SCIENCE

VOL. 86 FRIDAY, SEPTEMBER 24, 1937 NO. 2230

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal
Lancaster, Pa. Garrison, N. Y.

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

MEDICAL PROGRESS IN THE LAST HUNDRED YEARS[1]

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IN the final analysis, however we may view the passage of the last one hundred years, what we here set down constitutes the recountal of a chapter in history. Not the formal stodgy detailing of name, date and place; not the mere description of men and of movements; not a philosophical interpretation of the causes and effects of events, but in the truest sense of the words the outlining of a pageantry of progress. During the past century, the mills of God have woven no other fabric so shot through, in both warp and woof, with the incomparably brilliant, gold and scarlet and royal purple as is the tapestry of medicine.

Your and my difficulty lies not in conceding the wonders of accomplishment of this century, but rather in setting down the facts on which they rest, without ending up with a mere catalogue of assets. And if we are to escape the dilemma of piling discovery on discovery and of glorifying discoverer after discoverer, then we must recognize in the first instance that, like man himself, medicine can not thrive detached, but waxes and wanes in direct proportion to the inspirational impetus furnished her by the times in which she works. This is a truth, the generality of which is in no way invalidated by the fact that, on occasion, there comes from within the realm of medicine itself the stimulus that energizes and colors an entire era. Such was the case, for example, in the instances of Hippocrates and Galen, of Vesalius and his followers and of Harvey, to mention only a noted few.

Centuries, like men, have souls; but the perspective of time is required for their evaluation. Who among us would be bold enough to predict with assurance the final judgment of history on these hectic days through which you and I are elbowing our ways?

The seventeenth century was a time of individualism run riot. There were great writers—Shakespeare and

[1] Address before the St. Louis Medical Society centennial celebration, on April 6, 1937.

Milton; great painters—Rembrandt and Velasquez; great musicians—Bach and Purcell; great philosophers—Newton, Leibnitz, Bacon, Spinoza, Descartes and Locke; great satirists—Molière and Cervantes; great pathfinders—Servetus, Galileo and Copernicus. Medicine contributed her seventeenth century heroes in the persons of Harvey and van Leeuwenhoek, not in themselves a phalanx, it is true, but nevertheless constituting a fine illustration of Marlowe's "Infinite riches in a little room."

The eighteenth century in her turn represented a fatuous attempt to cast into molds or systems the inspirational thinking of the seventeenth century giants, and so we have an era of formalizing—what Garrison calls "tedious and platitudinous formalizing" —that so clutched the spirit of medicine that this branch of knowledge also became the bulwark of theorizers and systematizers, whose dull dialecticism was relieved only by such high lights as Morgagni, the Hunter brothers, Jenner, Auenbrugger and Benjamin Rush.

Then there dawned the era that concerns us this evening—the nineteenth century, a period of revolt against what went on during the preceding hundred years, a loosening of science for all time from the shackles of philosophy and her bastard offspring, natural philosophy, a start on the road of march toward discoveries and accomplishments that have no counterpart in the pages of history.

What was the general characteristic of this nineteenth century? One may subscribe unequivocally to the statement that Taine, the French historian and critic, makes in his "History of English Literature" when he says that:

> On the eve of the nineteenth century the thinking public and the human mind had changed. A new world had arisen. The death of the guild system, the development of railroads, steamboats, textile machinery and the consequent birth of the industrial age led to the establishment of large urban centers holding hundreds of thousands of souls. Comfort, leisure, education and many of the other amenities that grace modern society became the heritages of the common man instead of the privileges of the chosen few. In the early eighteenth century, the total annual circulation of newspapers in England amounted to three thousand numbers—by contrast, long before one half of the nineteenth century had passed, there were being distributed in England seventy-one million newspapers during the course of one year. The enfranchised and prosperous artisans assumed important rôles in governments, playing major parts in wars, commerce, inventions, science and politics. Careers opened up to talents. Under such stimuli, the human mind flowered and throughout the world there was as a consequence, a rebirth of manners, religions, philosophies and science.

And so, what we know as modern man emerged during this nineteenth century of progress. The philosophy of democracy not only tinctured and colored, but it also dominated the minds of nineteenth century men, setting in motion currents and cross-currents that moved now slowly and now with torrential force over established barriers and limits, finally coursing peacefully toward the delta of a transformation which we in our day can so clearly see by a mere glance over the shoulder.

It is of more than passing interest, since we are assaying the soul of the nineteenth century, to call to mind what we have already said in regard to the participation of medicine in the spirit of the times through which she passes, and the influence on her of the ferment which happens to be activating the minds of men in general. How natural it was, indeed, how inevitable it was, that medicine of the nineteenth century should bear the impress of the stamp upon her of such epochal contemporaneous trail blazing as the theories of evolution proposed by Lamarck and Darwin, the atomic theory of Dalton, the law of the conservation of energy demonstrated by Mayer, the firm establishment of organic chemistry by Woehler's synthesis of urea and the complete annihilation of the doctrine of spontaneous generation by Pasteur. It requires little thought to grasp the idea that a century which, like the nineteenth, opened the doors for all talents should stimulate such intellectual activities as these. It requires even less effort of mind to appreciate the irresistible force of such a leaven after its transforming process of fermentation had once started.

The twentieth century contributes thirty-six years toward the completion of the one hundred years that we are evaluating; and in general, estimating this short period as well as we can, handicapped as we are by its proximity and by our rôles as participants, it would seem that it has taken on the complexion of the preceding sixty-four years. There is, however, a notable variation. The nineteenth century represented a free course for all, with the race to the swiftest. In the general mêlée, speed and the mere idea of victory tended to crowd out all thought of how the race was run. In contrast with this spirit of laissez-faire, we are now, if for the moment we bar Germany, Spain and possibly Italy, engaged in the healthful process of moulding a social conscience. Garrison very succinctly summarizes the evidences of this tendency by recounting the efforts expended during the past third of the century on modern studies of foods, drugs, water, soil and sewage; the hygiene of industry and housing; the nutritional studies of children and adults; social surveys and settlement experiments; cooperative movements of various types; intensive studies of nation-wide prophylaxis against alcohol,

gonorrhea, syphilis, tuberculosis and cancer; and finally the interlocking efforts of army, navy, institutes of science, universities and public health agencies of all sorts. This is neither the time nor place to hint at the explosive force of autocracy concealed within the folds of this fabric of fair ideals. There is little cause to fear that man will be sacrificed to the state unless man sinks to the pusillanimous level of meriting such degradation. This is the time and place, however, to point out that just as the nineteenth century demonstrated the unshackling mechanism in the efforts of Darwin, Lamarck, Dalton, Mayer, Woehler and Pasteur, so likewise has the young twentieth century continued the demonstration in the stimulating and energizing influences of Bohr, Millikan, Compton, Einstein, Coolidge, Langmuir, Freud, Pearson, Ehrlich, Roentgen, Pavlov and Fischer, all of them fundamental scientists who lent color and direction to medical progress.

Such then having been what the Germans call the general "Tendenz" of the last hundred years, part of which period lay in the nineteenth century, a smaller part in the twentieth, it is now in order to set down the assets that have flowed to the account of medicine in the form of men, discoveries and procedures conserving health, life and limb, contributing to happiness and increasing the quantum of well-being throughout the world. And that sort of presentation holds within itself all the dangers and pitfalls inherent in literary strategy. Picture yourself comfortably thumbing through the pages of any adequate volume of medical history, noting merely the heroes who have come to constitute our gallery of Lares and Penates. Then assume the task of framing these household gods of medicine within the compass of a half-hour address! By what standard will you evaluate accomplishment so as correctly to group and classify the sowers, the reapers, the gleaners and the inevitable flock of geese who cackle over the discovery of an occasional grain of truth?

The surest way, it seems to me, is to concentrate on the larger conquests of the last hundred years of medicine rather than on the individuals responsible for victories. This means that it will suffice us, for example, to contemplate such a discovery as that of anesthesia as a gift of incomparable and incalculable beneficence, without stressing the historic significance of Sir Humphry Davy, Crawford Williamson Long, William Thomas Morton, Charles T. Jackson, John Collins Warren, Horace Wells or Sir James Y. Simpson. It is significant that when the concept of "the death of pain" gripped the minds of men, there resulted, almost simultaneously, the discoveries of nitrous oxide, ether and chloroform anesthesia. And it is of no less interest that nearly half a century elapsed before the interacting brilliance of the minds of Sigmund Freud and Carl Koller furnished the world with the boon of local anesthesia, to be followed very shortly by spinal and sacral intravenous and rectal anesthesia. In laying on the picture of this dramatic conquest of pain, as we must, in broad splashes with large brush, there should be no wasting of concern over the fact that there results inevitably a blurring of such vital details as the rôles played by Corning, Schleich, Matas, Halsted, Cushing, Crile, Gwathmey and the prohibitively long list of chemists and physiologists who contributed and are still contributing to the expanding field of painless surgery. The significant fact for us this evening is that during the last hundred years the specter of surgical pain has been laid low.

Following a similar line of thought, even though we recognize that were prayers and paternosters, orisons and litanies to go up daily from every heart and hearth and pulpit throughout the world, in honor of Louis Pasteur, they could serve only as scant evidences of his service to humanity. And yet, to-night with callous objectivity we stress only the fact that the last hundred years furnished the world with the means of combatting infection and thus conserving life and of converting hospitals from pest and charnel houses of stench and blood and pain into havens of restoration, sweetness and light and life. Lord Lister's application of Pasteur's discoveries in the field of surgery and Semmelweis' and Holmes' anticipation of these same discoveries in the realm of obstetrics can claim from us only a reverent genuflection. The story that we are telling is that of gifts to humanity rather than of the agencies through which the gift came, during the past one hundred years.

Pity 'tis that we can not even trace the fruits of the gifts as they ripened in the minds and through the efforts of surgeons. The last hundred years gave great surgeons to the world: Cooper, Syme, Liston, Brodie, Larry, Dupuytren, Velpeau, Malgaigne, Nelaton, Bigelow, Warren, Mott, McDowell, Sims, von Langenbeck and Simon, to select only a few from various lands; but these men spent their active surgical years before the introduction of antisepsis. After Pasteur was accepted came Billroth, Eiselsberg, Kocher, Trendelenburg, Tuffier, Chassaignac, Doyen, Jaboulay, Pozzi, Moynihan, Jones, Mayo-Robson, Makins, Bowlby, McBurney, Murphy, Bull, Weir, Seen, Fenger, Deaver, DaCosta and so on in every land and clime, shining in the light that their own times had furnished and, like the vestal virgins, tending that light in such a fashion as to preserve the blaze and heighten its brilliance.

No less brilliant have been the advances that have occurred in the non-surgical fields. Yellow fever dis-

closed the secret of her transmission to Reed, Carrel, Agramonte and Lazear. Once the secret was out, Gorgas saw to it that it was made public property. Typhoid fever similarly yielded to Eberth, in the first instance, and then, similarly, beat a retreat before Wright and Russel. The story is not much different in relation to plague, cholera, diphtheria, tetanus, scarlet fever, hydrophobia, epidemic meningitis and certain types of pneumonia. One has to shake oneself out of a dream, as it were, to grasp the reality of it all. But the facts are writ large in the founding of bacteriology by Koch, on the principles of Pasteur, and the development of the new field by Roux, Behring, Loeffler, Klebs, Kitasato, Bordet, Welch, Smith, the Dicks, and who knows how many other workers in the fields of bacteriology, epidemiology and sanitation. With Schaudinn's discovery, and Noguchi's cultural studies of the pallid spirochaeta, there has come a better understanding of syphilis, and with Ehrlich's arsenic, a marked advance in treatment. The Peruvian romance of malaria was heightened when Laveran discovered the organism responsible for the disease and Ross located the mosquito as the carrier. All these victories rested on the orderly and logical procedure of reasoning from cause to effect. But even the failures to establish specific causes have not put insuperable barriers in the way, as may be witnessed by the partial conquest of diabetes, pernicious anemia, adrenal, thyroid, pituitary and gonadal hypo- and hyper-function through the genius of Banting, Minot, Murphy, Swingle, Kendall, Doisy, Frank and countless others.

In internal medicine, just as we saw to be the case in surgery, the adapters of these fundamental discoveries, in other words, the clinicians, grew in accomplishment as the basic science of their specialty developed. When we contemplate what the fundamentalists did for the oncomers when they established the principles underlying blood measurements by graphic instruments; blood staining and blood transfusion; the unraveling of the endocrine system; the mapping of the brain paths; the establishment of the various tests for functional activities; the visual inspection of the larynx, ear, eye, nose and the various hollow viscera; the rôle of bacteria and parasites in disease, the relationships between the physiology of heart and blood vessels and cardio-vascular diseases—when we contemplate just these few of the countless many brilliant activities of those whom I have called the fundamentalists, then it is not difficult to appreciate why the internists of the earlier of the past hundred years, solid and indispensable as they were, such men as Graves, Adams, Stokes, Cheyne, Bright, Hodgkin, Addison, Schoenlein, Wunderlich, Skoda, Nothnagel, Broussais, Louis and Bretonneau, clinical giants, all of them, were nevertheless of a different stripe from their colleagues, who came later and who could, therefore, lean so heavily on the newly acquired fundamentals. But here we tread on dangerous ground, for we are practically in our own day, speaking, literally, of ourselves. No stratagem of style and no assumed cloak of modesty could furnish satisfying assurance that what we say might not carry the false note of egotism. Perspective, perspective, always perspective is the keynote for the proper evaluation so necessary to the sound judgment of history. The essayist who occupies this place at the bicentennial of the St. Louis Medical Society in 2037 is now and herewith granted full authority to deal with us in accordance with our just deserts and is counseled to avoid, in his turn, the invidiousness involved in characterizing and classifying the clinicians of his own day and generation. Somehow or another, the still small voice seems always to be cautioning against vainglory.

Somewhere it has been said that no man can read all that has been written in any one limited specialty of medicine and retain his reason. With equal appropriateness may we say that reason reels in the attempt to coordinate, in detail, the progress in the field of medicine during the last one hundred years; but since the attack has been made, the task must be completed by the enumeration of a few more of the solid building stones that the men of the past century have placed in the ever incomplete structure of medicine. Even such a seemingly simple selection is not an easy task, because it inevitably necessitates leaving out so many things that are important, even if they be not all keystones in the structural addition to medicine made during the past hundred years.

Virchow, laying the capstone on the labors of Johannes Mueller and Carl Rokitansky, published his "Cellular Pathology" in 1858, thus establishing the basis on which modern pathological thought and method rests, and incisively divorcing medicine from the complex humoralistic theories which had prevailed since the days of Hippocrates. Virchow's cellular concept necessarily rested on the studies of the botanist Schleiden and the anatomist Schwann, the discoverers of the cell as the unit in plant and animal structure—discoveries that were made during the hundred-year period that we are discussing.

It is more difficult accurately to date the birth of experimental physiology; but it would not be inaccurate to say that she too was the child of the century just closing. Purkinje in Bohemia, Magendie in France, Weber in Germany, Sharpey in England and Beaumont in America laid the ground-work, during the first half of this period, for the brilliant physio-

logical studies that followed and that are still following.

Regarding embryology, we may be more accurate and place the birth date during the life of Carl Ernst von Baer, who, in the early days of poor microscopes and no microtomes, discovered the human ovum and cut wondrous microscopic sections out of which he constructed the ground-work for almost all that we know to-day of mammalian development. Likewise is it possible to give the exact date of the accouchement when medicine was delivered of radiology and radiotherapy. We need not even mention, before an audience such as this, that Roentgen and the Curies furnished the inseminating stimulus, considerably less than fifty years ago.

And then there is cancer! In truth still a house of mystery, in so far as specific cause or cure is concerned, but no less in truth a house several doors of which have been opened by keys of the experimental method, furnished in the first instance by Leo Loeb, in 1901, when he showed that cancer could be transplanted or grafted; in the second instance by Yamagiwa and Itchikawa, in 1914, when they showed that cancer could be produced, at will, by the use of tar; in the third instance by the countless investigators who have been busy for the past quarter of a century examining everything, animate or inanimate, in relation to cancer; and in the fourth instance by the clinicians, throughout the world, in their untiring labors with the problem of treatment.

And so we could continue with the story of the development or establishment, during the last hundred years, of such basic branches of medicine as public health, industrial hygiene, international hygiene, medical bibliography, pharmacology, biophysics, biochemistry and the purely technical advances, such as, among many others, micro-injection and micro-dissection techniques. Will you believe me when I tell you that I read recently of some experiments that were based on the administration of enemas to mosquitoes? We could dilate further on what the last half a century has brought forth in the way of specialties such as orthopoedic and neurological surgery, genito-urinary and pulmonary surgery, otology, laryngology, ophthalmology and gynecology—that vast troop of not unmixed blessings that have at one and the same time furnished achievement, splendor and glory and tended to narrow the minds of practitioners within the bounds of specula, mirrors and small calibered tubes.

But we dare not continue, for our time has been set. There remains only a concluding note of caution lest we of to-day take unto our souls too much proud unction for all that which we may claim as the fruit of our own fertile brains. Nothing that the past hundred years has brought forth rests solely on its own bottom. Just as one cell inevitably must grow from a preceding one, just so is every newly discovered fact linked in some way to the recent or remote past efforts of the medical heroes of the long ago.

> All things by immortal power,
> Near and far,
> Hiddenly,
> To each other linked are.
> Thou canst not stir a flower
> Without troubling of a star.

If it be true that there is no pride on earth like the pride of intellect and science, then it would seem that we may well be proud of our last century of medicine; but, in our pride, let us not forget Tennyson's quatrain:

> Read my little fable;
> He that runs may read.
> Most can raise the flowers now,
> For all have got the seed.

SCIENTIFIC EVENTS

THE INSTITUTE OF NEUROPSYCHIATRY OF THE UNIVERSITY OF MICHIGAN

A SPECIAL meeting of the Board of Regents of the University of Michigan was held on July 3, at which recommendations were received and approved for a general plan of management of the Neuropsychiatric Institute. Members of the committee making the recommendations were: John C. Christensen, comptroller and assistant secretary; Dr. H. A. Haynes, director of the University Hospital; Dean Albert C. Furstenberg, of the Medical School; Professor E. Blythe Stason, of the Law School, and Dr. Raymond W. Waggoner, director of the institute.

In future the institute will be a department of the Medical School, to treat mentally diseased persons, to engage in reaserch concerning mental diseases, to aid in establishing in the State of Michigan suitable preventive measures in order to reduce the amount of mental disease in the state and to train physicians and nurses in the care and treatment of mental disease, and further, to provide for the instruction of psychiatric social workers, occupational therapists and physical therapists.

The instructional program and the program of scientific research and of preventive psychiatry will be under the direction of the executive committee and of the dean of the Medical School. The care and treatment of mentally diseased persons will be integrated with the activities of the University Hospital and, acting in that capacity, will be a department of the Uni-