A NEW AMERICAN UNIVERSITY

With the advent of the European War, the so-called solidarity of science as an international solvent suddenly became volatile and vanished.\(^1\) And hardly less speedily universities began to lose their most distinguishing trait, namely, their international character, except in so far as such a relationship could be partially sustained through new alignments. Similarly, with restricted range and limited jurisdiction, smaller war groups have divided up among themselves the world-wide domains of the republic of letters and the commonwealth of learning, whose foundations had been thought to lie "below the tides of war." If the phrases denominational university, sectional university, national university, are each in turn contradictions in terms, likewise an international university—if dominated by a particular form of international mind—is also a contradiction in terms. A university may bear name of place or founder as a means of identification in space and time; if the institution be worthy of the designation, the term university should take care of all the rest; and it takes care of all the rest by excluding all but the disinterested pursuit of truth.

On the shield of the oldest university in America stands the Latin word *Veritas*, whose Anglo-Saxon equivalent is that other fine word, Truth. To truth, others have undertaken to join in turn freedom or justice or goodness or beauty, or any other of the great ideas by which for mankind progress has been gained, only to find all these aspects of truth swallowed up in the thing itself and truth still standing alone "above all things bearing away the victory." On the scroll of the youngest of institutions in America—to which in the essay-review reprinted here from *Science Progress* for July, 1918, Mr. Jourdain politely refers as the latest American university—stand three of the disciplines through which men seek truth.

Of truth-seekers a great company it was that assembled, in the days of which Mr. Jourdain writes, to speed the new university on its high

\(^1\) In the face of reported repudiations of honorary degrees, melting down of gold medals, and renouncing of memberships in alien learned societies during the present conflict, it may be interesting to recall that a hundred years ago, while France and England were at war, Sir Humphry Davy, of the Royal Society and Royal Institution of London, on visiting Paris was received with the highest honors, awarded a gold medal, and elected a foreign member of the Academy of Sciences. See Schuster and Shipley, "Britain's Heritage of Science," 2d edition. London, Constable, 1918.
adventure. From all quarters of the compass they came, for in those fair days now far removed by war's swift sweep, all the highways of the world—the land routes, the air routes, the water routes—were open. To-day most of those highways are closed, and the few remaining open are menaced. To-day no such assemblage could be arranged even in the disinterested interests of the pursuit of truth. To-day war conditions have rendered utterly impossible even the gathering of the clans of letters, science, and art. The uniqueness thus given to the events and the significance of the events themselves may perhaps justify this further reference to a record war-delayed in the making and distribution. In any event, the reader of Mr. Jourdain's essay will find therein views on university education of more than passing interest.


These magnificently produced volumes celebrate the opening of the latest American University. The history of the growth of a noble idea and its materialization are well sketched by the first President of the Rice Institute, Mr. Edgar Odell Lovett, in a paper in the first volume, and the various important inaugural lectures, delivered by eminent men summoned from all parts of the world to Houston, Texas, in October, 1912, form the second and third volumes. To come to details, the first volume also contains the usual preliminaries to an academical festival: list of delegates, addresses of welcome and responses, programmes of concerts, toasts and responses, and accounts of religious services given in the city auditorium. Some of these accounts were reproduced in the Rice Institute Pamphlet (1915, 1, 1-132; 1916, 3, 231-310), and, in the case of the important scientific and other lectures in the second and third volumes, we shall give reference to the reproductions in rather more accessible form in this Pamphlet. The portraits and other reproductions are very fine indeed: in the first volume there are two photogravures of the founder, a view of the University, the general architectural plan, the invitation to the festival, and facsimiles of some of the letters received. The second and third volumes contain finely executed portraits of the

1 An Essay-Review in Science Progress for July, 1918.
authors of the various inaugural lectures, and also one of the subject of
one of these lectures, Henri Poincaré. A half-tone reproduction of the
same portrait of Poincaré is also given in No. 2 of Vol. I (1915) of the
Pamphlet (facing p. 133).

The second volume contains: Rafael Altamira y Crevea, "The Prob-
lem of the Philosophy of History" (265-87; 1915, 1, 256-78), "The
Theory of Civilization" (288-320; 1915, 1, 279-311), and "The Methods
of Extending Civilization among the Nations" (321-46; 1915, 1, 312-37);
Émile Borel, "Molecular Theories and Mathematics" (347-77; 1915, 1,
163-93), "Aggregates of Zero Measure" (378-98; 1917, 4, 1-21), and
"Monogenic Uniform Non-Analytic Functions: The Theories of Cauchy,
Weierstrass and Riemann" (399-429; 1917, 4, 22-52); Benedetto Croce,
"The Breviary of Æsthetic" (430-517; 1915, 2, 223-310); Hugo de
Vries, "Mutations in Heredity" (518-70; 1915, 1, 339-91), "Geographi-
cal Botany" (571-95), "Modern Cytological Problems" (596-614), and
"The Ideals of an Experiment Garden" (615-9); Sir Henry Jones,
"Philosophical Landmarks, being a Survey of the Recent Gains and the
Present Problems of Reflective Thought" (620-80; 1915, 1, 195-255).

The third volume contains: Baron Dairoku Kikuchi, "The Intro-
duction of Western Learning into Japan" (681-725; 1915, 2, 55-99); John
William Mackail, "The Study of Poetry" (726-77; 1915, 2, 1-52);
Wilhelm Ostwald, "The System of the Sciences" (778-867; 1915, 2,
101-90), and "Principles of the Theory of Education" (868-98; 1915, 2,
191-221); Vito Volterra, "Henri Poincaré" (899-928; 1915, 1, 133-62); Sir
William Ramsay, "The Electron as an Element" (929-46; 1915, 1,
392-409), "Compounds of Electrons" (947-61; 1915, 1, 410-24), and
"The Disruption of the so-called Elements" (962-80; 1915, 1, 425-43); Carl
Starmer, "The Corpuscular Theory of Aurora Borealis" (981-
1035); Vito Volterra, "The Generalization of Analytic Functions"
(1036-84; 1917, 4, 53-101), and "On the Theory of Waves and Green's
Method" (1085-1100; 1917, 4, 102-17).

It may surprise some that such a large space is given to pure mathe-
matics in these lectures. But it seems particularly suitable that, in a
large and rather sparsely inhabited province of the United States where
we should expect particular attention to be paid to the practical sciences,
a far-seeing President and Committee should have laid stress on the
great truth that science in general can only proceed if the logical instru-
ment for exact thought and exact expression is diligently cultivated. It
is surely not a mere accident that two of those men among modern
mathematicians should be chosen as lecturers whose work is in the fore-
most line of advance of pure mathematics and has also a very close con-
nection with mathematical physics.
Aspects of University Education

I will now attempt to pick out some of the points of scientific interest in some of the lectures.

Sir Henry Jones attempts to "indicate the manner in which the natural sciences ... must not only extend your mastery over the outer world, but reverberate within your inner selves, enriching and enlarging the powers of your rational nature." The intercourse of Japan with the West began in 1543, and then it was through the Portuguese. Not long afterwards came the English, the Dutch, and the Spanish; but Western medicine, surgery, and mathematics seem to have been introduced by the Jesuits. Baron Kikuchi's short summary is especially interesting from the point of view of the parts which various nations have played in developing the intercourse up to 1912. Mr. Mackail deals in succession with the function of a University, the nature of Poetry, the Modern World, Poetry and Science ("The fancied opposition of science to art and letters, and more particularly to poetry, is injurious to the general interests of mankind. ... The creative instinct, the imaginative impulse, which find expression in poetry, are powerfully reinforced by the discoveries of science and by the growth of the scientific spirit. ..."), Poetry and Business, and Poetry and Democracy. The lecture by Prof. Størmer contains a summary of his researches on aurora borealis which were begun in 1904, and the results of which have been published from 1904 to 1912 in various periodicals.

Two of the lectures by M. Borel and two of those by Prof. Volterra were noticed in the "Recent Advances" of the last number of Science Progress (1918, 12, 544). M. Borel's lecture on "Molecular Theories and Mathematics" starts from the reflection that "it was the study of physical phenomena which suggested the notions of continuity, derivative, integral, differential equation, vector, and the calculus of vectors; and these notions, by a just return, have become part of the scientific equipment necessary to every physicist ...," and examines the influence which molecular theories may have on the development of mathematics. Indeed, "the points of contact between molecular physics and mathematics are numerous," "mathematicians can only gain by investigating [the analogies] more closely," and "the task ... cannot long be deferred of creating an analysis adapted to theoretical researches in the physics of discontinuity." Prof. Volterra's lecture on "Henri Poincaré" emphasizes the very modern aspect of Poincaré's scientific work. At the present day scientific work is published chiefly in the form of memoirs in scientific journals, so that work is often published as it progresses. "The proceedings of the academies, short and precise reviews, have appeared. A man reports in a few words every discovery as soon as he has made it. Time presses; one fears that the next minute the dis-
covery may be lost. . . . This development has created a particular state of mind among scientists, and has changed their lives, their ways of working, and even of thinking. There are great advantages in this modern scientific life. Research has become almost collective. The energies of the investigators are summed; their discoveries follow each other rapidly; competition spurs them on. Their number increases from day to day. But how many objections we can oppose to these advantages!" Indeed, the whole aspect of scientific life has quite changed since the tradition created by Gauss's practice of writing "pauca sed matura." It may be remembered that Weierstrass once remarked that the method adopted by the Paris Academy of Sciences for announcing discoveries seemed to him to injure the work of Poincaré. However, it does not really seem that the objections urged by Weierstrass had weight against Poincaré's best work; as regards his "philosophical" work, certainly much of it gives one the impression of a kind of lively lack of interest in the subject, and consequent carelessness, but the work that Poincaré loved preserves a power of stimulating his readers, and, like many Frenchmen, he thought so quickly and accurately in his chosen domain that one can hardly imagine that his work would have been improved by years of silent meditation before it was published. Prof. Volterra gives a very clear account of certain of Poincaré's mathematical investigations: on the theory of linear differential equations and "Fuchsian" functions, on mathematical physics, and on dynamics and astronomy. In particular, that investigation is described rather more in detail which concerns the equilibrium of a rotating fluid mass.

We have noticed the stimulating effect of much of Poincaré's work, which is partly due to the modern methods of publication. There are some remarks made by Sir William Ramsay, in his reply to a toast after a public luncheon given on the occasion of the opening of the Rice Institute, which seem to bear on the subject. Speaking of the danger of having too large classes of students in a University, he recommended that the number of assistants to a Professor should not be increased but the number of entirely separate departments should be increased. Learned men cannot, he points out, be made like needles or wire or nails, but each student must come into personal contact with his teachers. It seems that this Platonic view ought, perhaps, to be rubbed into our British educational authorities rather than into such authorities in America. The importance of personal contact has never been lost sight of in America: we need only remember the wonderfully broad-minded conditions under which Sylvester held his professorate at Johns Hopkins University.

What seems to be an even greater need at the present time is the
provision of means whereby an intending investigator may keep abreast of the huge flood of literature on scientific subjects. It is—partly at least—owing to the modern conditions spoken of by Professor Volterra that men of science publish their work in short communications at different times and perhaps in different periodicals. The personal element is preserved, in many cases, because we are present, so to speak, at the discovery of what is discovered, but it becomes necessary to have a complete and critical index, a thread to follow in the maze of scientific literature. This seems to be one of the things that can be undertaken by a prosperous University, and by such a University alone. Hitherto the work of this kind has almost wholly been left to Germany. Now, apart altogether from certain national prejudices which undoubtedly appear in many German accounts of other nations' work, and thus affecting both the completeness and the value of the criticism, we are faced with the problem that, for reasons which reduce to financial ones, no European country except Germany ever has been able to undertake such a work on a large scale, while Germany itself will probably be unable to do its part for some time to come. One of the distressing results of the intolerable (to others) government of Germany is that what is good in Germany—good intentions of some of its scientific men—has its power weakened.

It only remains to point out one or two printer's or other mistakes in these noble volumes. The word "the" is sometimes superfluous—at least to British ears: thus "the Nations" (p. 321) and "the mathematical analysis" (p. 984). In the note on p. 273 it is confusing that the title of a book is translated, although the book has not been translated into English, but this confusion is not always made (for example on p. 336). In the notes on pp. 1041 and 1042 the text of the Italian is not translated, as if "Vedi" and "e seg." were part of the title of a book or a paper. On pp. 339 and 428 the word "vigorously" appears instead of rigorous"; and on p. 400 the word "exactly" is wrongly used: Fourier cannot be said to have proved his theorem exactly (that is, rigidly); what the original seems to have meant is that this theorem was exactly what Fourier proved—or rather made very probable.

Philip E. B. Jourdain.