Notes on the post-industrial society (I)

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Notes are often a difficult form for a reader — even, I suspect, a reader of *The Public Interest*. He naturally prefers a tidy exposition which makes its points in some linear fashion and which comes to a specific conclusion. In a sense, this is a peculiarly “American” demand. The presumption is usually made that every problem has a solution, and one can march towards it in a direct line. Indirection irritates. It suggests ambiguity or complexity which, in the American vernacular, becomes translated as evasiveness or hesitation.

Nevertheless, here are some “notes.” I have chosen this form, not to irritate the reader (though this may be a consequence), but to suggest the incompleteness of my own thoughts and the tentativeness of my formulations. For the past four years, I have been engaged on a long work entitled *The Post-Industrial Society*. It is an effort to deal with underlying structural changes in American society. The purpose of the following “notes” is to suggest some of the directions that my inquiry has been taking.

- **Speeding-up the time machine**

  It was once exceedingly rare to be able to observe the formation of institutions *de novo*. Social change was crescive and moved slowly.
Adaptations were piecemeal and contradictory, the process of diffusion halting. In his reflections on history, thirty-five years ago, Paul Valéry, the quintessential French man of letters, remarked that:

"There is nothing easier than to point out the absence, from history books, of major phenomena which were imperceptible owing to the slowness of their evolution. They escape the historian's notice because no document expressly mentions them... "An event which takes shape over a century will not be found in any document or collection of memoirs..."

Today, not only are we aware of, and trying to identify, processes of change, even when they cannot be "dated," but there has been a speeding-up of the "time-machine," so that the interval between the initial impetus to change and its realization has been radically reduced. A study by Frank Lynn of twenty major technological innovations that have had a substantial economic and/or social impact during the last sixty to seventy years indicates that every step in the process of technological development and diffusion has accelerated during this period. Specifically:

¶The average time span between the initial discovery of a new technological innovation and the recognition of its commercial potential decreased from 30 years (for technological innovations introduced during the early part of this century, 1880-1919) to 16 years (for innovations introduced during the post-World War I period) to 9 years (for the post-World War II period).
¶The time required to translate a basic technical discovery into a commercial product or process decreased from 7 to 5 years during the 60-70-year time period investigated.
¶The rate of diffusion (measured by economic growth) for technological innovations introduced during the post-World War II period was approximately twice the rate for post-World War I innovations and four times the rate for innovations introduced during the early part of this century.

Perhaps the most important social change of our time is the emergence of a process of direct and deliberate contrivance of change itself. Men now seek to anticipate change, measure the course of its direction and its impact, control it, and even shape it for predetermined ends.

• The prophet from the past

More than a hundred and fifty years ago, the wildly brilliant, almost monomaniacal technocrat, Claude-Henri de Rouvroy, le Comte de Saint-Simon ("the last gentleman and the first socialist" of France), popularized the word industrialism to designate the emergent society, wherein wealth would be created by mechanized production rather than be seized through plunder and war. Past society, said Saint-
Simon, had been military society, in which the dominant figures were noblemen, soldiers, and priests, and the leading positions in the society were based either on control of the means of violence or on the manipulation of religious myth. In the new society, the "natural élite" that would organize society in a rational, "positive" fashion would be the industrialists (actually the engineers or technocrats), for the methods of industry were methods of order, precision, and certainty, rather than of metaphysical thought. In this society, ordered by function and capacity, "the real noblemen would be industrial chiefs and the real priests would be scientists."

The revolution which ended feudal society—the French Revolution—could have ushered in the industrial society, said Saint-Simon, but it did not do so because it had been captured by metaphysicians, lawyers, and sophists, men with a predilection for abstract slogans. What was needed, Saint-Simon added, was a breed of "new men"—engineers, builders, planners—who would provide the necessary leadership. And since such leaders require some inspiration, Saint-Simon, shortly before his death, commissioned Rouget de l'Isle, the composer of the "Marseillaise," to write a new "Industrial Marseillaise." This "Chant des Industriels," as it was called, was given its première in 1821 before Saint-Simon and his friend Ternaus, the textile manufacturer, at the opening of a new textile factory in Saint-Ouen.

The episode takes on a somewhat comic air, especially when we read that a number of the Count's followers established a new religious cult of Saint-Simonianism to canonize his teachings. (In the monastic castle to which the followers of Saint-Simon retreated, garments were buttoned down the back so that, in socialist fashion, each man would require the help of another in order to dress.) And yet many of these same followers of Saint-Simon were also the men who, in the middle of the 19th century, redrew the industrial map of Europe.*

We may at this point leave the story of Saint-Simon and his followers to the curiosas of the history of ideas. But if, with the spirit

*It is not too much to say, Professor F. H. Markham has written, "that the St. Simonians were the most important single force behind the great economic expansion of the second Empire, particularly in the development of banks and railways." Enfantin, the most bizarre of the St. Simonians, formed the society for planning the Suez Canal. The former St. Simonians constructed many of the European railways—in Austria, Russia, and Spain. The brothers Emile and Isaac Pereire, who promoted the first French railway from Paris to Saint-Germain, also founded the Crédit Mobilier, the first industrial investment bank in France, as well as the great shipping company, the Compagnie Générale Transatlantique which today sails the Flandre and the France, and which gave its first ships the names of St. Simonian followers, including the Saint-Simon (1,987 tons).
rather than the method of Saint-Simon, one speculates on the shape of society forty or fifty years from now, it becomes clear that the "old" industrial order is passing and that a "new society" is indeed in the making. To speak rashly: if the dominant figures of the past hundred years have been the entrepreneur, the businessman, and the industrial executive, the "new men" are the scientists, the mathematicians, the economists, and the engineers of the new computer technology. And the dominant institutions of the new society — in the sense that they will provide the most creative challenges and enlist the richest talents — will be the intellectual institutions. The leadership of the new society will rest, not with businessmen or corporations as we know them (for a good deal of production will have been routinized), but with the research corporation, the industrial laboratories, the experimental stations, and the universities. In fact, the skeletal structure of the new society is already visible.

- The transformation of society

We are now, one might say, in the first stages of a post-industrial society. A post-industrial society can be characterized in several ways. We can begin with the fact that ours is no longer primarily a manufacturing economy. The service sector (comprising trade; finance, insurance and real estate; personal, professional, business, and repair services; and general government) now accounts for more than half of the total employment and more than half of the gross national product. We are now, as Victor Fuchs pointed out in The Public Interest, No. 2, a "service economy" — i.e., the first nation in the history of the world in which more than half of the employed population is not involved in the production of food, clothing, houses, automobiles, and other tangible goods.

Or one can look at a society, not in terms of where people work, but of what kind of work they do — the occupational divisions. In a paper read to the Cambridge Reform Club in 1873, Alfred Marshall, the great figure of neo-classical economics, posed a question that was implicit in the title of his paper, "The Future of the Working Classes." "The question," he said, "is not whether all men will ultimately be equal — that they certainly will not be — but whether progress may not go on steadily, if slowly, till, by occupation at least, every man is a gentleman." And he answered his question thus: "I hold that it may, and that it will."

Marshall's criterion of a gentleman — in a broad, not in the traditional genteel, sense — was that heavy, excessive, and soul-destroying labor would vanish, and the worker would then begin to value education and leisure. Apart from any qualitative assessment of contemporary culture, it is clear that Marshall's question is well on the way to achieving the answer he predicted.
In one respect, 1956 may be taken as the symbolic turning point. For in that year – for the first time in American history, if not in the history of industrial civilization – the number of white-collar workers (professional, managerial, office and sales personnel) outnumbered the blue-collar workers (craftsmen, semi-skilled operatives, and laborers) in the occupational ranks of the American class structure. Since 1956 the ratio has been increasing: today white-collar workers outnumber the blue-collar workers by more than five to four.

Stated in these terms, the change is quite dramatic. Yet it is also somewhat deceptive, for until recently the overwhelming number of white-collar workers have been women, who held minor clerical or sales jobs; and in American society, as in most others, family status is still evaluated on the basis of the job that the man holds. But it is at this point, in the changing nature of the male labor force, that a status upheaval has been taking place. Where in 1900 only fifteen percent of American males wore white collars (and most of these were independent small businessmen), by 1940 the figure had risen to twenty-five percent, and by 1970, it is estimated, about forty percent of the male labor force, or about twenty million men, will be holding white-collar jobs. Out of this number, fourteen million will be in managerial, professional, or technical positions, and it is this group that forms the heart of the upper-middle-class in the United States.

What is most startling in these figures is the growth in professional and technical employment. In 1940, there were 3.9 million professional and technical persons in the society, making up 7.5% of the labor force; by 1962, the number had risen to 8 million, comprising 11.8% of the labor force; it is estimated that by 1975 there will be 12.4 million professional and technical persons, making up 14.2% of the labor force.

- **A new principle**

   In identifying a new and emerging social system, however, it is not only in such portents as the move away from manufacturing (or the rise of “the new property” which Charles Reich has described) that one seeks to understand fundamental social change. It is in the defining characteristics that the nerves of a new system can be located. The ganglion of the post-industrial society is knowledge. But to put it this way is banal. Knowledge is at the basis of every society. But in the post-industrial society, what is crucial is not just a shift from property or political position to knowledge as the new base of power, but a change in the character of knowledge itself.

   What has now become decisive for society is the new centrality of theoretical knowledge, the primacy of theory over empiricism, and the codification of knowledge into abstract systems of symbols that can be translated into many different and varied circumstances.
Every society now lives by innovation and growth; and it is theoretical knowledge that has become the matrix of innovation.

One can see this, first, in the changing relations of science and technology, particularly in the matter of invention. In the 19th and early 20th centuries, the great inventions and the industries that derived from them — steel, electric light, telegraph, telephone, automobile — were the work of inspired and talented tinkerers, many of whom were indifferent to the fundamental laws which underlay their inventions. On the other hand, where principles and fundamental properties were discovered, the practical applications were made only decades later, largely by trial-and-error methods.

In one sense, chemistry is the first of the "modern" industries because its inventions — the chemically-created synthetics — were based on theoretical knowledge of the properties of macromolecules, which were "manipulated" to achieve the planned production of new materials. At the start of World War I, hardly any of the generals of the Western Allies anticipated a long war, for they assumed that the effective naval blockade of the Central powers, thus cutting off their supply of Chilean nitrates, would bring Germany to her knees. But under the pressure of isolation, Germany harnessed all her available scientific energy and resources to solving this problem. The result — the development of synthetic ammonia by Bosch and Haber — was a turning point, not only in Germany’s capacity for waging war, but also in the connection of science to technology.*

In a less direct but equally important way, the changing association of theory and empiricism is reflected in the management of economies. The rise of macro-economics and of governmental intervention in economic matters is possible because new codifications in economic theory allow governments, by direct planning, monetary or fiscal policy, to seek economic growth, to redirect the allocation of resources, to maintain balances between different sectors, and even, as

*In Modern Science and Modern Man, James Bryant Conant, who, before becoming a distinguished educator, was a prominent chemist, tells the story that when the United States entered World War I, a representative of the American Chemical Society called on Newton D. Baker, then Secretary of War, and offered the services of the chemists to the government. He was thanked and asked to come back the next day — when he was told that the offer was unnecessary since the War Department already had a chemist! When President Wilson appointed a consulting board to assist the Navy, it was chaired by Thomas Edison, and this appointment was widely hailed for bringing the best brains of science to the solution of naval problems. The solitary physicist on the board owed his appointment to the fact that Edison, in choosing his fellow members, had said to President Wilson, "We might have one mathematical fellow in case we have to calculate something out." In fact, as R. T. Birge reports, during World War I there was no such classification as "physicist;" when the armed forces felt the need of one, which was only occasionally, he was hired as a chemist.
in the case of Great Britain today, to effect a controlled recession, in an effort to shape the direction of the economy by conscious policy.

And, with the growing sophistication of computer-based simulation procedures — simulations of economic systems, of social behavior, of decision problems — we have the possibility, for the first time, of large-scale "controlled experiments" in the social sciences. These, in turn, will allow us to plot "alternative futures," thus greatly increasing the extent to which we can choose and control matters that affect our lives.

In all this, the university, which is the place where theoretical knowledge is sought, tested, and codified in a disinterested way, becomes the primary institution of the new society. Perhaps it is not too much to say that if the business firm was the key institution of the past hundred years, because of its role in organizing production for the mass creation of products, the university will become the central institution of the next hundred years because of its role as the new source of innovation and knowledge.

To say that the primary institutions of the new age will be intellectual is not to say that the majority of persons will be scientists, engineers, technicians, or intellectuals. The majority of individuals in contemporary society are not businessmen, yet one can say that this has been a "business civilization." The basic values of society have been focused on business institutions, the largest rewards have been found in business, and the strongest power has been held by the business community, although today that power is to some extent shared within the factory by the trade union, and regulated within the society by the political order. In the most general ways, however, the major decisions affecting the day-to-day life of the citizen — the kinds of work available, the location of plants, investment decisions on new products, the distribution of tax burdens, occupational mobility — have been made by business, and latterly by government, which gives major priority to the welfare of business.

To say that the major institutions of the new society will be intellectual is to say that production and business decisions will be subordinated to, or will derive from, other forces in society; that the crucial decisions regarding the growth of the economy and its balance will come from government, but they will be based on the government's sponsorship of research and development, of cost-effectiveness and cost-benefit analysis; that the making of decisions, because of the intricately linked nature of their consequences, will have an increasingly technical character. The husbanding of talent and the spread of educational and intellectual institutions will become a prime concern for the society; not only the best talents, but eventually the entire complex of social prestige and social status, will be rooted in the intellectual and scientific communities.
• Things ride men

Saint-Simon, the "father" of technocracy, had a vision of the future society that made him a utopian in the eyes of Marx. Society would be a scientific-industrial association whose goal would be the highest productive effort to conquer nature and to achieve the greatest possible benefits for all. Men would become happy in their work, as producers, and would fill a place in accordance with their natural abilities. The ideal industrial society would by no means be classless, for individuals were unequal in ability and in capacity. But social divisions would follow actual abilities, as opposed to the artificial divisions of previous societies, and individuals would find happiness and liberty in working at the job to which they were best suited. With every man in his natural place, each would obey his superior spontaneously, as one obeyed one's doctor, for a superior was defined by a higher technical capacity. In the industrial society, there would be three major divisions of work, corresponding, in the naive yet almost persuasive psychology of Saint-Simon, to three major psychological types. The majority of men were of the motor-capacity type, and they would become the laborers of the industrial society; within this class, the best would become the production leaders and administrators of society. The second type was the rational one, and men of this capacity would become the scientists, discovering new knowledge and writing the laws that were to guide men. The third type was the sensory, and these men would be the artists and religious leaders. This last class, Saint-Simon believed, would bring a new religion of collective worship to the people that would overcome individual egoism. It was in work and in carnival that men would find satisfaction; and in this positivist utopia, society would move from the governing of men to the administration of things.

But in the evolution of technocratic thinking, things began to ride men. For Frederick W. Taylor, who—as the founder of scientific management—was perhaps most responsible for the translation of technocratic modes into the actual practices of industry, any notion of ends other than production and efficiency of output was almost

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*The word *technocracy* itself was first coined in 1919 by William Henry Smyth, an inventor and engineer in Berkeley, California, in three articles published in *Industrial Management* of February, March, and May in that year. These were reprinted in a pamphlet, and later included with nine more articles, written for the *Berkeley Gazette*, in a larger reprint. The word was taken over by Howard Scott, a one-time research director for the Industrial Workers of the World, and was popularized in 1933-34, when Technocracy flashed briefly as a social movement and a panacea for the depression. The word became associated with Scott, and through him with Thorstein Veblen, who, after writing *The Engineers and the Price System*, had been associated earlier with Scott in an educational venture at the New School for Social Research. Interestingly, when the word became nationally
nonexistent. Taylor believed strongly that "status must be based upon superior knowledge rather than nepotism and superior financial power," and in his idea of functional foremanship he asserted that influence and leadership should be based on technical competence rather than on any other skills. But in his view of work, man disappeared, and all that remained was "hands" and "things" arranged, on the basis of minute scientific examination, along the lines of a detailed division of labor wherein the smallest unit of motion and the smallest unit of time became the measure of a man’s contribution to work.

In the technocratic mode, the ends have become simply efficiency and output. The technocratic mode has become established because it is the mode of efficiency — of production, of program, of "getting things done." For these reasons, the technocratic mode has spread in our society. But whether the technocrats themselves will become a dominant class, and in what ways the technocratic mode might be challenged are different questions.

- **Soldiers ride things**

It was the root idea of Saint-Simon, August Comte, and Herbert Spencer, the 19th-century theorists of industrial society, that there was a radical opposition between the industrial and the military spirit. The one emphasized work, production, rationality; the other display, waste, and heroics. Out of technology, economizing, and investment would come productivity as the basis of an increasing wealth for all, rather than exploit and plunder as the means of seizing wealth from others. In ancient society, work was subordinated to war and the warrior ruled; in industrial society, the times would become pacific and the producer would rule.

The irony is that, while the economizing spirit — the deployment of limited resources to attain maximum results — has indeed spread throughout society, it has been war rather than peace that has been largely responsible for the acceptance of planning and technocratic modes in government.

Instead of peace, every industrial society has a Wehrwirtschaft, a "preparedness economy," or a mobilized society. A mobilized society is one in which the major resources of the country are concentrated on a relatively few specific objectives defined by the government. In these sectors, in effect, private needs are subordinated to social goals and the role of private decision is correspondingly repopular through Scott, it was repudiated by Smyth, who claimed that Scott’s use of the word fused technology and autocrat, “rule by technicians responsible to no one;” whereas his original word implied “the rule of the people made effective through the agency of their servants, the scientists and technicians.”
duced. The Soviet Union is a mobilized society par excellence. Most of the “new states,” in their quest for modernization, have become mobilized: the basic resources of the society — capital and trained manpower — are geared to planned economic change.

In recent years, America has taken on the features of a mobilized polity in that one of the crucial scarce resources, that of “research and development” — and more specifically, the work of most of the scientists and engineers in research and development — is tied to the requirements of the military and of war preparedness. The United States has not done this by outright commandeering of talents, or by restricting the right of nongovernmental units to engage in R & D. But since R & D is always a risk, in that no immediate payoffs or profits are assured, and the costs of R & D have become astronomical, few institutions other than the government can underwrite such expenditures. And the government has been compelled to do so because of the extraordinary revolutions in the art of war that have occurred since 1945.

In one sense, as Herman Kahn has pointed out, military technology has supplanted the “mode of production,” in Marx’s use of the term, as a major determinant of social structure. Since the end of World War II there have been almost three total revolutions in military technology, with complete and across-the-board replacement of equipment, as older weapons systems were phased out without being used. Neither World War I nor World War II represented such complete breaks in continuity.

The source of these accelerated revolutions — changes in the character of atomic weapons, from manned bombers to missiles, from fixed missiles to roving missiles and from medium-range to intercontinental missiles — has been concentrated research and development, concerted planning for new systems of weaponry. And the technology of “custom-crafted” missile construction, as against bombers, was a chief element in changing the “production-mix” of the aerospace industry labor force, so much so that the Budget Bureau Report on Defense Contracting (The David Bell Report of 1962) estimated that the ratio of engineers and scientists to production workers in the aerospace industry was roughly one-to-one.

In the Economic Report of the President, presented to Congress in January 1963, President Kennedy declared: “The defense, space and atomic energy activities of the country absorb about two-thirds of the trained people available for exploring our scientific and technical frontiers.... In the course of meeting scientific challenges so brilliantly, we have paid a price by sharply limiting the scarce scientific and engineering resources available to the civilian sectors of the American economy.” By now, it is likely that President Kennedy’s estimates are too low.
Who holds power?

Decisions are a matter of power, and the crucial questions in any society are: who holds power, and how is power held? Forty-five years ago, as we have noted, Thorstein Veblen foresaw a new society based on technical organization and industrial management, a "soviet of technicians," as he put it in the striking language he loved to employ in order to scare and mystify the academic world. In making this prediction, Veblen shared the illusion of Saint-Simon that the complexity of the industrial system and the indispensability of the technicians made military and political revolutions a thing of the past. "Revolutions in the 18th century," Veblen wrote, "were military and political; and the Elder Statesmen who now believe themselves to be making history still believe that revolutions can be made and unmade by the same ways and means in the 20th century. But any substantial or effectual overturn in the 20th century will necessarily be an industrial overturn; and by the same token, any 20th-century revolution can be combatted or neutralized only by industrial ways and means."

This syndicalist idea that revolution in the 20th century could only be an "industrial overturn" exemplifies the rationalist fallacy in so much of Veblen's thought. For, as we have learned, though technological and social processes are crescive, the crucial turning points in a society are political events. It is not the technocrat who ultimately holds power, but the politician.

The major changes which have reshaped American society over the past thirty years— the creation of a managed economy, a welfare society, and a mobilized polity— grew out of political responses: in the first instances to accommodate the demands of economically insecure and disadvantaged groups— the farmers, workers, Negroes, and the poor— for protection against the hazards of the market; and, later, as a consequence of the concentration of resources and political objectives following the mobilized postures of the Cold War and the space race.

The result of all this is to enlarge the arena of power, and at the same time to complicate the modes of decision-making. The domestic political process initiated by the New Deal, which continues in the same form in the domestic program of the Johnson administration, was in effect a broadening of the "brokerage" system— the system of political "deals" between constituencies. But there is also a new dimension in the political process which has given the technocrats a new role. Matters of foreign policy are not a reflex of internal political forces, but a judgment about the national interest, involving strategy decisions based on the calculations of an opponent's strength and intentions. Once the fundamental policy decision was made to oppose the Communist power, many technical decisions, based on military
technology and strategic assessments, took on the highest importance in the shaping of subsequent policy. And even the reworking of the economic map of the United States followed as well, with Texas and California gaining great importance because of the importance of the electronics and aerospace industries. In these instances, technology and strategy laid down the requirements, and only then could business and local political groups seek to modify, or take advantage of, these decisions so as to protect their own economic interests.

In all this, the technologists are in a double position. To the extent that they have interests in research, and positions in the universities, they become a new constituency — just as the military is a distinct new constituency, since we have never had a permanent military establishment in this country before — seeking money and support for science, for research and development. Thus the technical intelligentsia becomes a claimant, like other groups, for public support (though its influence is felt in the bureaucratic and administrative labyrinth, rather than in the electoral system and through mass pressure). At the same time, the technologists provide an indispensable administrative mechanism for the political office-holder with his public following. As the technical and professional sectors of society expand, the interests of this stratum, of this constituency, exert a greater pressure — in the demands not only for objectives of immediate interest but in the wider social ethos which tends to be associated with the more highly educated: the demands for more amenities, for a more urbane quality of life in our cities, for a more differentiated and better educational system, and an improvement in the character of our culture.

But while the weights of the class system may shift, the nature of the political system, as the arena where interests become mediated, will not. In the next few decades, the political arena will become more decisive, if anything, for three fundamental reasons: we have become, for the first time, a national society (though there has always been the idea of the nation) in which crucial decisions, affecting all parts of the society simultaneously (from foreign affairs to fiscal policy) are made by the government, rather than through the market; in addition, we have become a communal society, in which many more groups now seek to establish their social rights — their claims on society — through the political order; and third, with our increasing "future orientation," government will necessarily have to do more and more planning. But since all of these involve policy decisions, it cannot be the technocrat alone, but the political figures who can make them. And necessarily, the two roles are distinct, even though they come into complicated interplay with each other.

[Part Two of these “Notes” will appear in the next issue of The Public Interest.]