nature (or a motor accident) has destroyed, why, there is little wonder that the surgeon is not only regarded with veneration but invested with glamour.

Here I should remind you that glamour is not properly the attribute of a film actress who happens to combine an unruly temperament with a nicely developed figure. The word "glamour" is merely a corruption of "grammar," for which film actresses care little; and grammar, before it became the menace of the elementary school room, could mean the occult learning of scholars. It could mean the magic art—and to the layman the art of the plastic surgeon is close akin to that.

Justice, however, compels me to add that the surgeon, no less than his patient, owes much to the modern anaesthetist: without the anaesthetist the surgeon would have fewer patients, and patients would have less admiration for the surgeon's skill.

The World of To-morrow

But it is not my intention to offer a conducted tour of the contemporary clinic, the modern operating-theatre: a task for which I am quite unqualified. I have merely been taking a sidelong glance at some aspects of the profession you are about to enter, and may adorn, with the purpose of suggesting that, while some of you may die of overwork, none of you need perish of boredom.

With the purpose, also, of reminding those of you whose studies have precluded much study of the ancient world, that mankind has had a fairly long history, and on the threshold of a new Promethean age it is useful to recall the old one, and realize that men not only survived the peril of fire, but tamed it and made it their servant, and built upon the crafts that fire made possible a long succession of civilizations. Many of these have disappeared—whether by ill fortune or the growth of their own iniquity it is now hard to tell—but a by-product of the Promethean ménage has outlived all the casualties of men, and is still with us, more exuberant than ever.

Hope, the miraculous survivor, came into the world—according to the myth—by the agency of Epimetheus, who was a fool, and Pandora, who was beautiful but silly; and Hope has been as good a servant to mankind as fire. I can find no explanation for her curious origin except in a theory put forward by my old friend, the late James Bridie, who was a good physician as well as a brilliant dramatist. He, in one of his plays, boldly asserted that "God is a very good biologist."

You may, of course, object that much of my argument is invalidated because Prometheus never existed; but that does not alter my case. For there was a Promethean age, and there is about to be another. And in the new world of to-morrow—among machines of hitherto unknown power, in the din of rockets taking-off for interplanetary space, between electronic brains that fortify the already dazzling intelligence of our scientists—in this new world mankind will still be subject to the ills and torments released from Pandora's box. You, as physicians, will have to deal with people who still suffer from all the old familiar diseases, as well as brand-new psychosomatic ailments of unknown origin—and in these circumstances, and with immortal Hope beside your chair, you may (I repeat) die of overwork, but it is quite unlikely that you will perish of boredom.

The October issue (Vol. 168, No. 10) of the *International Record of Medicine and General Practice Clinics* contains a symposium on medical writing. Dr. H. E. SIGERIST opens it with "Thoughts on the Physician's Writing and Reading." Then come papers by Professor HANS SELYE ("How Not to Write a Medical Paper"), the Editor of the *British Medical Journal* ("An Editor's Prejudices"), Dr. WALTER C. ALVAREZ ("Medical Writing"), and Dr. FÉLIX MARTÍ-IBÁÑEZ, editor of the *International Record* ("Books in the Physician's Life").

SOCIAL CLASS SELECTION AND CLASS DIFFERENCES IN RELATION TO STILLBIRTHS AND INFANT DEATHS

BY

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The effect of environment on stillbirths and infant deaths is usually assessed by comparing the rates of different social classes, class being defined in terms of the occupation of the husband—that is, the child's father. This index of environment provides no direct information about the wife, whose influence on the course of pregnancy, labour, and early infant care is more obviously relevant. Many primiparae have only recently married (Baird and Illsley, 1953), and may continue during pregnancy to live in their parents' home (Thompson, 1954); in such circumstances it would seem reasonable to base the wife's social class on her father's rather than her husband's occupation, thus providing a measure of her pre-marital environment.

A preliminary study of Aberdeen primiparae (Baird and Illsley, 1953) showed considerable interchange between social classes* at marriage, so that, for example, many daughters of skilled manual workers (Class III) married "upwards," to men in the professional and managerial classes (I and II), or "downwards" to men in semi-skilled or unskilled occupations (IV and V). Women who married into a higher social class were usually taller and in better health, were better educated, and came from smaller families than those who remained in the same class or who married into a lower social class.

Clearly, selective movement between classes at marriage, such that healthy well-grown women would tend to marry into higher social classes and small women with poorer health and physique into lower classes, might exercise a considerable influence on class differences in vital statistics. In the present paper this process is examined and its effect is shown on the rates of prematurity and obstetric death (stillbirths and first-week deaths) of the social classes in Aberdeen.

Method

All married primiparae resident and delivered in the city of Aberdeen between July, 1950, and December, 1954 (4,344 cases), were studied. Detailed medical and social data were available for 3,911 of these who booked for confinement in the Aberdeen Maternity Hospital. Less information was available for patients who booked for confinement in a private nursing-home (298), or in their own homes (113), and for those who made no booking arrangements (22). Certain analyses, therefore, are restricted to maternity hospital patients. Intelligence test data were obtained by Miss E. M. Scott in a special study of a sample of 278 hospital primigravidae (Scott, 1954).

The social class of the patient's father was based on his main occupation during the patient's school years.†

*Social class is based throughout on occupation, in accordance with the method used by the Registrar-General (1951).

†This information was not obtained for 63 patients, most of whom were delivered in the nursing-home or in their own homes. In a further 66 cases where the conditions of upbringing were variable or highly abnormal it was impossible to make a meaningful classification, even though a great deal was known about the patient's upbringing. The exclusion of these 129 patients made almost no difference to the prematurity and obstetric death rates of each husband's social class.

Throughout the paper Social Class I has been combined with Social Class II, and Social Class IV with Social Class V. This was necessary for simplicity of exposition and because the numbers in these classes, particularly in Social Class I, are too small for separate treatment. However, occupational groups were reclassified in various ways to test whether the pattern of selective interchange shown below persisted when the boundaries between classes were changed and when allowance was made for local peculiarities: for example, non-manual workers in Class III were grouped with Classes I and II, occupations connected with the fishing industry were excluded, etc. This produced changes of detail but did not affect the broad pattern of the results.

Results

Amount and Direction of Interclass Movement

Fig. 1 shows that there is considerable interclass movement at marriage, particularly between adjacent classes. Forty-six per cent. of women brought up in Classes I and II

FIG. 1.—Intermarriage between social classes. Aberdeen married primiparae, 1950-4. The breadth of the lines is proportional to the numbers in each group.

married men in Class III, whilst 40% of the women married to men in Classes I and II were themselves brought up in Class III.* Movement between Class III and Classes IV and V is even more pronounced: 61% of women brought up in Classes IV and V married into Class III, whilst 41% of the women married to men in Classes IV and V were brought up in Class III.

Intermarriage between extreme classes is rare. Out of 648 women brought up in Classes I and II only 47 married into Classes IV and V; conversely, only 56 women out of 1,517 brought up in Classes IV and V married into Classes I and II. All told, such cases comprise only 2% of the total population. Detailed investigation shows that much of the extreme movement arises from anomalies in the method of social classification (Illsley and Thompson, 1955). For example, the daughters of shopkeepers or farmers are allocated by the Registrar-General to Class II irrespective of the size of the business or of the farm, but they often resemble Class III rather than Class II in their way of life. In such cases extreme movement between classes does not imply any extreme change in living standards or general social background. For this reason further attention is not paid to this small and rather anomalous minority; the main emphasis is placed on the larger groups who marry into the same or adjacent classes.

Features of Interclass Movement

Table I shows some social, physical, and obstetrical features of each social class group divided according to their class of upbringing and their class at marriage.

*The occupation of the wife's father relates to the wife's school years, whilst the husband's occupation refers to the date of birth of his first child. Some husbands may be promoted subsequently to a higher class.

School-leaving Age, Occupation, and Intelligence-test Grade.—In each class of upbringing, the groups who married husbands in Classes I and II contained the highest proportion of women who had remained at school beyond the minimum school-leaving age, or who had subsequently taken professional, highly technical, or clerical occupations; while the groups who married into Classes IV and V ranked lowest in these respects (Table I, A). Intelligence test results† showed a similar pattern, women marrying into Classes I and II obtaining the largest proportion of "above average" scores and those marrying into Classes IV and V obtaining the largest proportion of "below average" scores. Although the intelligence-test findings are based on a small sample, the results of an inquiry on 1,907 males in Stockholm showed a very similar pattern for the mean I.Q. of each social class group according to its class of origin (Boalt, 1955). These results are shown diagrammatically in Fig. 2, where the primary classification is class at marriage. This arrangement produces a fairly steady gradient for each

FIG. 2.—Interclass movement—intelligence, education, and pre-marital occupation. Wife's pre-marital occupation: P.T.C.=Professional, technical, and clerical. III=Shop assistants and skilled manual. IV and V=Semi-skilled and unskilled manual.

characteristic. Moreover, it appears that the groups which rise are not only superior in each respect to the remainder of their class of upbringing, but are also superior to the group brought up in the higher class whom they replace. For example, the group which rose at marriage from Class III into Classes I and II contains a higher proportion of intelligent, educated, and skilled women than the group brought up in Classes I and II which married into Class III. Thus, through the social selection occurring at marriage, women with these characteristics tend to become concentrated at the upper end of the social scale; and, conversely, women without them tend to concentrate at the lower end.

Physique, Health, and Height.—In Table I, B and Fig. 3 are given the heights of each class group, and an assessment of their physique and health made by senior obstetricians at the patient's first visit to the antenatal clinic. In each class of upbringing the women who married into a higher class tended to be taller, with better physique and health, than those who remained in the same class at marriage or who fell in social status. As with social characteristics, the women who married into Classes I and II from lower classes were on average taller and healthier than the women brought up in Classes I and II who married into lower classes (Fig. 3). And, conversely, the women who married into Classes IV and V tended to be shorter and less healthy than women brought up in Classes IV and V who married into Class III.

†Raven's progressive matrices (1938), a non-verbal test. A similar but more pronounced pattern was obtained with a verbal test—four subtests of the Wechsler-Bellevue intelligence scale (Scott, 1954).

TABLE I.—*Interclass Movement and Associated Characteristics*

Father's Social Class: Husband's Social Class:	I and II			III			IV and V		
	I and II	III	IV and V	I and II	III	IV and V	I and II	III	IV and V
A									
Intelligence test grade above average (%) ..	78.6	50.0	40.0	72.7	46.5	20.0	100.0	35.1	20.5
Cases	14	22	5	11	86	20	2	77	39
B									
Left school after minimum leaving age (%) ..	78.9	35.6	9.3	48.8	15.7	4.7	13.6	6.1	1.2
Professional, technical, or clerical workers (%) ..	90.4	55.5	21.4	71.4	37.8	13.7	44.6	20.0	6.7
C									
Physique and health good or very good (%) ..	88.7	77.3	71.4	86.0	69.4	54.7	68.1	64.7	50.9
Cases	210	262	44	169	1,303	387	47	884	525
5 ft. 4 in. (162 cm.) or over (%)	50.2	34.1	22.9	42.9	29.1	19.9	37.5	23.9	21.2
C									
Prematurity rate (per 100 births)	3.6	6.0	12.8	6.3	6.4	11.5	8.9	8.0	11.0
Obstetric death rate (per 1,000 births)	29.8	23.4	42.6	16.7	33.6	56.0	—	34.9	55.0
Cases	302	299	47	239	1,400	410	56	916	545

Note.—Not all items of information are known for the whole population; intelligence test scores are available for a relatively small sample of the hospital population; the data on school-leaving age, and on the wife's occupation and her physique and health, refer to all married city primiparae booked for confinement in the Maternity Hospital; height and prematurity and obstetric death rates refer to all married city primiparae irrespective of the place of confinement.

FIG. 3.—Interclass movement—height, physique, and health.

Prematurity and Obstetric Death Rates.—The prematurity and obstetric death rates shown in Table I, C and Fig. 4 follow a similar pattern. Within each class of upbringing the range of prematurity and obstetric death rates is wide, the highest rates occurring to those groups which married into Classes IV and V, the lowest rates to the groups which married into Classes I and II. The high prematurity rate in the group brought up in Classes III-V which married into Classes I and II is considerably influenced by the results of one year in which the prematurity rate for this group was 13.3 per 100 births—

FIG. 4.—Interclass movement—prematurity and obstetric death rates.

a high rate for any class and quite exceptional for Classes I and II. Omitting this year, the rate for this group would be 4.5 per 100 births. The relatively high obstetric death rate (30 per 1,000) in the group which was brought up and which also married into Classes I and II may result from small numbers, but it may also be a real phenomenon, for this group contains an unusually high proportion of women aged 30 or over at their first delivery; and the stillbirth rate tends to rise with maternal age. If we consider only women under 30 years of age the rate falls to 18 per 1,000.

Discussion

It is not surprising that women who married husbands in higher social classes than their fathers were likely to be of more than average intelligence (as measured by intelligence tests), to have spent longer at school, and to have been themselves in the more highly skilled and better-paid jobs. Intelligence and education, themselves closely related, are commonly recognized as qualities leading to professional and skilled occupations (Martin, 1954) and to the wider occupational and social contacts which favour a "good" marriage.

Good health and physique are also likely to be matrimonially advantageous. It is, however, not so easy to see why tallness should be associated with marriage into the upper occupational levels, nor why social mobility at marriage, both upwards and downwards, is associated with low and high prematurity and obstetric death rates, respectively.

The findings are, however, consistent with other socio-medical work undertaken in Aberdeen showing that social class, height, physique and health, intelligence, and nutrition tend, in primigravidae at least, to operate consistently together; low prematurity and obstetric death rates are to be expected when those factors are favourable, and vice versa (Baird, 1952; Illsley, Billewicz, and Thomson, 1954; Scott, 1954). The present data indicate that, at the time of marriage, women who rose in social status at marriage already possessed advantages in terms of growth, health, and education, and, as expected, women with these advantages were more efficient at child-bearing than women less well favoured.

The lower prematurity and obstetric death rates of women who moved up the social scale at marriage might result from improved social conditions (including medical care) between marriage and delivery. But this explanation could not apply to the differences in education, pre-marital occupation, and height, which are already determined at the time of marriage.

The data given in Table II for two groups of women who experienced little or no change in their immediate environment, or who had been exposed to a change for a short

TABLE II.—*Interclass Movement Among Women who Experienced Little Change in Living Conditions Between Marriage and Delivery. (Maternity Hospital Patients Only)*

Father's Social Class:	III		IV and V	
Husband's Social Class:	III	IV and V	III	IV and V
(a) Patients living with their mother after marriage until delivery				
Physique and health good or very good (%)	70.7	55.3	66.8	50.0
Prematurity rate (per 100 births)	7.0	12.8	7.2	11.5
Obstetric death rate (per 1,000 births)	30.3	63.8	31.4	63.7
No. of cases	330	94	223	157
(b) Patients who conceived before marriage				
Physique and health good or very good (%)	70.6	55.4	65.5	46.9
Prematurity rate (per 100 births)	7.3	12.1	10.2	15.1
Obstetric death rate (per 1,000 births)	28.8	56.7	41.0	57.3
No. of cases	313	141	244	192

Note.—Social Classes I and II have been excluded, since very few women in these classes conceived prenatally and relatively few continued to live with their parents after marriage.

time only, suggest that it is also unlikely to apply to physique and health or to prematurity and obstetric death rates. Among these women, as in the population at large, those who moved up the social scale at marriage had better physique and health, and lower prematurity and obstetric death rates, than women who remained in the same class or who moved down. In other words, the association between interclass movement and health remains even when changes subsequent to marriage are slight.

Change of class at marriage appears seldom to involve a substantial change in living standards. Judged by their education, premarital occupations, and height, women who change class at marriage tend to resemble the class into which they marry rather than their class of origin. Detailed case studies (to be reported elsewhere) suggest that before marriage into Classes I and II women from Class III have already experienced a way of life more typical of Class I and II than of Class III. And, conversely, women who married out of Class III into Classes IV and V seem to have been reared more in accordance with the standards of Classes IV and V than of Class III. On this evidence, an abrupt change in living conditions at the time of marriage, capable of influencing to any important degree the course of child-bearing, is exceptional.

The use of the husband's social class in vital statistics tends automatically to focus attention on the conditions existing at the time of maternity. The present study suggests that the husband's social class has a much wider significance. Generally speaking, like marries like; for example, the wife of a professional man, irrespective of her father's social class, will normally possess before marriage the personal qualities, education, and social habits which fit her for that role. "Husband's social class" is useful as a

research tool, not only because it accounts for the immediate way of life of a mother, but because it reflects her life history, the conditions of her upbringing, and her personal qualities. Without this very wide significance "husband's social class" would be much less useful in distinguishing groups with high and low rates of morbidity and mortality.

Effect of Marriage Selection on the Size of Class Differences

The total effect of marriage selection on the social class differences in our data is shown in Table III. For each characteristic the range between the highest and the lowest classes is wider when women are classified according to their husbands' rather than their fathers' occupations. Each class of upbringing (fathers') is highly heterogeneous in respect of the characteristics shown, and the differences between classes is consequently small. The upgrading at marriage of women with "superior" characteristics and the downgrading of women with "inferior" characteristics lead to less heterogeneity within classes and to a widening of class differences.

The results given hitherto have related solely to primiparae. The data presented in the last two lines of Table III, although based on an incomplete population, indicate, however, that the findings on primiparae apply to all parities.

Implication for National Stillbirth and Infant Mortality Rates

If Aberdeen experience applies elsewhere in Britain marriage selection must have a considerable bearing on the size of class differences found in national statistics. The disparity between the infant mortality rates of the social classes has remained almost constant since 1911 (Titmuss, 1943; Logan, 1954; Morris and Heady, 1955): the same is true of stillbirth rates by social class since 1939, the earliest year for which data are available (McKinlay, 1948; Logan, 1954). This failure of the social class "gap" to narrow has occurred despite the general fall in mortality rates and the social levelling of recent years consequent upon full employment, differential taxation, and the growth of welfare services (Seers, 1948; *Economist*, 1951; Hollingsworth, 1955; Morris and Heady, 1955).

The relative size of the social classes has, however, changed considerably over these years. Between 1931 and 1951 the number of married women aged 20-44 increased by 80%, 45%, and 38% in Classes I, II, and III respectively; in Class IV the increase was only 10%, whilst in striking contrast the number in Class V decreased by 25% (Registrar-General, 1938, 1954). This has occurred despite the fact that in 1931 the crude birth rate was much higher in Classes IV and V than in Classes I, II, and III. The great decrease in the size of Class V despite its high birth rate must have meant movement in an upward direction, made possible by changes in the occupational structure of the country, such as those resulting from increased mechanization. When so many opportunities existed for social advancement those who remained in Classes IV and

TABLE III.—*The Range of Class Differences*

Characteristic	Husband's Social Class				Father's Social Class			
	I and II	III	IV and V	Range	I and II	III	IV and V	Range
Primiparae								
Intelligence test grade above average (%)	77.8	42.2	21.9	55.9	58.5	44.4	31.4	27.1
Left school after minimum leaving age (%)	59.6	14.4	3.0	56.6	50.5	16.3	4.6	45.9
Professional, technical, or clerical workers (%)	77.4	33.3	10.2	67.2	66.4	35.8	16.0	46.4
5 ft. 4 in. (162 cm.) or over (%)	46.1	27.8	20.7	25.4	40.7	28.8	23.4	17.3
Physique and health good or very good (%)	85.3	68.3	53.4	31.9	81.4	67.6	59.8	21.6
Prematurity rate (per 100 births)	5.2	6.9	11.3	6.1	5.4	7.4	9.1	3.8
Obstetric death rate (per 1,000 births)	21.8	32.8	54.9	33.1	27.8	36.2	40.9	13.1
All Parities*								
Prematurity rate (per 100 births)	4.2	5.3	8.4	4.2	4.8	5.8	7.0	2.2
Obstetric death rate (per 1,000 births)	19.0	26.4	45.3	26.3	26.2	31.2	33.0	6.8

* Based on 5,121 cases delivered between July, 1950, and December, 1952 (79% of total births). The principal exclusions are patients delivered in their own homes or in the private nursing-home, for whom information on their fathers' social class was not available.

V or who married into Classes IV and V from a higher class must have been highly selected, either because their environment or training was particularly unfavourable or because their abilities were poor. If the Aberdeen experience is relevant, these movements would tend to concentrate in Classes IV and V women with poor physique and health, who have relatively high prematurity and obstetric death rates. At the same time continuous recruitment of healthy women into higher classes would lower the prematurity and obstetric death rates of these classes. In this way the process of social selection may continuously obscure the effects of social levelling by keeping open the gap between classes.

The inevitable delay in translating social improvements into improved health and the greater rapidity with which the upper social classes take advantage of new welfare services and advances in medical knowledge also tend to keep open the gap between classes,* so that it is impossible to assess quantitatively the influence of selective mobility on differences of mortality between the social classes. The Aberdeen figures and the amount of interclass movement occurring in the last 20 years suggest that the influence of selection may have been considerable. The Aberdeen data, however, relate only to an urban population in a single city over a short period of time, and the number of cases in the upper social classes is small. While there is no reason to suppose that either the occupational structure or the prematurity and obstetric death rates of Aberdeen are at all exceptional for an urban community, it is obviously desirable that the study should be repeated and extended to rural areas.

Nevertheless it is clear that a comparison of social class differences at two points in time—for example, between census years—is misleading, because of changes in the composition of classes and selective interchange between classes. The persistent gap between the mortality of the various social classes, defined in occupational terms, does not necessarily mean that the social levelling of recent years has been ineffective. The use of another social classification less affected by selective mobility or by changes in occupational structure might well show that the difference between classes has narrowed.

Summary

A socio-medical investigation of Aberdeen primiparae has shown that women who rise in social status at marriage tend to be of superior intelligence, education, and occupational skill. Such women also tend to be tall, to be in good health, and to have low prematurity and obstetric death rates. Conversely, women whose social status falls at marriage tend to have the opposite characteristics. Social status is defined in terms of the occupation of the patient's father and of her husband.

This selective interchange between classes at marriage tends to accentuate class differences, and is partly responsible for the continuing disparity between the mortality rates of the Registrar-General's social classes, despite the social and economic changes of recent years. These classes are changing in composition and size, and movement between them is highly selective, so that comparison of class mortality rates at different periods of time may give misleading results.

I am indebted to Professor D. Baird for help at all stages of this inquiry; to the almoners' department of the Maternity Hospital, and especially to Miss B. Thompson, for social data on hospital patients; to the Medical Officer of Health for Aberdeen, the matron of the Rubislaw Nursing Home, and the general practitioners of the city for data on women confined in their own homes or in the nursing-home; and to Mr. D. Allcorn, Mr. W. Z. Billewicz, Dr. J. N. Morris, Dr. I. M. Richardson, and Professor R. M. Titmuss for advice and criticism.

*For a fuller discussion of these influences see Morris and Heady (1955).

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NECROBACILLOSIS IN GREAT BRITAIN*

BY

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The micro-organism most commonly known as *Bacillus necrophorus* causes various lesions in wild and domestic animals but is not often found in human infections, although in human beings it may produce a fatal suppurative.

The organism belongs to a group which has not yet been fully explored and which has come into existence through the realization that various bacteria described and named as the cause of different diseases in animals and in man are very similar. The first name given to the organism was bacillus of calf diphtheria, by which Loeffler (1884) called a bacillus which he saw in lesions in the throats of calves and in lesions in rabbits and mice which he infected by material from calves' throats. Other names which are now considered to be synonyms are *Bacterium necrophorum*, *Fusiformis necrophorus*, *Bacteroides necrophorus*, *Actinomyces necrophorus*, *Streptothrix necrophora*, Bang's necrosis bacillus, *Streptothrix cuniculi*, *Actinomyces cuniculi*, *Bacillus filiformis*, *Bacillus funduliformis*, *Bacteroides funduliformis*, *Bacillus pyogenes anaerobius*. Domesticated animals that are known to be subject to the infection include cattle, sheep, goats, deer, horses, pigs, rabbits, guinea-pigs, dogs, monkeys, and poultry; and various wild animals have also been found to be infected (Albrecht, 1929). The diseases may be epizootic or sporadic and local or widespread in the different species. Thus, as well as calf diphtheria, we have necrotic stomatitis of calves, lambs, and pigs, foot-rot of cattle and sheep, gangrenous dermatitis of horses and mules, multiple abscesses of lungs and liver of cattle and pigs, post-partum necrobacillosis of the vagina and uterus of cows, and navel-ill in calves born from them (Cunningham, 1930).

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