

THURSDAY, SEPTEMBER 17, 1874

## THE EDUCATION OF WOMEN

NONE of the subjects discussed at the recent meeting of the British Association at Belfast were of greater practical importance than the one introduced to the notice of the Economic Section by Mrs. Grey in her paper on the Science of Education, and supplemented by the address afterwards delivered by her at a meeting held under the auspices of the National Union for Improving the Education of Women of all Classes. So much nonsense is talked and written on the theme of the higher education of women, the utterances even of some of those who are looked on as authorities on the question are too often so doctrinaire and unpractical on one side or the other, that it is a relief to read the well-considered and thoughtful reflections of one who has bestowed much labour and serious thought upon it, and who has given evidence that she is wedded to no preconceived views. The crowded attendance at the Section when Mrs. Grey's paper and the two which followed it—also by ladies—were read, and the lengthened and animated discussion to which they gave rise, sufficiently evince the wide interest felt in the subject by those who attended the meetings of the Association.

The branch which specially concerns us is the extent to which instruction in some or all of the various branches of science should enter into the liberal education of women; and this again is but a phase of the more general question as to the mode in which, if at all, the education of girls should differ from that of boys. We may set aside on the present occasion as a subject of too great importance to be discussed in a general article like this, the much-vexed question of the Medical Education of Women. With regard to the difference which has been established by general custom or prejudice between the ordinary curriculum of the studies of boys and girls, Miss Davies has pointed out with great force, in one of her Essays on the Higher Education of Women, what appear at first sight some glaring inconsistencies and absurdities. To boys who are destined for a mercantile life or a public career, an intimate acquaintance with French and German is now almost indispensable; Latin and Greek are therefore almost universally taught in boys' schools, while the modern languages are considered an essential part of the course of study of a girl, to whom they will be of much less service. A fair knowledge of the elements of physics and chemistry would be of immense advantage to a woman in the management of a household; but these are subjects considered by many to be decidedly unfeminine. Music is the most inexhaustible and harmless recreation for the mind overtaken with the burden of daily cares; but music hardly comes within the scope of a boy's education, at least in this country; while it is almost compulsory on girls, whether they have the talent for it or not, and who have at all events abundant other occupations, such as needle-work, for their leisure moments. The earliest years of a child's life are almost entirely regulated, for good or for evil, by the mother and her female dependents; but any knowledge of human physiology or hygiene has been till recently almost forbidden to the

girl on the score of delicacy. May we not sum up by saying that few men have the leisure, after they arrive at manhood, for pursuing the studies of their youth; while an enormous number of women of the upper and middle classes would be most thankful for a rational substitute for the purposeless vacuity in which they are at present forced to spend a large portion of their time? And yet in the face of this it is still the orthodox creed that the education which any English gentleman gets or can get at a public school or University is too broad or too deep for the mass of women of the same class.

An almost ludicrous instance of the difficulty which is experienced practically in the attempt to frame a curriculum of studies which shall be specially adapted for girls, was brought out in the recent debate in the Convocation of the University of London on the desirableness of admitting women to degrees. When the existing General Examination for women was instituted, a Committee of the Senate was appointed to draw up a scheme which should meet all the requirements of the case. After long deliberation, the extent to which it was found possible to deviate from the ordinary Matriculation examination was this: Greek was made optional; and girls were allowed to take Botany if they wished instead of Chemistry, and Italian if they preferred it instead of German; they were also exempted from all the books of Euclid except the first, if they took Geography instead! The first of these indulgences is now extended to boys; and the other differences are so trivial that we are glad to see that another Committee of the Senate has already recommended that the examination be altogether assimilated to that for Matriculation. When this is done, it may possibly occur to the Senate that there will be no object in keeping up a distinction of name between the two; and how will it then be possible to refuse to women examinations which shall be equivalent to those that admit men to degrees, at least in the Faculties of Arts, Science, and Laws? We do not propose here to discuss the expediency of nominally permitting women to take degrees in our universities; but there is one aspect of the question which has hardly been sufficiently considered by those who oppose the innovation. A university degree is the acknowledged hall-mark of a certain standard of education for men who make teaching their profession. A very large number of women are equally dependent on teaching as a means of livelihood; notwithstanding the many additional facilities given them of late years for acquiring knowledge, they have at present no equivalent test of their qualifications; and as long as this is the case the really competent governess or schoolmistress will always be subject to unequal competition from her incompetent sisters, and the rising generation of both boys and girls will be the sufferers.

The vision that frightens many from looking with candid and impartial mind at the problem of the higher education of women is the fear that the educated woman will be lifted out of what we are pleased to term her sphere, and rendered unfit for what man considers to be her duties. But the admirers of the uneducated woman may take comfort in the assurance given them by Prof. Fawcett at the Brighton meeting of the British Association, that whatever facilities are offered for improving their minds, there will still be left for many

years an ample supply of those who prefer to remain ignorant and uncultured to satisfy all demands. In the noble address delivered by Prof. Huxley at Belfast, he insisted, with all the force of his calm eloquence, on the folly of making a bugbear of logical consequences; and in no science is there more need for this exhortation than in that of education. Mrs. Grey well put it that no education is worthy of the name that does not at least aim at a right training of the three departments of the mind—the reasoning faculties to determine the right from the wrong, the emotional to follow the right when found, and the imaginative to conceive the perfect ideal of all goodness. In determining a course of education, whether for boys or girls, when we have once satisfied ourselves that our principles are sound, let us unhesitatingly follow them out, letting the possible consequences take care of themselves; and we may feel sure that the conclusions to which we shall be led will stand the test of experience.

The point which we think should be most prominently brought forward by the advocates of a reform in female education is not so much the desirableness of turning its future current in any one direction, as the necessity for removing all trammels and barriers raised by man's ignorance or prejudice. On this ground we sympathise most heartily in all the efforts now being made to widen the basis of the education of women, whether in the way of special colleges, university examinations, or courses of lectures involving severe study. Let us first of all—divesting ourselves of all preconceived theories on the subject, whether social, metaphysical, or physiological—give free scope to the faculties of woman before we begin to dogmatise on the extent to which these faculties will bear cultivation. Natural Selection will point out the occupations in which the female mind will excel; and the Survival of the Fittest will determine the professions in which woman can successfully compete with man. And every one who believes that faculties were originally endowed or gradually evolved for the purpose of being used, and powers for the sake of being exercised, must rejoice at every fresh extension of the field in which they may be employed.

#### DE BOISBAUDRAN ON SPECTRES LUMINEUX

*Spectres Prismatiques et en Longueurs d'Ondes destinés aux Recherches de Chimie Minérale.* Par M. Lecoq de Boisbaudran, avec Atlas des Spectres. (Paris: Gauthier-Villars, 1874).

THE spectrum maps of Kirchhoff, Huggins, Angström, and Thalen are so complete that little has been left for later observers except the filling up of some details. Angström's discovery that the bright lines which form the spectrum of the electric spark are partly due to the air or other gaseous medium traversed by the spark, partly to the vapour of the metallic poles, formed an epoch in the history of spectrum analysis; and the publication of the fine map of the solar spectrum by Kirchhoff (founded on the great original work of Fraunhofer), in which the positions of a large number of the metallic lines are carefully laid down, gave a great impulse to the pursuit of this branch of physical science. For the discovery of the new metals, cæsium, rubidium, thallium, and

indium, we are indebted to spectroscopic analysis. In a paper communicated to the Royal Society in 1863, Mr. Huggins gave a valuable map of the bright lines of the metals, as seen through a system of prisms adjusted for a minimum deviation of the line *D* of Fraunhofer. This was followed by the works of Thalen and Mascart, in which the positions of the metal lines are given in wave-lengths. The results obtained by Thalen are incorporated in the great work of Angström on the solar spectrum.

To observe the metal lines, the method usually employed is to pass the spark from a Ruhmkorff's machine, having a condenser connected with the fine wire, between poles of different metals. The air lines which come into view at the same time are easily distinguished by well-known characters from the metal lines, and were used by Mr. Huggins to fix the positions of the latter. In some cases the metal lines were obtained by drawing sparks from solutions of the chlorides.

In the work of M. Lecoq de Boisbaudran, two methods are chiefly followed for obtaining the spectra of the elements and of certain compound bodies. The first is the ordinary method of heating the body in the flame of a Bunsen burner; the second is to pass short electrical sparks from a Ruhmkorff's coil, *without condenser*, between a solution of the chloride of the metal and a fine platinum wire suspended above the solution. In the latter case the following is the method of experimenting usually employed by him:—The metallic solution is contained in a short glass tube, into the lower end of which a platinum wire is hermetically sealed. Another wire of platinum, or, still better, of iridium, attached to an insulating support, is adjusted at a distance of two or three millimetres from the surface of the liquid. An essential condition to the success of the experiment is to make the free wire positive, and the liquid negative. If this condition is reversed, the spectrum of the solution seldom appears, but is replaced by the ordinary air spectrum. In some cases, as with the alkaline salts, a fine spectrum is obtained by passing sparks between a fused bead of the salt and a platinum wire heated to redness in a Bunsen or spirit flame. According to M. Lecoq de Boisbaudran, the spectrum produced in this way is not only more brilliant, but is richer in metallic lines than that of the solution. The method of taking sparks in air between metallic poles has been employed in the work before us only in the cases of aluminium and lead. The spectroscopy employed was formed of a single prism of heavy glass, with a collimator, and telescope moveable on a graduated arc. An illuminated scale, projected from the anterior surface of the prism, was seen above the spectrum, and its indications were reduced to wave-lengths by comparison with the wave-lengths of certain solar and metallic lines, as determined by Fraunhofer, Mascart, Angström, and Thalen.

In a series of twenty-eight finely-executed engravings, M. Lecoq de Boisbaudran has given delineations of the spectra of a large number of bodies referred to the arbitrary scale of his spectroscopy, and also in wave-lengths. Except in a few cases, he has not attempted to represent the feebly illuminated ground or continuous spectrum which in many instances extends over nearly the whole field of view. But the characters of the bright lines and