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STANDARDS OF LIVING AS FUNCTIONS OF SCIENCE AND OF SOCIAL ORGANIZATION[1]

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THE purposes of my paper as first projected for inclusion in the symposium on "Science and Society" were: "(1) to take stock of the extent to which the standards of living of the people in the world have been raised in recent times; (2) to examine the extent to which production must still be expanded in order to provide satisfactory standards of living." It was hoped thus to "provide a factual basis on which to consider the needs for further applications of science to productive enterprise."

The phrasing of these intended specifications implies an attempt at statistical precision. "Take stock," "extent," "raised," "factual basis," "further applications," are expressions appropriately used in discussing measurable and measured or enumerated phenomena. Alas! Quantitative evidences of changes in the world's standards of living are not to be here presented. The concept "standard of living" is a will-o'-the-wisp. Its incarnate shapes and dimensions at different times in different climes have not been calibrated.

Alfred Marshall avoids the term "standard of living"[2] and distinguishes between the *standard of life,* meaning "the standard of activities adjusted to wants," and the *standard of comfort,* "a term that may suggest a mere increase of artificial wants, among which perhaps the grosser wants may predominate." "A rise in the standard of life implies an increase in intelli-

[1] Condensed from the address on "World Standards of Living" of the retiring vice-president and chairman of Section K, of the American Association for the Advancement of Science, at the Ottawa session, June 28, 1938.

[2] "Principles of Economics," 8th ed., Chapter XIII, on "Progress in Relation to Standards of Life."

gence and energy and self-respect; leading to more care and judgment in expenditure, and to an avoidance of food and drink that gratify the appetite but afford no strength, and of ways of living that are unwholesome physically and morally. . . . It is true that every broad improvement in the standard of comfort is likely to bring with it a better manner of living, and to open the way to new and higher activities; while people who have hitherto had neither the necessities nor the decencies of life can hardly fail to get some increase of vitality and energy from an increase of comfort, however gross and material the view which they may take of it."

The concepts underlying factual studies of standards of living probably include now one and now the other of Marshall's standards. In "The Encyclopaedia of the Social Sciences,"[3] Carl Brinckmann asserts that "the concept . . has yet to be worked into definitive form." Brinckmann himself comes closer than Marshall to precise definition when he says: "The underlying idea of a standard of living would seem to be that of a particular system of wants as connected with a specific system of productive services designed to transform these wants into efficient demand in the market." This concept must be distinguished not only from Marshall's standard of life and standard of comfort but also from what are sometimes called the "plane of living" and the "cost of living," although all these to a certain extent approach each other.

The standard of living, to expand Brinckmann's definition, is a composite. On one side it is a "system" or complex of wants. This complex, in turn, is composed in part of certain natural or physical requirements for existence and in part, and more significantly, of material and immaterial elements related to the customs, attitudes and valuations peculiar to the group. These latter are not subject, as Marshall implies in describing the standard of life, to judgments outside of the group itself as to what is wholesome or "unwholesome . . . morally," conducive to a "better manner of living" or promotive of "higher activities." There is room for many differences of evaluation and of reference when such terms are used. The Florida kidnapper and murderer of little Jimmy Cash "claimed he wanted the better things of life for his wife and himself."[4]

From the side of human wants, then, a standard of living is a mixture of physical or natural *and cultural* elements. In its second, or complementary aspect, a standard of living involves the possibility of satisfying wants. The wants must not be merely conceptual, fantastic or utopian. They must exclude the moon, even though the baby cries for it. Ownership of a motor car may be part of the standard of living of a well-paid American workman, even though he does not have one in his possession; while the standard of living of a Mexican peon may exclude this item because the possibilities and expectations available to his status make such ownership fantastic. Brinckmann says: "Standards of living, besides representing the natural or physical conditions of certain minima of existence, derive their greatest economic and social significance, first, from the ways these conditions are reacted upon and developed, so that they result in cultural instead of natural minima, and, second, and even more important, from the productive contributions that societies or groups are able and willing to make in order to attain such minima."

All this bears upon the task initially undertaken for this paper because it indicates that the supplementary concepts of "raising the standard of living" and "measuring improvements in standards of living" are mixtures of definite and realistic and of indefinite or unreal elements.

If the standard of living includes the "natural or physical conditions of certain minima of existence," these conditions, taken together, will comprise, as it were, a *minimum* minimum standard of living. This will include certain ranges of altitude, of heat and cold, of access to food, of means, in general, for the survival and prolongation of life. These things are capable of examination by quantitative methods. While some of them may be related to human existence as constants or discrete phenomena rather than as variables, their combined effects produce variation in the possibilities of living or not living. The transition of desert to fertile land through irrigation would represent a gain in the *minimum* minimum standard of living, as would also the recession of the frontier for wheat production in western Canada—both of them triumphs of applied science. So, too, would medical discoveries. Indexes of change in the *minimum* minimum standard of living could be found in periodic data showing the numbers of the world's population, or in comparisons, at intervals, of the average expectation of life.

When we pass from the natural or physical conditions of existence and examine the cultural components of a standard of living, we immediately encounter individual and social values, improvements in which can not be assumed or measured except in relation to artificially fixed points of reference. Universal agreement upon these points of reference will be rendered difficult if not impossible for all time to come because of the great diversity of human cultures.[5]

[3] "Standards of Living," Vol. 14, p. 322.

[4] Statement of the Chief of the Federal Bureau of Investigation, *The New York Times*, June 11, 1938, p. 1.

[5] Cultural anthropologists distinguish between material culture and immaterial culture. The latter would include such items as beliefs, speech habits, ethical ideas or scientific knowledge. Material culture would include dwellings, machines, incendiary bombs, microscopes and frying

The assumption which is general in Euro-American culture that standards of living are continuously improving as a result of scientific development appears to be a thinly disguised version of the belief in social progress. The concept of social progress has been somewhat discredited and confused by events since the outbreak of the World War. The development of communism and of fascism are cited by Russians and Germans, respectively, as evidences of social progress, while the success of both doctrines is responsible for dimming the belief in progress in the United States and Canada.

If standards of living are functions of cultural standards of value which are highly diverse, no means seem available for accurate comparisons of the standard of living among races and nations, or among groups and classes within the same racial or national structure or within the same nation or group at differing periods of time. Even individuals of the same group and social status may have widely differing standards at the same moment of time.

May I illustrate by describing an afternoon which I spent some years ago at the English country home of one of the world's leading social scientists. I sat with him in a small, frugal study, chilled to the bone by the raw drizzle through which we had walked from the station. It contained tiers of books, a simple oak table, two dilapidated chairs and a tiny grate containing a single, partially burned but unlit coal. That was all.

Outside in the garden he proudly exhibited neat rows of vegetables and—a rock-garden. The younger and middle-aged generations, he said sadly, are rushing around in motor cars and losing their capacity to construct and enjoy rock-gardens. This he regarded as a definite loss to living standards—a decline in one of the recognized norms of the English home, important in itself no less than as a symbol of that quiet contentment and domestic stability that makes every Englishman's home his castle.

Figures are no doubt available showing the production and use of motor vehicles in Great Britain, with estimates of passenger miles driven. These doubtless would show upward trends since the World War. But I am sure that no indexes have yet been devised to determine the relationships of such figures to the essential values in his nation's standard of living that alone seemed worth preserving to this distinguished scholar.

How, then, may we determine "the extent to which the standards of living of the people of the world have been raised in recent times?" I believe that there is no satisfactory quantitative answer to this problem. The question is on a par with such others as: To what extent have men gained wisdom in and satisfaction from the spending of their incomes? What improvements can be shown in the world's choices of occupations? In how far have human customs and manners been improved? Such questions are unreal, first, because of the absence of norms from which to measure deviations; second, because they assume the existence of criteria external to the productive system of which, in actuality, such criteria must be a part. One is reminded of the question allegedly asked of Abraham Lincoln, "How long should a man's legs be?" And his alleged reply, "Long enough to reach the ground."

The only practical means which I can discern by which to approach such questions have already been disclosed. First, we may agree to accept as a norm some pattern of standards which is held for the moment by a given group, presumably our own. This solution is implicit in all missionary activity, political, economic or religious. It is especially congenial to a nation which finds its motion pictures, its manners and its forms of industrial organization increasingly demanded or imitated throughout the world. As other peoples seek to become more like ourselves it is easy to agree that their standards of living are improving, and it would probably be possible to devise some indexes of the process.

For example, we might reduce to an annual index the world total, broken down by countries, of exhibitions of motion picture films or even of theater attendance. (The data required are not, I believe, available; but they could become so.) The areas of higher and lower living standards, as gauged by the index, would be clearly disclosed. If the land of Ghandi, who, I believe, spurns Hollywood art no less than our mechanical gadgets, should appear as one of the darker areas on the map, this would substantiate the vast superiority of American standards. Those who do not admire our gods show themselves to be heathen; and being heathen, what would you expect? However, the darker areas would be a challenge to the evangels of higher standards. Experience has shown that sales resistance can be overcome, and intensification of marketing efforts would be indicated. It is largely by such efforts that living standards, in the sense that I now employ the term, have actually been raised throughout the world.

A second approach to the problem of gauging im-

pans. Theoretically, it might be possible to obtain periodic quantitative measures of material culture, by weight, by number of units, by monetary value, by variety or otherwise. Thus it has been estimated that one million distinguishable types and varieties of commodities enter into trade in the United States, and this might be taken as a measure of our material culture. The relation of the material culture to standards of living depends upon its relationship to the *minimum* minimum standard or, more often, to the values contained in the immaterial culture. Thus increases in the quantity of opium in the United States would be increases in its material culture but probably not in its standards of living. A new aqueduct to supply pure water to a city, on the other hand, would be an unquestioned addition to the standard of living because it would be favorable to human life itself.

provements in world standards of living is to limit the examination to the *minimum* minimum standard. This has incidental statistical advantages, since it tends to avoid many questions of qualitative differences, of national or group averages, of deviations within the group, of the valuation to be placed on the consumption of leisure and the disvaluation to attach to forms of discontent arising from constraints upon individuals. Thus human life may be postulated as a good in itself. The development during several centuries past of the medical, hygienic, nutritional, political, sociological, productive and distributive sciences, technologies and arts, has brought about increases in the expectation of life and possibly also in opportunities to be born. The net result, in any event, has been an increase in the world's population. To science may be attributed the primary credit for the fact that there is undoubtedly more human life on our planet to-day than at any time before in its known history.[6] This brings me to the second of my initial undertakings: "to examine the extent to which production must still be expanded in order to provide satisfactory standards of living" and thus to "provide a factual basis on which to consider the needs for further applications of science to productive enterprise."

As already indicated, specifications for a "satisfactory" standard of living of world-wide application are unrealistic. At the same time, I believe that living standards in my own country are far from satisfactory, and that in most of the remaining countries of the world they are probably even less so. One third of the nation, according to our President, is "ill-fed, ill-clad and ill-housed." But such negative statements are easier to make than are their complementary positives. I could not say when, if all individual real incomes were to be raised at the same constant rate, "one third" would have been reduced to zero. Once the nation had attained a "satisfactory" level for every one, we should in the process have developed new opinions as to what is "satisfactory."

Two assumptions in my initial project caused me the most difficulty; first, that satisfactory standards of living are to be achieved by the expansion of production; second, that such an expansion depends upon "further applications of science." Both of these are partially true but omit a major consideration. In the case of the second, I can resolve the difficulty by placing my own interpretation upon the term "science."

The overlooked consideration is that natural science alone, without social organization to sustain it and put its achievements to work, would be a modern form of monasticism. By "social organization" I do not refer to the organization of scientific laboratories, faculties, staffs and associations merely; but rather to the entire structure and organized processes by means of which men live, produce and consume together. I mean in combination what the economist means by "the economy," the sociologist by "the society" and the political scientist by "the state," in so far as these differ. As an economy the system may be capitalistic or communistic or something between; as a society it may veer toward individual freedom or toward autocracy; as a state it may be democratic or totalitarian. Social organization of some kind there must be if the masses of men are to receive benefits from the laboratories and cloisters of the men of science.

A recent Associated Press dispatch from Shanghai will illustrate the way in which natural science, when implemented by social organization, may extend the lives of persons who are utterly lacking in knowledge of its aims and methods; "In this war-shocked, disease-ridden city any resistance on the part of a Chinese war refugee against vaccination is efficiently countered by health workers with strong-arm methods. While a sock on the jaw or the application of a half-Nelson may seem a bit drastic, such measures are often the only means of overcoming the Oriental fear of a bit of arm-scraping and a dose of vaccine." In its essentials, this mode of applying science through social organization is familiar to all of us.

But while social organization in cooperation with natural science is saving lives, social *disorganization,* especially on an international level, is destroying the lives and the cultural achievements of millions and reducing the standards of living of hundreds of millions. Science has been unable to prevent and in some respects has actually furthered social disorganization. How long will social organization, in forms competent to translate natural science into living standards, be able to endure as against the forces throughout the world making for war and other forms of social disintegration?

In the United States, we find: One third of the nation ill-fed, ill-clad and ill-housed; tremendous surpluses of food products and cotton; the producers of lumber, steel, glass, cement and other building materials operating well below capacity. Are the greater possibilities of improving standards of living in the United States to be found in expansions of production or in improvements in distribution? In further applications of science to productive enterprise or in perfecting the social organization?

In the *long run,* in my opinion, further applications of science to the increase of production will be required. From both the short-run and the long-run standpoints improvements in the mechanism of distribution and a recasting of present forms of social organization are essential. What shapes the recasting

[6] *Cf.* "Science," F. R. Moulton, SCIENCE, June 18, 1937, Vol. 85, No. 2216.

will produce I do not know. *Laissez-faire* in my opinion, and that of the publication *Fortune*,[7] is dead. The forms of departure from *laissez-faire* known as fascism, communism and national socialism all seem to me highly objectionable. I believe that ways can be found to reconcile social and political democracy with social efficiency in a system which will permit the untrammeled development of science and the distribution of its benefits to all the people. Hence, it would appear that *just now,* in accordance with the economic principles of *increasing* and *diminishing returns,* additional increments of scientific development would be most profitable in the fields of distribution and in respect to the perfection or recasting of social organization. These are tasks for social science rather than natural science.

These are questions of deadly seriousness for our present industrial civilization. Since the beginning of the industrial revolution in Europe, there has been a general upward trend in the possibilities of life—the *minimum* minimum standard of living. There has also been a great increase in material culture, though whether this has contributed more to the "standard of life" or to the "standard of comfort," using Marshall's distinction, is not certain.

Prior to the World War there seemed to be progress in the development of certain elements of immaterial culture which most people like ourselves deemed "desirable." These included "democracy," "civic consciousness," personal liberty, liberalism, universal education, cultural leveling, the free development of individuality, scholarship, research, tolerance, sophistication, urbanity, cosmopolitanism, pacification and perhaps pacifism, world-wide economic and intellectual interdependence, international justice, international law, humane sentiment, attention to personal cleanliness and appearance, esthetic sensitivity and appreciation, "sincerity" in architectural standards and more frequent and more rapid intercommunication over wider areas. Most of these are still regarded as desirable by people such as we. Others are being widely challenged and some have an interest mainly historical. The war brought subtle and often imperceptible changes in our valuations. Even in 1918, John Maurice Clark, Walton H. Hamilton and Harold G. Moulton pointed to "the establishment of new industrial standards, the enlarged domain of control, *the changes in personal habits and the newer conceptions of what is worth while in national and individual life*"[8] that would affect the transition from war to peace.

Before the war, the social mechanism, both internationally and within each nation, was becoming more subject to failure of parts to intermesh. The sacrifices of war were made endurable to democratic peoples by the faith that it would recast the worn-out parts and reset the ill-fitting gears. It was a war to make the world safe. These faiths have been very largely dissipated. World tensions have been growing more rapidly than before the war to end war. What meanings can be obtained from these experiences? What are the near-term prospects for human life and civilization on this planet? The world confronts two types of hazards, in my opinion: first, a catastrophic breakdown in its social organization; second, a slow disintegration and decay of social organization.

I have referred above to "war and other forms of social disorganization." This really begs an important question. Warfare has served at many historical junctures as a force making for social unification, organization and cultural diffusion; just as slavery, also, has had its periods of usefulness as an instrument of progress. But warfare, with the World War marking a turning point, has radically changed its character.

Traditionally, war has been a conflict between armies. The morale of the civilian populations behind the lines was usually strengthened by it, and nations could emerge from war with the social fabric more firmly inter-knit than before. To-day there are no lines to stay behind. The destruction of the morale and social organization, not to speak of the civilian lives, of the enemy nation have become major military objectives. Technological progress has facilitated the prosecution of these objectives, as by the development of aerial warfare. Technology has also increased the vulnerability to attack of social organization; first, by contributing to social complexity; second, by increasing social dependence upon material structures open to physical attack, such as central power stations, transportation and communication systems, and concentrated centers of manufacturing production.

For these reasons, a catastrophic breakdown in social organization, as a result of another world war involving unparalleled destructive efficiency, seems a distinct possibility. This is the forecast of H. G. Wells in his "Things to Come."

The possibility of slow decay in social organization arises from more subtle forces of disintegration at work within the social structure itself. The retardation of the birth rate; the prospective stabilization or decline of national populations; the weakening or disappearance of traditional sanctions for individual behavior; and the failure, in western liberal, capitalistic countries, to devise efficient means for the distribution of the products of technology, seem to be among these forces.

The existence of both of these hazards is an evidence of the seeming limitations upon man's capacity to

[7] "Business and Government," *Fortune Magazine*—February, March, April, May, 1938.

[8] Clark, Hamilton and Moulton, "Readings in the Economics of War," University of Chicago Press, p. 6, 7. Italics are mine.

direct a mechanism so complex as his own social organization.

A characteristic of periods of social stress and strain seems to be the tendency of peoples to seek escape into phantasy or *other-worldliness* from the over-difficult perplexities of real life. A leading economist said to me during the trough of the depression that we were headed in the United States for the "——est religious revival that this country has ever seen." His expectations were not realized, perhaps, because of the economic recovery that rapidly ensued thereafter. However, we see many evidences to-day of the same basic phenomenon to which he alluded. With a certain attitude of desperation the world is sacrificing its hopes of higher living standards on behalf of towering, nonproductive armaments; meanwhile seeking psychological compensation in phantasy. The unprecedented "success" of Walt Disney's "Snow White and the Seven Dwarfs" and the wide appeal of James Hilton's "Lost Horizon" illustrate the point.

I think it significant that the present-day pessimism in the nations which are striving to preserve simultaneously liberalism, capitalism and democracy, is not engendered by fear that natural science and technology, of themselves, may fail to provide foundations for further expansions of production. It arises from fear of universal warfare and the general breakdown of existing social institutions. Science itself, in the latter event, might perforce be compelled to retreat again into the cells to which it was once confined by medieval theology. Even now, in large and important nations, science has been commandeered by the priests of force and intolerance. Without understanding that science can prosper only when abundantly supplied with the air of freedom, they would drive it to serfdom and prostitution on behalf of bastard political and anthropological doctrines.

We whistle and believe that "it can't happen here." This keeps up our courage. I believe that we must do more. Natural science and social science must join their efforts in undertaking the realistic task of constructing social organization, national and international, that can function and produce for the well-being and improvement of mankind. Only then can we believe with confidence that improvements in world standards of living are a reality.

OBITUARY

HEINRICH WILLIAM POLL

DR. HEINRICH POLL, anatomist and biologist, died suddenly on June 12, 1939, in his sixty-second year. Long denied common decencies of human living in the home country which he loved even to the end, he had found refuge in Lund, Sweden. It was here that he died after but a few days of freedom, tragically burdened by concern over the welfare of Mrs. Poll (Dr. Clara Poll Cords), who remained in Germany.

Poll was born on August 5, 1877, in Berlin. In 1900 he received the degree of doctor of medicine from the University of Berlin, where during 1899 he served as assistant to Oscar Hertwig. Appointed privatdocent in the Berlin Institute of Anatomy and Biology in 1904, he was elevated to professorship in 1907 and to extraordinary professorship in 1922. In 1924 he removed to the University of Hamburg, to occupy the ordinary professorship and to serve as director of the Institute of Anatomy and Human Genetics. Displaced from this position in 1934, he remained thereafter without institutional connection.

In 1928–29 Poll presented the first series of Flexner Lectures at Vanderbilt University, and on the occasion of this visit in the United States lectures were given also at the University of Chicago, Columbia, Harvard, Washington University and Yale.

Poll's first publications appeared in 1896; as a youth in the late teens he was already driven by the urge which made of him a scholar in all that the true sense of the word implies. That urge never deserted him. Even through the dark years which followed 1934 Poll did not cease his studies, hampered though he was by material obstacles and stresses, which for another might have stultified productive work. His bibliography, numbering over one hundred titles, closes with two papers in press, and other investigations were left unfinished.

His studies for the most part lie in three fields: physical anthropology, the endocrines and genetics. It is significant to note that his two first publications are concerned respectively with physical anthropology and endocrinology. Both these interests endured through a working career of over four decades, and for a large part of this period genetical investigations claimed a share of his attention. To each of the three fields Poll contributed distinct advances, not only directly but through his students as well. His most important work in physical anthropology is perhaps that concerned with finger prints, a subject which commanded first place in his interests during the later years. He developed a novel and revealing methodology, with the use of which he investigated racial variation, geographic variation within single races, constitution and symmetry. In endocrinology, his early demonstration (1896) of survival of transplanted adrenal tissue, the discovery of adrenal-like elements in invertebrates and a series of studies on the interrelation of the sex glands and adrenal are noteworthy. His