippocrates (ca 460-400 B.C.) who described two basic human types each tending to demonstrate certain constellations of afflictions seldom found in the other type. One of these he characterized as the *Habitus apoplecticus*, being of short, thick build and evidencing diseases of the vascular system leading to apoplexy. At the other pole resided those men of *Habitus phthisicus*; long, thin individuals who are prone to tuberculosis.

A detailed account of human constitutional studies is found in Sheldon, Stevens and Tucker (1940). For the present we will restrict ourselves to a few important developments. An alternate tripolar typology was employed by Halle, Rostan and Spurzheim in the early nineteenth century. This scheme consisted of the *type digestif* which included persons with large nutritive systems and vital temperaments; *type musculaire*, those emphasizing motive, mechanical or locomotor aspects; and *type cerebral*, showing a predominance of mental functions and the nervous system. Grace notes of a fourth type occasionally occurred in subsequent studies although the basic dichotomy was that between bipolar and tripolar typologies.

Thereafter constitutional studies were overshadowed and consequently declined due in the first instance to the work of Darwin on evolution and of his cousin, Galton, on anthropometry and statistics; and compounded later on by the rebirth of Mendelian genetics at the turn of the century under the auspices of de Vries and Bateson.

The focus of constitution shifted to Padua in the persons of di Giovanni (1885); Viola (1909) and later Naccarati (1920), a student of Viola, in New York; all of these men continuing the bipolar approach.

Tripolar constitutional typology, as distinct from the anthropometric school of Galton and the combined anthropometry and typology of di Giovanni and later Hooton (1959), was reborn in 1925 in the work of a Bavarian doctor, Kretschmer. Generalized sketches of Kretschmer's three types, pyknic, athletic and asthenic, are shown in Elliot (1971). Kretschmer produced many works on the constitution of man and taught his theories to several generations of doctors, among them the American somatologist, Sheldon.

SOMATOTYPE METHODS

The innovations of Sheldon are discussed already in Elliot (1971). This section is devoted to answering two questions frequently asked by clinicians regarding somatotyping: (1) How are somatotype photographs taken and used, and

(2) Are somatotypes normally distributed so that we may use the common parametric methods of statistical analysis in dealing with data from somatotype studies?

Photographic Technique

Sheldon's procedure is carefully standardized. He and his followers (1940, 1954) use a particular type of camera. The distance from the camera lens to the subject remains constant. The subject is placed on a pedestal which revolves around three stops at 90° intervals to give frontal, profile and dorsal views. Sheldon estimates the relative strength of the components by a check list of the body regions and the whole body. At times he also used measurements of his standardized photographs as well as ratios, such as height/cube root of weight (ponderal index), based on anthropometric measurements of the living.

Somatotypers also use the Sheldonian photographs to study dysplasia, which is the uneven mixing of the three primary components; gynandromorphy or the extent to which the body presents traits associated with the other sex; and the gradation from coarse to fine physical texture (Sheldon *et al*, 1940, 1954).

Sheldon makes no claim that endomorphy, mesomorphy and ectomorphy constitute a "sacred three" in body typology; in fact he has always been equally interested in other natural body build groups such as mesopenes (those with lack of mesomorphy), endopenes, ectopenes and endomorphic mesomorphs as well as all the possible whole and half-step variations of his somatotypes.

Distribution of Data

Although the frequency distribution of Sheldon's somatotypes (based on 4,000 male college students, Sheldon *et al*, 1954) resembles an amoebaized dart board (Fig. 1) the resultant pattern generally simulates a squashed, bell-shaped (normal) curve of distribution spread out in a three dimensional way. It is as if the bell had been flattened out by the representatives of the three extreme somatotypes, each employing typical methods of his constitution; the endomorph simply lay down along the western border of the bell, the mesomorph energetically punched holes in the northern, northeastern and central areas of the bell, wherever he could reach, and the ectomorph spread himself out as much as he could along the southern and southeast peripheries to avoid the reclining endomorph and the flailing fists of the mesomorph.

When the somatotypes are placed into larger groupings the somewhat lopsided bullseye of the dart board approaches a circular shape and the

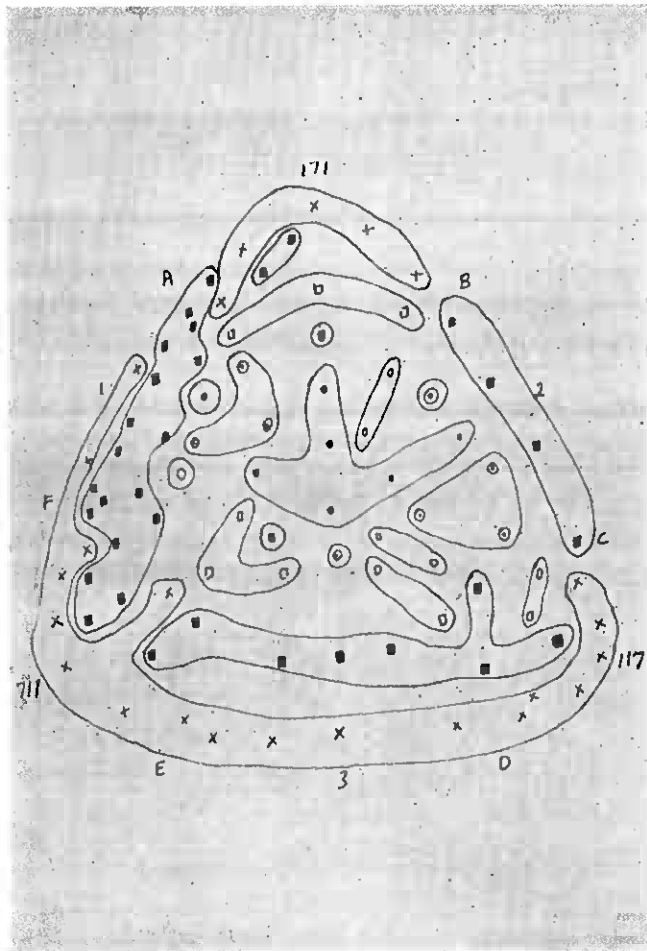


Fig. 1. Detailed frequency distribution of Sheldonian somatotypes among 4,000 college males (based on data in Sheldon, Dupertuis and McDermott, 1954).

Frequency groupings:

- 1 or less per 1,000 x
- 2 to 9 per 1,000 ■
- 10 to 19 per 1,000 □
- 20 to 29 per 1,000 ⊙
- 30 to 39 per 1,000 ○
- 40 to 60 per 1,000 ●

Somatotype categories:

- 711 Endomorphy
- 171 Mesomorphy
- 117 Ectomorphy
- A Endomorphic mesomorphs
- B Ectomorphic mesomorphs
- C Mesomorphic ectomorphs
- D Endomorphic ectomorphs
- E Ectomorphic endomorphs
- F Mesomorphic endomorphs
- 1 Ectopenes
- 2 Endopenes
- 3 Mesopenes

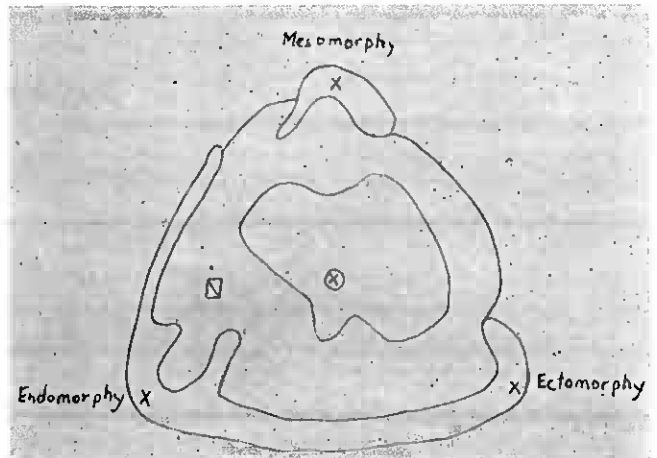


Fig. 2. Generalized frequency distribution of Sheldonian somatotypes among 4,000 college males (based on data in Sheldon, Dupertuis and McDermott, 1954).

Frequency groupings:

- 1 or less per 1,000 x
- 2 to 19 per 1,000 □
- 20 to 60 per 1,000 ⊙

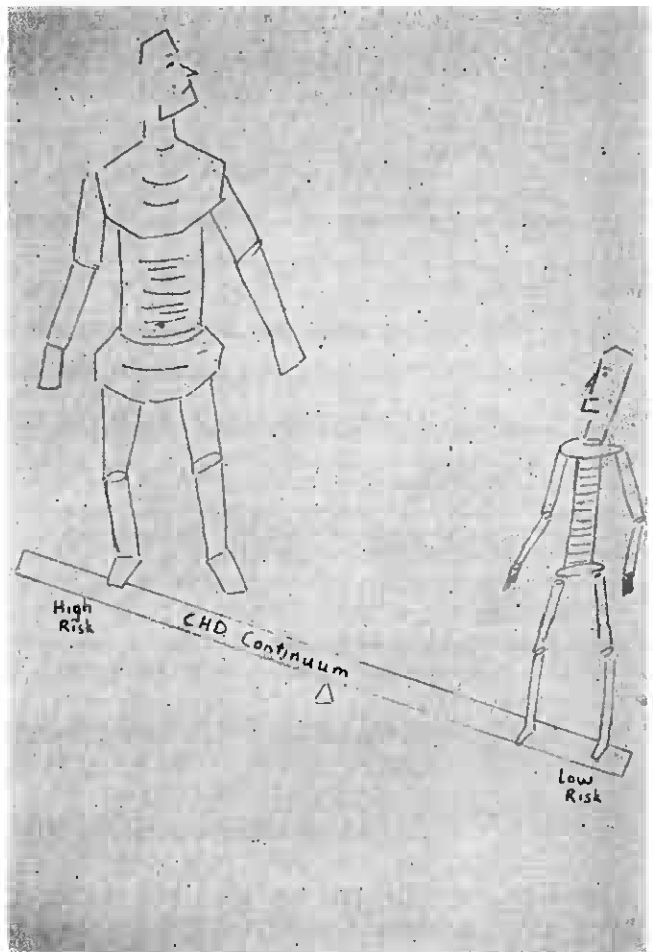


Fig. 3. A caricature of the body build contrast between men most prone and those least prone to coronary heart disease.

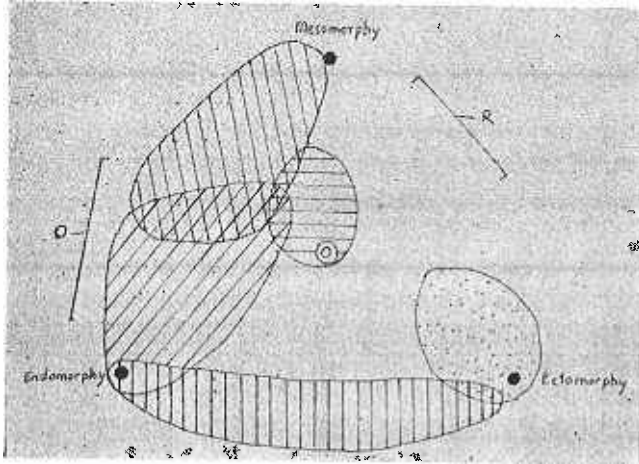


Fig. 4. Clinical associations of somatotypes (based on Sheldon, Dupertuis and McDermott, 1954 and review in Elliot, 1971).

- ☒ "Northwestern diseases": Apoplexy, coronary heart disease, renal disease, Meniere's disease.
- ▨ Ulcers (duodenal and gastric)
- ▧ Nonacute diabetes, gall bladder disease
- ▩ Frolich-like condition
- ▤ Tuberculosis
- ⊙ Acute diabetes
- Osteoarthritis
- Ⓘ Rheumatoidarthritis, toxic diffuse goiter, otosclerosis

Note: This indicates masculine phenotypes particularly prone to certain diseases that can also occur, although to a lesser extent, among other body builds.

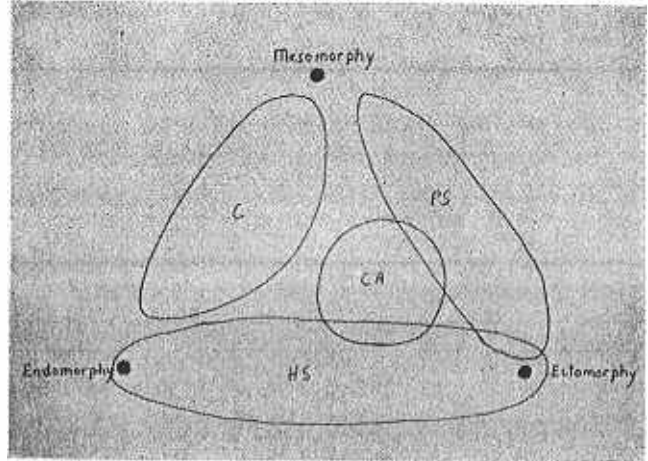


Fig. 5. Mental disease approximations of somatotypes (based on Sheldon, Dupertuis and McDermott, 1954 and review in Elliot, 1971).

- C — Circulars (Manic-depressives)
- Ca — Catatonic schizophrenics
- HS — Hebephrenic schizophrenics
- PS — Paranoid schizophrenics

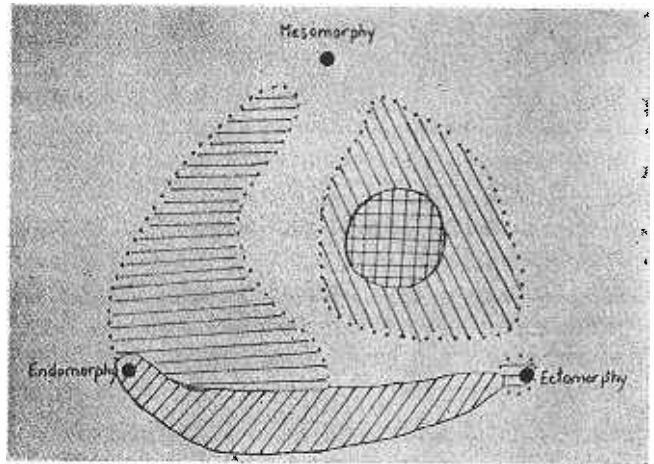


Fig. 6. Relative longevity of somatotypes (based on Sheldon, Dupertuis and McDermott, 1954).

- ⊙ Long life span
- ▨ Moderately long life span
- ▧ Short life span
- ▩ Moderately short life span

total configuration in general approximates a bell-shaped distribution with the bullseye at the peak of the bell (Fig. 2).

Additional information about variations and distributions of physiques as well as frank discussions about the difficulties as well as the benefits of employing the somatotype method may be found in Sheldon *et al* (1940, 1954).

CONSTITUTIONAL APPLICATIONS

Total Clinical Pattern

The medical practitioner is, of course, interested in what particular body builds tend to be associated with certain diseases and also with general survival value. He may, in addition, wish to relate physique to other readily derivable medical findings in order to form a composite picture or pattern of clinical clues to describe high risk patients as completely as possible. Furthermore, the identification and study of health patterns among persons who are least prone to develop these illnesses is now recognized as a useful way to examine processes that guard against disease (Kinch *et al*, 1965).

The sum total of medical examinations along with the interactions of these variables in relationship to the ecological environment of the patient is referred to as the "total clinical pattern", a concept similar to that of the "total morphological pattern" of Le Gros Clark (1955). The net result of this approach is a series of medicograms, each descriptive of a particular disease.

From a body build point of view the most noteworthy clinical application to date may rest on the finding that certain mesomorphic men (endomorphs, in particular) are most prone to develop coronary heart disease early in adulthood (Elliot, 1971, Table II). We can combine this finding with other clinical data to derive the medicograms of the two extremes of CHD risk and view them from the perspective of their relative position on the CHD continuum.

An introductory medicogram may be formed from the composite picture given by Kinch *et al* (1963) of "Harry Coronary". "Harry" has high blood pressure, high cholesterol, a balding scalp, and an enlarged left ventricle (on basis of EKG). He smokes a lot, seldom exercises, is 15 percent overweight and, important from the somatotypical point of view, is an ectopene, or endomorphic mesomorph. He is a 4-4-2 in somatotype rating, a Sheldonian beagle, in contrast to "Norman Normal", a noncoronary type who is a 3-4-3, balanced mesomorph, an Airedale according to Sheldon (1954).

Other scientists would rotate the somatotype axis still further to the right (East), among the ectomorphs, to pin-point the male physique most likely to fill the low CHD risk niche. Friedman (1969) offers the following conservative view:

"Perhaps the fairest manner of presenting our opinion about the relationship of mesomorphy to coronary heart disease is to state the fact that when we first see and examine a tall, quite thin, poorly muscled individual with flat forearms who is less than 55 years of age one would be rather surprised if he were found to have clinical coronary disease" (pages 131-132).

General differences in external phenotype between CHD prone men versus those with low risk are shown in Fig. 3. These are, of course, broad characterizations of western men and can not be applied to eastern populations who have not yet been investigated as to somatotype association with CHD.

Disease Patterns and Somatotype

There are a limited number of studies that have attempted to prove or disprove associations of particular somatotype patterns with certain disease configurations. This has been due, in large part, to the difficulty and expense in conducting somatotype investigations.

It is with this in mind that I have assembled generalized views of linkages between constitution and general clinical (Fig. 4) as well as typically mental (Fig. 5) disease configurations. In retrospect, there is insufficient data to permit any definite conclusions about such correlations with the possible exception of CHD and the endomorphic mesomorphic or ectopenic *habitus*.

This latter association remains the most dramatic one to date. It is interesting that investigators have found that the distribution of physiques prone to CHD, apoplexy and renal disease lies in the "Northwestern" sector, in agreement with Hippocrates' original characterization of the *Habitus apoplecticus*. The data describe an apoplectic right triangle whose apices (and supposedly less affected areas) are: at the top the 2-7-1 (Sheldonian lions or Bengal tigers), on the left the 6-3-1 (Sheldonian common porpoises or dolphins), and on the right the 3-4-3 (Sheldonian Airedale dogs). The latter angle is based more on Gertler, White *et al* (1954) than on Kinch *et al* (1963). This suggests, with Sheldon *et al* (1954) that the soft, heavy territory of the "Southwest" is less prone to early coronary thrombosis and less apoplectic (although having a higher risk of diabetes and gall bladder disease) than is the hard,

heavy "Northwest". Viewing these figures (4, 5) one should remember that in most cases the data are tentative, based on one or two studies only, and refer solely to western males.

Longevity and Somatotype

Sheldon *et al* (1954) made several interesting observations about life span and somatotypes. They presented information which, although far from conclusive, suggests that further constitutional investigation may be worthwhile to find out which body builds live longer and whether there are important world wide variations of such associations.

In comparing the frequency distributions (Figs. 1 and 2) with the very tentative three dimensional illustration (Fig. 6) based on the observations of Sheldon *et al* (1954) it appears that some association may exist between longevity and relative abundance of particular physiques. Sheldon *et al* (1954) suggest that in general the rare somatotypes are short lived, that maximum body weight comes late in life for long lived men, and that these persons are usually shorter than those who die young.

Although the build of the extreme ectomorphs does not seem well adapted to survival and therefore may be short lived, the prognosis of longevity seems to rest more frequently with mesomorphic ectomorphs, a group apparently resistant to degenerative diseases and common infections. The mode of death differs as well, according to Sheldon *et al* (1954) who cite the "acute vascular accident" causing endomorphic mesomorphs to die suddenly in contrast to gradual decease of the "Southwesterners" and the ectomorphs. Short life span was most frequently found by the above authors to occur among the "down under" or hebephrenic, Frölich-like group.

The order of precedence of disease and constitution may be difficult to discern and, rather than searching for causal relationships among the two topics, it may be best to rephrase the question:

"It is not the somatotype that causes shortness of life, but specific organ weakness with which the somatotype may be associated, and of which the somatotype may possibly in a general way be a reflection" (Sheldon *et al*, 1954).

DISCUSSION

An obvious criticism of the CHD findings as reported earlier in this paper and in Elliot (1971) rests on the observation that endomorphic mesomorphs are common in European and American populations and therefore it is not surprising to find many cases of CHD among them. Such com-

ments are stilled by the fact that, frequent as they are, the endomorphic mesomorphs dominate the CHD realm much more than they do the general range of physiques.

Many of the remaining apparently healthy muscular individuals are walking incubators of CHD with advanced atherosclerosis of coronary arteries as shown by Spain and colleagues (1953) in their necropsy study of violent death causes.

Another bone of contention is whether the above findings based on Western men are applicable to Easterners. In a general way, they probably are; since we must remember that all mankind belongs to the same species. We cannot as yet judge specific clinical applications in Asian medical centres for we still lack even preliminary studies relating Oriental constitution to patterns of disease.

A few reports have dealt with restricted samples of Chinese body build. Stevenson *et al* (1937) attempted to classify Chinese hospital patients according to Kretschmerian typology and concluded that while most of them fitted into the leptosomic category, their typically Mongolian long trunks and short limbs made them similar in other ways to Alpines and therefore difficult to describe by the Kretschmerian method.

The Sheldonian technique was applied to Chinese medical students, faculty, clerks and technicians yielding an average somatotype half-way between 3-3-4 (Sheldonian cotton-tail rabbits) and 3-4-4 (Sheldonian pointers) (Chen, Damon and Elliot, 1963). Both of these ectomorphic builds appear, from the foregoing section, to have a selective advantage in the modern world and may be contrasted with the typical averages of 3-5-3 (Sheldonian horses) found among American negro and 4-4-3 (Sheldonian foxhounds or "pyknic practical jokes") of American white soldiers (Damon *et al*, 1962).

Certain fundamental considerations however, prevent us from concluding, on the basis of the above results, that Oriental and specifically Chinese body build is necessarily ectomorphic.

The ectomorphic component has been associated in constitutional studies as well as in Eastern and Western writing as the physique of the scholar and religious recluse. Centuries' old traditions of Chinese education and civil service examinations have combined with other socially selective forces in the definition of the thin, weak aesthete as the occupant of the scholar's niche. In Mandarin there is the saying:

病 懷 書 生

It is worthwhile noting that somatotypers have found (Sheldon *et al*, 1940, 1954) greater ranges of variation in physique occurring among

the general population than in samples, although large, of selected groups, such as college men. It is not surprising then that Chinese students in American colleges gave rise to the belief that:

"...the South Chinese are at the present time among the least mesomorphic (and presumably the least somatotonic) of the peoples of the earth" (Sheldon and Stevens, 1942, page 432).

A study of the sibs that the Chinese scholars left at home to tend the family business might cause some alterations in the above conclusions. Personally I have observed a great variety of physiques occurring among the Cantonese, Fukien and other dialect groups residing in Hongkong and Southeast Asia, at least in the 1960's and early 1970's.

Occupational variations in body build are probably as evident in the East as they are anywhere in the West. In terms of somatotypes—while many Chinese office workers resemble Sheldonian wasps, falcons and flycatchers there appear to be several Sheldonian big cats and wolves among lumbermen and quarry workers. Variation in body build is therefore not the exclusive property of the western world.

It is obvious that a lot more needs to be said about eastern constitution. In commenting on investigations of western people Sheldon (1940) stated:

"For races such as Orientals and Negroes, it seems probable that different anthropometric norms from those presented in this book will have to be established for the somatotypes themselves. It is possible that new somatotypes may be discovered among these races, and that some of the somatotypes common in our own racial group may be rare or even absent in other racial groups" (page 219).

For these reasons it is preferable that no conclusive-sounding statements be made on Oriental physique as invariable and thin, merely on the basis of biased ascertainment from hospital patients, medical personnel or overseas students, until large scale studies have been done on all the dialect, caste, regional and aboriginal groups of man found in eastern and southeastern Asia.

Once such data are gathered the next step will be to apply the findings to studies of healthy Oriental men compared to those suffering from CHD and other afflictions. Subethnic, social, environmental and other background factors will have to be kept as comparable as possible among the groups in instances of matched studies and will have to be analyzed in mixed group investigation.

Constitution offers one means of studying the role of host factors in the diseases of man. Certain reptiles may be able to shed their skins but we can no more shed our constitutions than we can our genetic structure although, as is the case with the latter, the penetrance and expressivity of the former may be modifiable by environmental factors.

I have presented distributional patterns of body build and disease to indicate the present condition of this field of constitutional medicine. Medical practitioners have the necessary perspective of the patient as a dynamically unified but apparently varying *Gestalt* and it should be their judgement whether the field of constitutional medicine with its potential harvest of clues and markers is a plot best left fallow or, hopefully, worth cultivating further in the attempt to solve the mysteries of CHD and other afflictions of man.

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