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ANDREW CARNEGIE, PATRON OF LEARNING[1]

By Dr. JAMES B. CONANT

PRESIDENT OF HARVARD UNIVERSITY

WITH this evening's dinner we end a celebration which I am sure you will all agree has been most impressive. We bring to a conclusion this century's formal salutation to the memory of a most remarkable man. Now I am not qualified even to attempt to evaluate the part Andrew Carnegie played in the industrial development of this country; nor am I sufficiently informed as to the history of philanthropic enterprises to try to estimate the magnitude of the results accomplished by his immense donations. But it is clear even to the most casual observer that on this occasion we pay tribute to a unique personality, a single individual who had original ideas and the ability and character to put them into practice. When in Carnegie's own words "he resolved to stop accumulating and to begin the infinitely more serious and difficult task of wise distribution," he made for his day a novel decision. He turned a corner, as it were, and the Anglo-Saxon world following him looked at an old problem from a new angle.

Andrew Carnegie departed from the beaten track both in accumulating his wealth and, what is vastly more important, in disposing of it. I like to think that among the other objects he had in mind in the distribution of his money was the idea that for generations to come his own unorthodox actions might enable other men in entirely different walks of life to be equally original. As Mr. Keppel has said, Carnegie in the conduct of his business believed in the importance of finding the right man and then betting on him heavily. The same principle, to my mind, may be applied throughout the whole range of human activities. Unfortunately nowadays this is too often overlooked in our research institutes and our universities. The scientific director of a large and successful company once said to me, "We could burn all the specifications for making our products, we could sink all our plants to the bottom of the Atlantic, but if we kept

[1] Delivered at the Andrew Carnegie centenary dinner at the Waldorf-Astoria, New York, November 27, 1935.

the carefully selected staff we now have, we would succeed all over again. If we were to lose these men, however, all our plans and buildings and machinery would be of no use to us." If that is true of industry, how much more true it is of education and of research. Why bother too much about what is the most profitable field for future exploration or which of the many educational novelties seems best? Get the men, back them heartily, and very little else matters.

Andrew Carnegie, when he established the Carnegie Institution, clearly had in view not only the advancement of knowledge but the advancement of it by essentially the same practical method which he had used throughout his long business career—a method which made him suggest as his epitaph, "Here lies one who knew how to gather around him men who were cleverer than himself." The first two aims of the new institution which Carnegie established in Washington for the advancement of science were as follows (I quote from the deed of trust):

1. To promote original research, paying attention thereto as one of the most important of all departments.
2. To discover the exceptional man in every department of study, whenever and wherever found, inside or outside of schools, and enable him to make the work for which he seems specially designed his life work.

Would that these words might be engraved on the hearts of college presidents, deans and heads of departments—yes, and even on the hearts of presidents of great foundations, if Mr. Keppel will allow me to say so. Then there might be more hope that the present traditional stereotyped demands on our educational funds would diminish and the amount of fluid money available for the exceptional man would increase. There would be less talk of "new developments to be supported," less concern for the "most promising fields for exploration," less discussion of the "best projects for further study." There would be fewer schemes for the staff officers to mull over at headquarters, there might even be fewer staff officers.

One of the unfortunate results of the tremendous increase in the size of our universities has been the multiplication of administrative officials. And too often the men in these positions have been long divorced from active participation in research or teaching. They are out of touch with the fighting on the front line and their attention is too closely riveted to the maps and plans which lie on their tables. They fondly conceive that they have a clearer and broader grasp of what is going on than the captain in the thick of the fighting. A false analogy with business probably is responsible for the increasing number of non-scholarly executives who have been appointed to academic posts in recent years. But in this connection the testimony of an eminent scientist who has long directed research in industry is of interest. Dr. Mees is reported to have said recently: "The best person to decide what research work shall be done is the man who is doing the research. The next best man is the head of the department [he was speaking of an industrial organization]. After that you leave the field of best persons and meet increasingly worse groups. The first of these is the research director who is probably wrong more than half the time. Then comes a committee which is wrong most of the time. Finally there is the committee of company vice presidents which is wrong all the time." When administrative officers themselves continue to devote a considerable portion of their time and energies to creative work and teaching, however, the situation is entirely different—the dangers of educational bureaucracy largely disappear.

To return now to the founding of the Carnegie Institution, this was a peculiarly interesting event for a number of reasons. It was an early recognition of the vital significance of research. More than a generation ahead of most business men of this country, Andrew Carnegie understood the importance of science to industry. He has told us in his autobiography about his very early realization of the value of a chemist to a steel mill—a revolutionary idea in the 70's. Undoubtedly his interest in pure science had its origin in such experiences. But after all, the essentials of the final scheme for the institution might have been written for him by others—such things have happened with benefactors. It is important to remember, therefore, that he refused to establish a National University at Washington, as Dr. White had advised him to do. He replied to White that "while this does, as you say, ensure immortality to the founder, it has hitherto seemed to me not needed, and this puts immortality under foot." His own alternative proposal, the Carnegie Institution, seems to have been the result of his personal conviction "that under present conditions greater good would result from cooperation with, and strengthening of, existing universities throughout the country."

A story in connection with the founding of the Carnegie Institution illustrates the theme which some of you may think I am over-emphasizing to-night. Just at the moment of the establishment of this foundation for advancing science, Carnegie refused a request to build a laboratory for a certain university, but at the same time saw to it that a substantial annual grant for research was given to the very promising young scientist whose solicitations he had refused. Knowing something of the history of this particular case, I can say with considerable assurance that as between the two alternatives, a laboratory or backing

the young man, subsequent events showed that Andrew Carnegie was absolutely right. He had picked a Nobel Prize winner fourteen years before the event!

Now Mr. Keppel has asked me a difficult question, perhaps one that is too difficult. Indeed, if it were any one else who raised this point I might suspect him of purposely hurling at me an unanswerable query in order to spike my whole line of argument. Mr. Keppel has asked, "How are we to find the man who is worth supporting? By what process are we to discover the exceptional man?" My answer is—by much hard work and a sixth sense; a sixth sense that some people, including Andrew Carnegie, have had. As a matter of fact, I am inclined to think that this sixth sense might be found on analysis to be fundamentally only a passionate interest in the kind of man you are looking for, and the keenest possible desire to find him. My real answer to the challenge behind the question is that it can be done because it has been done. And those of us who control the expenditure of money, whether as officers of foundations or research institutions or universities, must enlist the services of those who have this sixth sense and who are worthy successors to such great connoisseurs of young talent as President Gilman and President Thomas.

All who have read the biographies of the scientific men of Central Europe in the last century will have come across repeated reference to one Carl Kappeler, for thirty-one years president of the Board of Education of the Swiss Confederacy and the virtual ruler of the Technische Hochschule at Zürich. The long list of distinguished men who in their youth filled the scientific and mathematical chairs at Zürich prove that Kappeler, who made the appointments, was a master of his craft. He has been described as one remarkable for "the keen scent with which he knew how to find young outstanding talent." The writer of a biographical note says that "Although he consulted with the authorities in the various fields about the scientific proficiency of the candidates, when professorships were to be filled, with regard to their teaching ability upon which he rightly laid equal weight, he trusted entirely to his own judgment. He did not spare long journeys—turning up now in the lecture rooms of one city, now in another, in order to acquaint himself at first hand with the individuals in question. Almost always his choice fell on the right man." We can perhaps gain a little more insight into this remarkable educational administrator's sixth sense from a story related by Emil Fischer in his autobiography. This chemist at the age of thirty-two was spending a few days in a summer hotel where it so happened that Carl Kappeler was also a guest. Kappeler, on discovering that the young man's name was Fischer and that he was a German professor of chemistry, sent a message to inquire which of the two cousins he might be, Emil or Otto, for as Emil Fischer remarks, "er war über die jungen Naturforscher in Deutschland ausgezeichnet unterrichtet." To be excellently informed about all the young men in academic posts is no simple task; but this evidence alone convicts Kappeler of being that sort of enthusiast who nowadays is encountered only among the readers who devour the news and gossip of professional baseball! A short time after this Kappeler offered Fischer the professorship at Zürich, and all who know anything of the debt we owe to Fischer's genius will score this invitation as one more mark of Kappeler's prowess as a judge of men.

If Mr. Keppel and I are fortunate enough to have a second Kappeler by our side and are wise enough to listen to his counsel, what shall we do for the exceptional man when he is found? Exactly what Kappeler did—give him an opportunity worthy of his promise. See that he teaches a course that is a little too difficult an assignment, see that he has a little more support in the way of money and men for research than he feels is justified; a little more support than he dares hope for, but not much more. In short, put him in a position of scholarly responsibility which will bring out all that is good in him, and then leave him alone for a number of years. Don't list the number of his papers or weigh his books; give him air and room to move and leave him to his own devices. The rivalry and criticism of his professional colleagues will supply any external stimulus that may be necessary. In this manner I believe the Johns Hopkins University was conducted in its opening years, thus initiating a new era in American scholarship and education.

There is one very disturbing and fundamental question that Mr. Keppel did not ask me—indeed one I am sure he would never think of formulating—but it is being asked to-day and many people are demanding the answer in an increasingly hostile tone. To all I have said thus far this evening, some would reply with one word,—why? Why should we try to find the exceptional man, why should we be interested in the future eminent scholar or great investigator, why do such men need encouragement, why provide them with facilities for their work? Hasn't there been enough research already—perhaps too much poring over old authors, too much digging up of ancient civilizations better left buried, too many discoveries in the natural sciences with their attendant inventions—the source of much evil in the world? Many are saying to-day—put on the brakes, slow down. They suggest that the human race has not yet reached a stage of moral development where it can wisely employ all this accumulated intellectual wealth.

An editorial writer in a leading scientific journal

recently used these words: "The very frailty of civilization may demand certain limitations on the freedom of investigation possessed by the man of science." This is a novel doctrine for an Anglo-Saxon journal of science and is significant of the trend of opinion. In the same article we find the ominous suggestion that "with the very continuance of civilization itself in doubt, something in the nature of a mobilization of scientific efforts in its support becomes an urgent need." The vision of the meeting of staff officers again comes immediately to mind. Must we have scientific planning for the advancement of science? Must we have a board of control which will direct the forward movement and perhaps even order strategic retreats when necessary, or indeed declare a complete cessation of the fighting if it is decided that the frailty of civilization has passed a certain critical value? Of course, if we began even to approximate such a situation, much of what I have been saying is quite beside the point. Our whole attitude changes at once. There is no need of trying to find the exceptional man under such circumstances, for he is by definition original and he will have novel ideas. History shows that such men never relish having their freedom limited even in the interests of civilization. Above all, we must not give him ample support without restraint; instead we may need to check him gently. His ambition will certainly be to "turn the corner" and Heaven knows what he may find there—quite possibly this sick society of ours may not be able to stomach it!

So, instead of exceptional men free to do what they want in their laboratories and free to write what they want in their libraries, we shall have clever workers without any imagination (and there will be no difficulty in recruiting this army). Then all the general staff will have to do is to give the orders. No crude, peremptory statements to do this or stop doing that. Those in command will merely have to draw their plans and then, by controlling the expenditure of money for research and salaries, they can have their ideas put into execution; or rather they can try to have them put into execution. If the gentlemen in control are interested only in relatively short advances in knowledge, the consolidation of positions as it were, they certainly will not fail. But the history of the last five centuries shows clearly that except in trivial matters such methods of directing intellectual activity can succeed only in checking it. If that is the real object desired, then there will not be the slightest difficulty.

I suppose the conflicting points of view in all such matters arise from different interpretations of history. Since the revival of learning in the Italian towns of the fourteenth century, man's spirit of intellectual adventure has been periodically rampant. In spite of waves of reaction and persecution, there has been an ever-increasing interest in new departures, a restless ambition to push on. More and more man's "desire to know why and how" has been in the ascendancy. That fundamental passion, curiosity, has been given free rein—a passion which Hobbes has described as "a lust of the mind that by a perseverance of delight in the continuall and indefatigable generation of knowledge, exceedeth the short vehemence of any carnall pleasure." To this human passion we owe the recapture of the world of ancient Greece and a constructive interest in the art and literature of ancient Rome. Many who may be inclined to deplore the results of man's recent curiosity in the fields of science would be loath to relinquish the fruits of the labors of the humanists in the fourteenth and fifteenth centuries. But the fundamental urge which drove those men to collect manuscripts, to learn Greek, to relive antiquity was exactly the same as that which two hundred years later moved Galileo to measure the swings of the cathedral lamp by means of his pulse beats. The patrons of learning were actuated by essentially the same motives as the men of wealth who have later supported scientific research. If one were to summon a demon to blot out all that has developed in the last six hundred years as a result of man's ungoverned curiosity, not only science but a large part of our knowledge of classical antiquity would disappear. Is there anybody who really believes that it would have been better if the intellectual outlook of the Middle Ages had not been transformed by the forces of the Renaissance?

In the introduction to his study of the seventeenth century, Basil Willey states clearly the fundamental question which must be answered by those who decry the advent of the modern world: "Do we or do we not approve the action of the Paduan professor who refused to look through Galileo's telescope?" he asks. "If we find that we condemn the professor," he continues, "we have already decided on the main issue." There are some intelligent, educated persons to-day who appear to take a position equivalent to that of not only applauding the professor but of wishing him brought back to the scene, armed with plenipotentiary powers to destroy the telescope or at least determine when and how it should be used.

Of course, there has been much evil attendant on the tremendous release of individual energy which has characterized the development of our modern civilization. Some are inclined in the present sad years to regard only the debit side of the ledger and conclude that intellectual and moral bankruptcy are inevitable. Much the same situation must have existed in Italy at

the opening of the sixteenth century. Many, many people who deplored the tremendous orgy of vice and corruption which was then rampant in even the highest circles must have been ready to wipe out all the advances of the two preceding centuries. Even some of those who were unmoved by the enthusiasm of a religious revival must have been ready to subscribe to the verdict of that austere priest who passionately declared, "The whole world is in confusion; all virtue is extinguished, and all good manners; no living light abroad, no one who blushes for his vices." They may well have cursed the memory of Petrarch, who had prized so deeply his manuscripts of Homer and Plato, and longed so ardently for the ability to read them. They may well have wished that he and his followers had never spread a knowledge of the Greek language and ancient philosophy and literature throughout the Italian peninsula. But even when we read of all the evils of that time and even when we are inclined to attribute them all to the revival of learning, do we wish to turn back the pages of history and erase what the humanists accomplished? We who see the anarchy and chaos of those times only through the glass of history will confidently say no. Let us consider how three hundred years from now our present fearful falterings will be regarded. Will it be said that with the advancement of knowledge well under way and man's horizons just beginning to clear, the human race became so preoccupied with material ills that it succumbed to terror and, in the interests of security, curiosity was confined? Or will it be said that, frightened as they were and bowed down by much trouble and suffering, nevertheless in one country—the traditional home of freedom—men still retained confidence in the importance of the great intellectual adventure?

The next twenty-five years will probably answer these questions, although those who are alive may not understand the full significance of what transpires. To my mind a fair indication of the way the tide is running will be afforded by noting to what extent we are still interested in finding and supporting Andrew Carnegie's "exceptional man."

HOW CARS GO OUT OF CONTROL: ANALYSIS OF THE DRIVER'S REFLEXES[1]

By Professor YANDELL HENDERSON
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A RECENT accident on a road by a lake in Switzerland—the most tragic and sorrowful event in the entire history of the motor car—challenges science. Accidents of this type are frequent. The conditions producing them exist in every modern car and every motorist. For the analysis and explanation of these conditions—particularly as concerns the reactions of the motorist—all that is needed is the application of well-established principles of neuro-physiology. Yet up to the present time no one appears to have made such an analysis.[2]

The type of accident is that in which the explanation commonly offered is that "the car went out of control." Yet in many cases subsequent examination demonstrates that the steering gear, motor and brakes were in good order.

In reality, it is the motorist who "goes out of control." Yet he acts in the only manner that his nature permits: the manner in which every human being always instinctively acts—and always will act—under the circumstances.

In all cars now, the throttle is controlled by the downward pressure of the motorist's right foot upon a pedal. Any occurrence that causes him suddenly to press down hard upon that pedal opens the throttle wide and causes the car to leap ahead with maximal acceleration. If he is then forced by his own reactions to continue to hold his foot clamped down hard upon that pedal, the car drives ahead until it collides with some object sufficiently solid to stop it or until it is overturned or until the motorist is thrown out of his seat. If he is thrown out and his foot thus removed from that pedal, the car slows down or stops. If, on the contrary, he retains his seat to the end, the speedometer is generally found to indicate a high speed at the instant of final crash. The critical feature in these accidents is, therefore, the continued pressure of the motorist's foot on the throttle pedal.

Normally the motorist regulates the speed of the car and its starting and stopping by means of several highly artificial reactions developed in his nervous system through training and experience. When speed is called for, he obtains it by a steady pressure with his right foot: an act that through all the ages prior to the invention of the motor car was never before employed by man or any of his animal ancestors to produce either rapid acceleration or continuous motion.

If the motorist wishes to go more slowly or to stop, he calls into play another much more complex acquired reaction. He draws his foot back, moves it a few

[1] Presented to the National Academy of Sciences, November 18, 1935.

[2] For a discussion of motor accidents at the British Association for the Advancement of Science, see the (London) *Times* of September 11, 1935.