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CONTENTS

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THE FIFTH ESTATE[1]

BENJAMIN FRANKLIN was not perhaps in all respects a paragon, but he was unquestionably a polygon—a plain figure with many sides and angles. There were not enough buttons on his black coat to tell off the multifarious aspects in which his complex personality was presented to the world. He was craftsman and tradesman; philosopher and publicist; diplomat, statesman and patriot. And he was, withal, a very human being. What concerns us particularly on this occasion is the fact that he was at once philosopher and man of affairs. His remarkable career should refute forever the fallacy, which, unfortunately, still is current, that the man of science is temperamentally unfitted for the practical business of life.

At the time when Franklin was in England the British Parliament was assumed to be composed of representatives of three estates: the lords spiritual, the lords temporal and the commons, but Edmund Burke, pointing to the Reporters' Gallery, said, "There sits a *Fourth Estate,* more important far than they all." No one at all familiar with the ubiquitous influence and all-pervading power of the press would to-day question the validity of Burke's appraisal. Even then, however, there was present in England in the person of Benjamin Franklin a prototype and exemplar of the membership of a *Fifth Estate,* an estate destined to play an even greater part than its predecessors in the remaking of the world.

This Fifth Estate, to which your attention is appropriately invited on the centenary of the Franklin Institute, is composed of those having the simplicity to wonder, the ability to question, the power to generalize, the capacity to apply. It is, in short, the company of thinkers, workers, expounders and practitioners upon which the world is absolutely dependent for the preservation and advancement of that organized knowledge which we call science. It is their seeing eye that discloses, as Carlyle said, "the inner harmony of things; what Nature meant." It is they who bring the power and the fruits of knowledge to the multitude who are content to go through life without thinking and without questioning, who accept fire and the hatching of an egg, the attraction of a feather by a bit of amber, and the stars in their courses as a fish accepts the ocean.

[1] Delivered in connection with centenary celebration of the founding of the Franklin Institute and the inauguration exercises of the Bartol Research Foundation on September 19, 1924.

The curious deterioration to which words are subject has left us with no term in good repute and common usage by which the members of the Fifth Estate may properly be characterized. Sophists are no longer distinguished for wisdom: they are now fallacious reasoners. Philosophers, who once claimed all knowledge for their province, are now content with speculative metaphysics. Scholars have become pupils. The absent-minded and myopic professor is a standardized property of the stage and screen. The expert, if not under a cloud, is at least standing in the shade. In Boston one hesitates to call a professional man a scientist, he may be a Presbyterian; and a "sage," as an anonymous writer has pointed out, "calls up in the average mind the picture of something grey and pedantic if not green and aromatic." Let us, therefore, for a time at least, escape these derogations and identify ourselves as members of the Fifth Estate.

Although the brotherhood of the Estate is open to all the world, its effective membership nowhere comprises more than an insignificant proportion of the population. Two hundred and fifty constitute the membership of the National Academy of Sciences. The latest edition of "American Men of Science" includes only about 9,500 names. The number is expanded to 12,000 on the roll of the American Association for the Advancement of Science. Although gathered from all countries and though chemistry is one of the most active and inclusive sciences, the chemical papers, books and patents reviewed in *Chemical Abstracts* in 1923 were the product of about 22,000 workers. One may hazard the estimate that there are not in all the world 100,000 persons whose creative effort is responsible for the advancement of science.

The studies of Cattell indicate that in America, at least, the great majority of men of science come from the so-called middle and upper classes, or precisely those sections of society which, in Russia, have been practically exterminated in the name of the new Social Justice. In about two thirds of Cattell's reported cases both parents were American-born, while the fathers of nearly one half were themselves professional men. Seventy-five per cent. are dependent upon the universities for support, from which we may assume that the burden of the higher surtaxes does not bear heavily upon the Fifth Estate.

In proportion to population the cities have produced twice as many scientific men as the country, but how many "hearts once pregnant with celestial fire" repose in country churchyards because of lack of opportunity and absence of the stimulus of contact can not, of course, be known, nor can we tell how many brains competent and equipped to penetrate the mysteries of nature the war has cost the world.

Initiative is one of the rarest mental qualities, yet without it progress is impossible. Its combination with the scientific imagination and command of fact is still rarer and more precious. Since comparatively few of those who study science develop the capacity to extend its borders the cost of a man competent to advance science has been estimated at $500,000 and his value to the community set at a far greater figure. Full membership in the Fifth Estate thus seems to involve the highest initiation fee on record. It is a figure disconcerting to the candidate, but as Wiggam has finely said: "Only genius can create science, but the humblest man can be taught its spirit. He can learn to face truth."

That the Fifth Estate is not better appreciated or always understood by the world at large is not surprising. In their endeavors to secure accuracy of definition and expression its members have evolved a preposterous and terrifying language of their own. It is not ideally adapted to the interchange of confidences in ordinary human intercourse. It does not lend itself to poetry. "Ladybird, ladybird, fly away home" becomes impossible when one is forced to address the prettily spotted beetle as *Coccinella dipunctata*. A primrose by the river's brim is much more than a yellow primrose to the botanist: it is a specimen of *Primula vulgaris*. The organic chemist produces a new synthetic product in a mass of pilular dimensions and bestows upon it a name that would slow up Arcturus. Nothing but static interference can account for the terms of radio telephony. If knowledge is to be humanized it must first be translated.

Dewar has said that the chief object of the training of a chemist is to produce an attitude of mind. It should be the object of all education to produce the scientific attitude toward truth. We may even agree with Robinson that "of all human ambitions an open mind, eagerly expectant of new discoveries and ready to remould conviction in the light of added knowledge and dispelled ignorances and misapprehensions, is the noblest, the rarest and the most difficult to achieve."

Carlyle says, "The degree of vision that dwells in a man is a correct measure of the man." And President Coolidge has been quoted as saying in a recent interview:

> Everything that flows from the application of trained intelligence and invested capital is the result of brains. . . . The man of trained intelligence is a public asset. . . . We go forward only through the trained intelligence of individuals but we, not the individuals, are the beneficiaries of that trained intelligence. In the very nature of things we can not all have the training but we can all have the benefits.

Now vision, a trained intelligence and an open mind are the qualities which characterize all those who are worthy of membership in the Fifth Estate. They are qualities which the many-sided Franklin possessed in exceptionally high degree.

Among all the activities with which his busy life was crowded Franklin undoubtedly found his greatest pleasure in the pursuit of science, and in that pursuit he followed the eclectic method. At a time when nearly everything awaited explanation his focused attention ranged like a searchlight over many fields. He observed the movement of winds and developed a theory of storms. He considered ventilation and the causes of smoky chimneys and proceeded to invent new stoves. He introduced the Gulf Stream to Falmouth skippers and demonstrated the calming effect of oil on turbulent seas to officers of the British Navy at Portsmouth. From earthquakes he turned to the heat absorption of colored cloths and the fertilizing properties of gypsum. He wrote on sun spots and meteors, waterspouts, tides and sound. The kite, which for centuries had been the toy of boys, became in Franklin's hands a scientific instrument, the means to a great discovery. That its significance is, even now, not universally appreciated is shown by the recent answer of a schoolboy, "Lightning differs from electricity because you don't have to pay for lightning." To Franklin, as the child of every man knows, we owe our initial conceptions of positive and negative electricity and he was the first to suggest that the aurora is an electrical phenomenon.

The gregariousness, which is a prominent characteristic of the Fifth Estate, found early expression in Franklin. He formed The Junta, a club for the discussion of morals, politics and natural philosophy, and in 1744 drew up a proposal for the organization of the American Philosophical Society, of which later he became president. He established a wide acquaintance and cemented many firm friendships among the foremost scientific men of France and England, by whom he was received on equal terms. In 1753 he was awarded the Copley medal of the Royal Society for his discoveries in electricity and on his leaving England, David Hume wrote: "I am sorry that you intend soon to leave our hemisphere. America has sent us many good things, gold, silver, sugar, tobacco, indigo, but you are the first philosopher and indeed the first great man of letters for whom we are beholden to her."

The professional spirit which animates the Fifth Estate is essentially one of service. Its compelling urge in the search for truth springs from the conviction that the Truth shall make men free. That spirit finds complete expression in Franklin's statement, "I have no private interest in the reception of my inventions by the world, having never made nor proposed to make the least profit by any of them." This impersonal relation to the children of his brain was indeed carried by him to an extent which ordinary human nature would find hard to emulate. "I have," he writes, "never entered into any controversy in support of my philosophical opinons; I leave them to take their chance in the world. If they are right, truth and experience will support them; if wrong, they ought to be refuted and rejected."

There is, nevertheless, a place for militancy in science. The world needs a Huxley for every Bryan.

Franklin was a man of science, but his career proclaims that it is possible to be a man of science and much more besides. Science was made for life and life is more than science. Art in its fullest expression may touch deeper springs, human relations and affections may bring richer rewards, and public affairs may make a more imperious claim. With Franklin as their prototype the members of the Fifth Estate may well strive to emulate his devotion to the public service and his broad and constructive interest in human problems and affairs.

Error and misconception have a feline tenacity of hold upon life, and the Fifth Estate, though richly endowed with latent executive capacity, is still in popular opinion regarded as equipped for thought rather than for action. The practical man, busily engaged in repeating the errors of his forefathers, has little time and less consideration for the distracting theories and disconcerting facts of the man of science. Yet who, among the men of action, is more intensely and truly practical than Carty, Baekeland, Reese or Whitaker? Where shall one find a firmer grasp on the details of business than that possessed by E. W. Rice, Jr., Gerard Swope or Dr. Nichols? What quality caused the young director of a research laboratory to find himself responsible for the production of gas masks to protect four million fighting men? In a time of dire emergency it was a professor of chemistry who organized the great Edgewood Arsenal and developed the means and methods and the trained personnel required to supply munitions for a new type of warfare. It was not to a statesman or a business man or a great manufacturer that the Allies entrusted the supreme command. It was to a teacher in a French military school. The range and value of their public service obscures the fact that Charles W. Eliot was a professor of chemistry and that Hoover is an engineer. The League of Nations is the child of a schoolmaster.

Numerically the Fifth Estate has always been feeble and insignificant. Its total membership at any time could be housed comfortably in a third-rate city. No politician makes a promise or invents a phrase to attract its scattered and ineffective vote. Rarely do its

members sit in Congress: when they do they sit in the gallery.

With less political influence than the sparse population of Nevada the Fifth Estate has recast civilization through its study and application of "the great and fundamental facts of Nature and the laws of her operation." It has opened out the heavens to depths beyond imagination, weighed remote suns and analyzed them by light which left them before the dawn of history. It has moved the earth from the center of the universe to its proper place within the cosmos. It has extended the horizon of the mind until its sweep includes the 30,000 suns within the wisp of smoke in the constellation Hercules and the electrons in their orbits within the atom. It has read the sermons in the rocks, revealed man's place in nature, disclosed the stupendous complexity of simple things, and hinted at the underlying unity of all.

Because of this new breadth of vision, this lifting of the corner of the veil, this new insight into the hidden meaning of the things about him, the mind of man, cramped for ages by taboos and bound by superstition, is emerging into freedom: into a new world rich in promise and of surpassing interest and wonder.

Man brought nothing into the world and through long and painful ages he added little to that nothing: a club, an ax of stone, a pebble in a sling, some skins of beasts, a rubbing of sticks for a fire. He might labor, but to what avail? Even to-day the South American Indian works incessantly, yet his labor produces little more than heaps of stones. To those who would have us believe that all wealth is produced by labor the Fifth Estate replies, "Wealth is the product of brains, and labor is productive only as it is guided by intelligence."

Science is the great emancipator of labor. Bagehot has somewhere said, perhaps in "Physics and Politics," that, during the early stages of civilization, slavery was essential to progress because only through the enforced labor of the many could the few have leisure to think. To-day, in the United States, the supply of available energy is equivalent to sixty man power for every man, woman and child. There is now leisure for all to think, but the millions prefer the movies.

It is not labor but the trained intelligence of the Fifth Estate which has endowed man with his present control of stupendous forces. It has solved problems that for ages have hindered and beset mankind. It has revealed great stores of raw materials, synthesized scores of thousands of new compounds, furnished the fundamental data which find embodiment in machines and processes and in those agencies of transportation and communication that have made of the world a neighborhood. It has enabled man effectively to combat disease, added years to the average life, and made it better worth the living.

Benjamin Franklin died in 1790—one hundred and thirty-four years ago. Could he return to make appraisal what wonders would confront his astonished vision, what triumphs of the Fifth Estate compel his admiration!

Electricity, which to his contemporaries was little more than an obscure force, the curious manifestations of which might supply an evening's entertainment, has become the structural basis of the universe. The atom of Democritus is now a microcosm, vibrant with energy that glows in the white light of the electric lamps, which have replaced the tallow dip. In place of the electrophorus and the charges of the Leyden jar he would find in our own country alone twenty-seven million horsepower driving generators in thousands of stations from which electric energy is distributed to our homes and factories and transportation lines to perform innumerable services. Imagine, if you can, the stunning impact of the impressions that would crowd the day of his return. With what amazement would he converse over a wire from Philadelphia to San Francisco or hear a voice transmitted through the ether from a point halfway around the world. So commonplace a thing as a street car would leave him open-mouthed with wonder, which might well increase at sight of an electric locomotive, hauling its hundreds of tons of freight.

In great industrial plants he would find electricity driving machines of an intricacy, precision and productive power beyond the imagination of his generation, or at work in decomposing cells and in the heart of glowing furnaces fashioning new products. In university and corporation laboratories would be revealed to him the marvels of the X-rays, photography, the fascinating world of the microscope, balances weighing 1/100,000th of a milligram, the spectroscope and all those instruments of precision and research which are the tools of the Fifth Estate. Elements unknown to him would be placed in his hand; fascinating experiments performed to demonstrate properties and relationships beyond his dream. The air, which he studied with reference to winds, combustion and ventilation, would be reduced before him to a liquid as obvious as water, though boiling on a cake of ice.

Where once the postboy and the post chaise were familiar he would find our roads crowded with automotive vehicles and the country gridironed by the railways. Did he wish to send a letter across the continent, he would have only to commit it to the air mail to ensure its arrival in thirty-six hours. Were he called upon to revisit England, there would be no ten-weeks' voyage in a sailing packet, but the speed and luxury of a 50,000-ton liner, oil fired and turbine driven. At Portsmouth, where he calmed the waves

with oil, he would find, instead of wooden frigates and smooth-bore cannon, submarines and armored superdreadnaughts, a single gun of which could sink the entire British Navy as he knew it. Did he wish to proceed to Paris, he would have only to take passage in an aeroplane.

The gardeners Franklin knew grew peas for pleasure or profit. Mendel grew them and established the laws of heredity. Farming, which was a wholly empirical occupation, is now the special concern of a great governmental department devoted to the development of scientific agriculture. Here Franklin would learn of soil analysis and seed selection, of hardier and more prolific varieties of plants, of better breeds of animals, of methods of control of such virulent diseases as splenic fever, anthrax, hog cholera and bovine tuberculosis. He would find his own experiments with gypsum extended to cover the whole field of chemical fertilizers, the air itself converted into an inexhaustible reservoir of plant food, and the efficiency of farm labor multiplied many times by ingenious agricultural machines.

He would find household economics revolutionized: the town pump replaced by running water; electricity a servant in the house; the food supply broadened and stabilized; domestic drudgery assumed by laundry, bakery and factory; tasteful clothing within the reach of all; transportation and amusement for the multitude, and the history of yesterday sold for a penny. Innumerable new industries based on the findings of the laboratory now offer the means of decent livelihood to millions and open careers to thousands.

In great hospitals, permeated with the scientific spirit and equipped with many new and strange devices for the alleviation of human suffering, he would hear of the incalculable benefits which medical and surgical science have conferred upon mankind. He would see the portraits and listen to the story of Pasteur and Lister and Loeb and Ehrlich. We know to-day with what joy and relief the world would welcome a veritable cure for cancer, but we can little realize the emotion with which one like Franklin would learn in a single afternoon of the germ theory of disease, of preventative serums, of antisepsis, of chemotherapy, of the marvelous complexity of the blood stream and the extraordinary influence and potency of the secretions of the ductless glands. What appraisal would he make of the service to humanity which, in little more than a generation, has mitigated the horrors of surgery by the blessings of anesthesia and antisepsis, which has controlled rabies, yellow fever, typhoid fever, tetanus, which is stamping out tuberculosis, curing leprosy, and providing specifics for other scourges of the race. What values would he put on insulin, thyroxin, adrenalin. The physician is no longer compelled to rely on herbs and simples and drastic mineral compounds of doubtful value and uncertain action. Compounds of extraordinary potency, isolated or synthesized by the chemist, are now available to allay pain, correct disorders, prolong life and even to restore mentality and character.

With contributions to their credit which have so enriched and stimulated the intellectual life; which have brought the peoples of the earth together into closer touch than English shires once were; which have revolutionized industry, enlarged the opportunity of the average man, and added so greatly to his comfort and well-being, we may reasonably inquire, "What are the recompenses of the Fifth Estate?"

On the material side they have almost invariably been curiously inadequate and meager. It is incomparably more profitable to draw the Gumps for a comic supplement than to write "The Origin of Species." There is more money in chewing gum than in relativity. Lobsters and limousines are acquired far more rapidly by the skillful thrower of custard pies in a moving-picture studio than by the no less skillful demonstrator of the projection of electrons. The gate receipts of an international prize fight would support a university faculty for a year.

One may recall that Lavoisier was guillotined by a republic that "had no need of chemists," that Priestley was driven from his sacked and devastated home, that LeBlanc, after giving the world cheap alkali, died in a French poorhouse, that Langley was crushed by ridicule and chagrin in his last days. A month before the war who could have believed that within a few years the Fifth Estate in Russia would be utterly destroyed and in Germany and Austria existing at the very edge of starvation. What has happened there may happen again elsewhere if the intelligence of the world does not assume and hold its proper place in the direction of national and world affairs.

In the preface to his recent "Lehrbuch der Photochemie" Professor Plotnikow has written: "Home and property were pillaged by bands of idle Russians who used my library for cigarette papers. Hunger, misery, want and personal insecurity, often approaching fear for my life, were the constant accompaniment of my labors."

One is reminded that Carlyle, on the authority of Richter, says: "In the Island of Sumatra there is a kind of 'light-chafers,' large fireflies, which people stick upon spits, and illuminate the ways with at night. Persons of condition can thus travel with a pleasant radiance, which they much admire. Great honor to the fire-flies, but — ! —"

It is not becoming that the world expect the light

to shine indefinitely when carrying a lantern is often less remunerative than carrying a hod. The money and the years of study required for special training are not recognized as invested capital, and the return from a decade of research is often taxed as the income of a year. Professorial salaries move forward as slowly as a glacier, but they seldom leave a terminal moraine. Yet teaching is our most important business, for a failure to pass on for a single generation the painfully accumulated knowledge of the race would return the world to barbarism.

Though material wealth is rarely acquired by the Fifth Estate, they have the riches of the royal man, defined by Emerson as " he who knows what sweets and virtues are in the ground, the waters, the plants, the heavens, and how to come at these enchantments." Their wealth is in the kingdom of the mind. It is inalienable and tax-exempt. It may be shared and yet retained.

A recent survey by a national magazine would seem to indicate that the majority of men have drifted into their vocations with little effort of selection and that a very large proportion ultimately regret their choice. This is seldom true of members of the Fifth Estate. Theirs is a true vocation, a calling and election. It brings intellectual satisfactions more precious than fine gold. They live in a world where common things assume a beauty and a meaning veiled from other eyes; a world where revelation follows skillful questioning and where wonder grows with knowledge. Together they share the interests, the communion of spirit, the labors and the triumphs of the fraternity of science. The law of diminishing returns exerts a control from which there is no escape in agriculture, industry and business. Research alone is beyond the twelve-mile limit of its inhibitions.

If "the Heavens declare the glory of God" that glory is surely made more manifest by telescope and spectroscope. If the whirling nebulae and the stars in their courses reveal omnipotence, so do the electrons in their orbits reveal His presence in universes brought into being by the striking of a match. The laboratory may be a temple as truly as the church. The laws of nature are the will of God, their discovery is a revelation as valid as that of Sinai, and by their observance only can man hope to come into harmony with the universe and with himself.

There has been a general and ready acceptance by the world of the material benefits of science, while its contributions to sociology and ethics are as generally ignored as guides to human conduct. Yet science proclaims new commandments as inflexible as those engraved on stone and furnishes what Wiggam has reverently termed "the true technology of the will of God."

Science has so drawn the world together and so rapidly remoulded civilization that the social structure is now strained at many points. Statecraft and politics, law and custom lack the plasticity of science and are now in imperfect contact with the contours of their new environment. The result, as events have shown, is friction and confusion. Though our civilization is based on science, the scientific method has little place in the making of our laws. Office does not seek the man in the laboratory, and candidates are not pictured as engaged in any activity that might suggest a superior intelligence. They are shown milking cows, pitching hay in new blue overalls, or helping with the family washing. Recently, in the senate of a New England state, there was presented the edifying spectacle of the presiding officer, being shaved by a barber, called to the rostrum, while senators were reading the encyclopaedia into the record. To expedite further the public business sundry members of the chamber were presently gassed with bromine. Does not this suggest that a few chemists might with advantage be distributed among our legislative bodies?

It is claimed that fifty per cent. of the members of state legislatures in America have never been through high school and that only one in seven has been through college. We see in the ranks of science knowledge without power and in politics power without knowledge. An electorate, which regards itself as free, listens to the broadcasted noise of manufactured demonstrations and is blind to the obvious mechanics of synthetic bedlam. The result is too often government by gullibility, propaganda, catchwords and slogans, instead of government by law based on facts, principles, intelligence and good will.

As President Stanley Hall once said, "man has not yet demonstrated that he can remain permanently civilized." Many thoughtful people have been led to question the ultimate effect of science upon civilization. We all recognize the utility of matches, but we keep them away from children. Meanwhile, science puts dynamite and T.N.T., poison gas, aeroplanes and motor cars at the disposal of criminals and the leaders of the mob. B. Russell, in "Icarus," sees in science the ultimate destroyer. Haldane, in "Daedalus," visualizes it as the stern and vigorous chastener and corrector which will ultimately save the race and usher in the new day of light and reason.

"Knowledge comes but wisdom lingers," and democracy levels down as well as up. Even in Boston cigars have replaced books on a corner famous for a century of literary associations. The world is wrong because few men can think. It will not be made right until those who can not think trust those who can. When its foundations are so obviously out of joint humanity still clings tenaciously to fossilized

precepts and opinions and is as resentful of suggested change as in the days of Galileo. Despite the pressure of new ideas, education must still, to be acceptable, follow old conventional lines.

Though we go from here to happy homes, let us not deceive ourselves. Human life is still a hard and fearsome thing. Mankind is required to maintain existence in a world in which, as Kipling has said, "any horror is credible." More than a hundred years ago De Quincey wrote, "We can die, but which of us, knowing as some of us do, what is human life, could, were he consciously called upon to do it, face, without shuddering, the hour of birth." But little more than yesterday Henry Adams closed his "Education" with the expression of the hope that perhaps some day, for the first time since man began his education among the carnivores, he would find a world that sensitive and timid natures could regard without a shudder.

Everywhere there is upheaval and unrest. "The machine," to quote Dr. Elton Mayo, "runs to an accompaniment of human reverie, human pessimism and sense of defeat."

We are everywhere overburdened by unnecessary illness, crushing taxation, extravagant and inefficient governments, huge expenditures for trivialities and the appalling waste of effort, material and resources. We are hampered by class suspicion and misunderstanding, racial antagonisms, the inhibitions of organized labor and the lack of imagination in high places. Life in general is on a low cultural plane and bound by custom and tradition.

One hundred years of science have failed to satisfy the cravings of humanity. Chesterton finds science "a thing on the outskirts of human life—it has nothing to do with the center of human life at all." We do not, of course, agree with him, but we must still meet the challenge of John Jay Chapman, who declares: "Science, which filled the air with so large a bray, is really a branch of domestic convenience, a department for the study of traction, cookery and wiring. The prophet-scientists have lived up to none of their prospectuses." The fault, however, as Wiggam points out, is not with science, nor with the scientists. It is with those who "have mainly used the immense spiritual enterprise of science to secure 5-cent fares, high wages and low freight rates," when it should have "ushered in a new humanism."

Thus we still encourage race-deterioration, still carry the burden of the unfit, still cultivate national antipathies, still are breeding from poor stock, and witnessing with equanimity the suppression of the best.

The history of aristocracies, feudalism, the church, the guilds and the soviets has amply demonstrated that no one class possesses the qualities required for the government of all classes, and we can not claim them for the Fifth Estate. We can, however, claim with full assurance that the Fifth Estate possesses many qualities, now practically ignored, which could be utilized in government to the incalculable advantage of us all. Its knowledge of material facts, of natural and economic laws, of the factors governing race development and human relations; its imagination, vision and its open mind should be brought to bear effectively in the formulation of national policies and the solution of governmental problems. There is an alternative before us, which has recently been defined with somewhat surprising frankness by Warren S. Stone, president of the Brotherhood of Locomotive Engineers, perhaps the most conservative of the labor unions. Mr. Stone says:

> But until labor, in the inclusive sense in which I am using it, secures control of legislative and executive branches of the national and state governments, and through control of the executive branch secures control of the judiciary, labor is in continuous peril or seeing its gains wiped out and its progress retarded, by hostile legislation or unfriendly court decisions.

Our countrymen may well consider whether they prefer participation in government by the Fifth Estate to the benefit of all or control of government by labor unions in the interest of labor.

Since most of the troubles that beset mankind have their origin in human nature it would seem worth the while of those who make our laws to study and apply the findings of the biologists and psychologists as to what human nature really is and the springs of its motivation.

Plato called democracy "the best form of bad government." It will be the best form of good government only as it develops the capacity to breed leaders and the faith to trust them. The quality of our children will determine the quality of our democracy. If our laws and mores and economic structure continue to discourage breeding from our best strains, if there is to be no adequate recompense for service of the higher types, the time is not far distant when democracy will no longer be safe for the world. If the Fifth Estate were everywhere to be wiped out, as it has been in Russia, the result would be vastly more calamitous than universal war.

Oswald Spengler, in a recent monumental work, forecasts the downfall of western civilization and would prove his thesis by the history of past cultures. But never in the past has man lived in so compact a world, never has he had such facilities for intercommunication with his fellows, never has he been endowed with such control of natural forces. He has

never known himself so well and, above all, never before has he had it in his power to direct so definitely the course of his own development. Our civilization is certainly imperiled, but there will be no downfall if mankind can be taught to follow the light already before it. As lantern bearers, it is the clear duty of the Fifth Estate to show the way. In the past the world has suffered grievously from lack of knowledge; to-day it suffers from its rejection or misapplication. Could the springs of human conduct and the affairs of peoples now be regulated only as wisely as we now know how there would be work and leisure and decent living for all. The criminal, the defective, the feeble-minded would be breeded out, and sane minds in sound bodies breeded in. The loss and suffering from preventable disease and accident would not be tolerated. Higher standards would govern the selection for the public service. Planning would replace *laissez-faire* development, and a rational conservation check the reckless waste of our resources. Production and distribution would attain to levels of efficiency altogether new, and the many injustices now existent in human relations would well-nigh disappear. With the reaction of a freed intelligence on politics, religion, morals we might hope for a broader tolerance, a better mutual understanding. With the recognition of the spirituality of science and the divinity of research and discovery should come larger interests and a new breadth of vision to the average man, and to us all acknowledgment of the steadfast purposive striving shown in the development of the created world and a reverent appreciation of man's privilege to aid and further this development.

We might reasonably expect ugliness to be replaced by beauty in our cities and small towns and later even in our homes. Government by intelligence for the general good of all should supersede government by special interests, blocs, faddists and fear of organized minorities and the uninformed crowd. With it all would come relief from the economic pressure, which bears so heavily upon the Fifth Estate that its children, which should be counted among the best assets of the community, are now a luxury.

The world needs most a new tolerance, a new understanding, an appreciation of the knowledge now at hand. For these it can look nowhere with such confidence as to the members of the Fifth Estate. Let us, therefore, recognize the obligation we are under. Ours is the duty and the privilege of bringing home to every man the wonders, the significance and the underlying harmony of the world in which we live.

ARTHUR D. LITTLE

JOHN MACLEAN—CHEMIST[1]

JOHN MACLEAN, M.D., the first professor of chemistry in the College of New Jersey (Princeton) and, according to Dr. Edgar F. Smith, one of the first chemists in the country at the close of the 18th century, was born in Glasgow, March 1, 1771, which made him a contemporary of Davy, Dalton, Priestley, Lavoisier, Berzelius, Avogadro and other very eminent chemists. His father, for whom he was named, was a surgeon of note, who was present at the capture of Quebec from the French, and he was the third man to scale the formidable heights of Abraham. His mother was Agnes Lang, of Glasgow.

While very young he lost both of his parents, whereupon George Macintosh, a gentleman of rare worth, became his guardian. It is of interest to note that he was the father of Charles Macintosh, F.R.S., a wealthy chemical manufacturer who invented the water-proof cloth.

Young Maclean received his early education at the Glasgow Grammar School and in the university, which he entered before he was 13 years of age, thus indicating that he was a precocious lad. This is borne out by the fact that he was awarded several premiums in school and in the university. It appears that he was much interested in the classics, particularly Latin, and in later years he wrote to his son, John Maclean, Jr., who became the tenth president of Princeton, as follows: "Be assured, that notwithstanding what ignorant and lazy people say, it is a matter of great consequence for every gentleman or professional man to be a good classical scholar."

At the university it is said that he gave close attention to chemistry, mathematics and natural philosophy, and especially to chemistry. In the 16th year of his age he joined the Chemical Society of Glasgow, before which he read at least seven papers, including one on *respiration*, another on *fermentation* and another on *alkalies*. Some of these papers contained suggestions in advance of the science of that day.

While at Glasgow Dr. Maclean also studied medicine and anatomy, for it was his purpose to become a surgeon. From Glasgow he went to Edinburgh, primarily, it may be presumed, to attend the chemical lectures of the celebrated Dr. Black. From Edinburgh he repaired to London and to Paris, where he had the best facilities for the study of chemistry and surgery. While a student at Paris, Lavoisier, Berthollet and other famous chemists were busy with their investigations, and Maclean was no doubt greatly impressed by them.

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