

## CHAPTER 4

### THE EMERGENCE OF THE CAVENDISH SCHOOL, 1895-1900

It was fortunate that the new University regulations, which caused a large influx of students to the Laboratory bent upon original research, came just at the time when the discovery of the Röntgen rays gave us a very powerful method of investigating the phenomena attending the discharge of electricity through gases.

J.J. Thomson<sup>1</sup>

The short period under review [1895 to 1898] is one of the most interesting and important in the history of research in the Cavendish Laboratory . . . Amongst other discoveries it witnessed within its walls the final proof of the nature of the cathode rays, the advent of the negative corpuscle, or electron, as a definite entity, the experimental proof of the character of the conduction of electricity through gases, and the initial analysis of the radiations from radioactive matter.

Ernest Rutherford<sup>2</sup>

#### *4.1. The 1895 Regulation*

During the closing decades of the nineteenth century, it became evident that some of the exclusive traditions of the Universities of Oxford and Cambridge required radical reform to meet the challenges of changing times. One obvious defect was these Universities' lack of graduate programs, which were flourishing in the German-speaking countries and which had already proven their effectiveness and value, particularly in the sciences. Because teaching positions at other universities increasingly were being filled by doctors of science (or Ph.D. holders), graduate students from English-speaking countries were flocking to German universities or British universities where doctoral degrees were available. The problem had political ramifications: was it right for an Australian graduate student to use a British government scholarship to fund his study of electromagnetism at a German university? As the significance of the situation became recognized, a crucial reform in Cambridge's regulations began to be formulated. This reform soon would prove to be one of the most significant events in the history of the Cavendish Laboratory.

---

<sup>1</sup> *A History of the Cavendish Laboratory*, 93.

<sup>2</sup> *Ibid.*, 159.

In February of 1894, Cambridge University's "Council on Post-Graduate Study" released its first report on "the advisability of encouraging the residence in the University of Graduates of other Universities who may desire to pursue in Cambridge a course of advanced study or research."<sup>3</sup> In this report, the Council recommended that the University establish two new degrees, a Bachelor of Letters (Litt. B.) and a Bachelor of Science (Sc. B.). A graduate of one of certain recognized universities or a qualified Cambridge graduate could apply for one of these new degrees after presenting an original dissertation, for examination and approval, to the degree committee of one of the special boards of studies. The Council further recommended that a distinctive student who had made an "original contribution to the advancement of science" could be granted the degree of "Doctor Designate in Science," and a student who had made similar contributions to learning could be awarded the degree of "Doctor Designate in Letters." This new scheme, the Council thought, would make Cambridge "attractive to Graduates of other Universities, who naturally desire that a course of study pursued by them in Cambridge should receive some mark of University recognition."

The ensuing discussion of the report, which took place on February 15, was heated.<sup>4</sup> In the University Senate, supporters of the Council's new scheme faced strong opposition. H. Lawrence argued that the reform would have "a great political advantage, as it would help to bring English-speaking peoples together and would promote good feeling both between England and America and England and her colonies." G. M. Humphry argued that introducing a greater number of advanced and older students to Cambridge would be advantageous for both professors and younger students. H. Jackson supported the reform as necessary to prevent able students from being lost to German universities, pointing out that many American students just passed through England, "either having spent or about to spend a year in studying at a German University." J.J. reported that many foreign students expressed "the great desire" for higher degrees at Cambridge and that ratification of the proposal would be much welcomed at the Cavendish Laboratory. The opposition, however, suggested that graduates of other universities might achieve the proposed degrees more easily than Cambridge graduates, causing "unpleasant feelings to Cambridge students comparing their own position with the special privilege of outside students." One member of the University Senate thought the reform would cause Cambridge to become overcrowded with "degree hunters." Some argued that the new degrees might not solve the problems they were designed to address: the distinction, competence, and reputation of professors, and the development of advanced instruction for Cambridge students. W. Bateson, basing his comments on his experience at the morphological laboratory under Professor F. M. Balfour, suggested that "what attracted [graduate students] to Cambridge was that they could see methods applied and investigations carried on which they could hardly see anywhere else in the world." A. Marshall agreed that Cambridge had need of "some

---

<sup>3</sup> *CUR* (6 February 1894): 425-427.

<sup>4</sup> *CUR* (20 February 1894): 492-498. Brackets added.

system analogous to the German one [seminar and Privatdocent]" to serve Cambridge students, but he was unsympathetic to the notion of attracting graduate students to Cambridge from elsewhere.

The divide in the Senate indicated that the Council's proposal would not be passed without revision. In October, therefore, the Council issued a second report, this time recommending the appointment of a syndicate "to consider the proposals for . . . special degrees for advanced study and research."<sup>5</sup> The Council also suggested relaxing the requirements for Cambridge graduates wishing to enter the new degree programs. To support its agenda, the Council included in its report a communication from the Secretary of State for the Colonies, which contained the following two letters from Canada:

8th Oct. 1894

I enclosed herewith a copy of a letter I have received from the Minister of Education of Ontario, who informs me, as you will observe, that the arrangement at present in operation at the Universities of Oxford and Cambridge have the effect of sending Canadian graduates who desire to take a post-graduate course to the Continent in preference to the English Universities.

I think this is very much to be regretted on every account and I should be extremely obliged if you could induce the authorities of the English Universities to dispense with the preliminary examination, which under the circumstances does not seem to be necessary, and thus afford Canadian graduates the same facilities that are offered them at Berlin, Leipzig and elsewhere.

Charles Tupper, the High Commissioner for Canada

13th Sept. 1894

It is quite the usual thing for graduates of the Universities of Ontario to take a post-graduate course on the Continent either at the English or at the German Universities. They are, however, placed at some disadvantage in taking such a course at Oxford and Cambridge as compared with the facilities afforded at Berlin, Leipzig, and elsewhere. The German Universities admit graduates of our Canadian Universities to their courses without any preliminary examination. At Oxford and Cambridge however a preliminary examination is required, the effect of which is to force our students to prefer the German post-graduate course to the English one. I think if this circumstance were pointed out to the authorities at Oxford and Cambridge they would relax a regulation which is vexatious to the Canadian students and which places them in foreign associations which are certainly not as desirable in many respects as the association of the British University. If such relaxation were obtained I am quite sure many Canadians would prefer remaining in England. Do you think anything could be done in the direction I indicate?

Geo. W. Ross, the Minister of Education of Ontario

---

<sup>5</sup> *CUR* (23 October 1894): 80-86. The regulations allowed Cambridge graduates to enter the program "if they [had] passed a Tripos Examination (Part I or Part II in the case of a divided Tripos)." The report included four appendices: Appendix 1 contained suggested provisions for the degrees of Litt.B. & Sc.B.; Appendix 2 contained the Oxford resolution for the new degrees; Appendix 3 contained the Scottish universities' regulations for the research students; and Appendix 4 contained the two letters from the Secretary of State for the Colonies. The council also reported that "a scheme having the same object has recently come into operation at the University of Harvard" (p. 80).

The message from Canada was clear: Britain was losing able students from its own empire to Germany, her chief rival on the Continent. To emphasize the need for reform, the Council reissued these two letters several times. Because Britain was acutely aware of the expansion and growth of the German empire, discussion of the reform of Britain's two most venerable universities, Oxford and Cambridge, was not confined to academic circles. The proposed reform was a political matter, and few dared to object to a scheme clearly in the best interests of Britain. Even the most conservative of reform opponents had to give up their resistance. Just two weeks after the Council's release of its second report, a proposal to appoint a syndicate for the reform was passed.<sup>6</sup> J.J. was elected as one of the twelve members of the new Advanced Study and Research Syndicate.

In February of 1895, one year after the publication of the Council's first report, the new syndicate published its first report.<sup>7</sup> Despite the push for the radical reform, it recommended a compromise between the reform and conservative positions. As usual, Cambridge was resisting change. The syndicate had sacrificed the radical proposal of instituting new degrees in favor of awarding non-Cambridge degree candidates with the B.A. degree and/or a "Certificate of Research." The syndicate also had made a number of other important revisions to the 1894 proposal. The new proposal called for a distinction between Cambridge and non-Cambridge students: "Advanced Students who enter for a Tripos Examination and those who pursue a more independent course of study or research." Second, it included more stringent prerequisites for non-Cambridge applicants to the graduate program. Third, it lengthened the period of Cambridge residence required of degree candidates from three to "at least six" terms. In other words, the Syndicate aimed to promote the supervision and assimilation of outsiders. As the Vice-Chancellor noted in the discussion of this report, although few objected in principle to the prospect of bringing advanced students to Cambridge from elsewhere, "great diversity of opinion" still existed concerning the methods to be used in doing so and the number of such students to be admitted.<sup>8</sup>

The elimination of the proposed new baccalaureates in letters and in science, however, was largely offset by the establishment of the new certificate of research. Most advanced students, especially those in the sciences, came to Cambridge to perform research and not to sit for a tripos. According to the new proposal, a certificate of research was available to a Cambridge graduate or an advanced student from outside who pursued "under supervision a course of research in the University" and "submitted a dissertation which shall have been adjudged to be of distinction as an original contribution to learning or as a record of original

---

<sup>6</sup> *CUR* (13 November 1894): 208. The Syndicate would "consider (1) the best means of further help and encouragement to persons who desire to pursue courses of advanced study or research within the University, (2) what classes of students should be admitted to such courses, (3) what academic recognition, whether by degrees of otherwise, should be given to such students, and upon what conditions."

<sup>7</sup> *CUR* (5 March 1895): 594-598.

<sup>8</sup> *CUR* (19 March 1895): 666.

research,” provided that the student had resided in Cambridge for two terms or longer.<sup>9</sup> If the student had resided in Cambridge for at least six terms, he or she would also receive a B.A. degree. In other words, an advanced student at Cambridge could receive a B.A. degree plus a certificate in two years without taking any examinations. The student could then proceed “under the usual conditions to the Degree of M.A. and to other Degrees in the University.” It would be an attractive plan because the student would be able to concentrate on research for two years, with few interruptions, receive degrees for that research from one of the most prestigious universities in the world, and then go on to earn a master’s degree from that same university. This second proposal was reviewed promptly and the final third report was passed by the Senate, without significant modification, in June of 1895.<sup>10</sup> The corresponding statutes for advanced students were altered and then approved by the Queen in Council.<sup>11</sup>

The new regulations directly impacted the Cavendish Laboratory by making its status as a graduate school official. The first beneficiaries of this change were the Cambridge graduates at the Cavendish, who previously had not received any official University recognition for their work. As the number of foreign students studying at the Cavendish increased, the character of the institution also changed. Although a German Ph.D. still had more value than a second bachelor’s degree and Cambridge certificate of research, the Cambridge affiliation was powerful enough to attract a greater number of students from English-speaking countries. Under the new regulations, non-Cambridge men and women, once in the minority at the Laboratory, no longer were regarded as guests. Nor did they follow John A. Fleming’s example of pursuing the NST. They now were regular members of the University.

However, the new regulations could not ensure a constant flow of able students to the Cavendish. The most effective magnet for attracting students to the Laboratory was still the Professor himself: it was “any special distinction on the part of the Professor or any original and important method of work” that induced “the best students from all sides” to come to Cambridge.<sup>12</sup> J.J. Thomson’s fame as a physicist and research projects were now capable of attracting talented students from Cambridge and beyond. Among these talented newcomers was J.J.’s future successor as Cavendish professor, Ernest Rutherford.

#### 4.2. *J.J. Thomson and the Newcomers*

##### 4.2.1. *J.J. and the First Wave of Advanced Students*

When the first of advanced students, E. Rutherford and J. S. Townsend, arrived at the Cavendish Laboratory in the Michaelmas Term of 1895, they were warmly

---

<sup>9</sup> *CUR* (5 March 1895): 595. This residence requirement was added to the Syndicate’s amended third report. See *CUR* (11 June 1895): 942.

<sup>10</sup> *CUR* (11 June 1895): 940-943.

<sup>11</sup> *CUR* (2 October 1895): 2-4; (26 May 1896): 799-800.

<sup>12</sup> *CUR* (20 February 1894): 494.

Leadership and Creativity

A History of the Cavendish Laboratory, 1871-1919

Dong-Won Kim

2002, XXIV, 226 p., Hardcover

ISBN: 978-1-4020-0475-9