

practical calculations go, Prof. Perry, in getting out in foot-pounds the energy of rotation of a fly-wheel, or in making a conversion into horse-power from C.G.S. units, merely does his division by  $g$  (arithmetically or symbolically) at an early stage, where a "poundalist" would probably divide at the end. But with the elementary student it is different; a misconception at the start may stick to him for years unnoticed. Perhaps an occasional bath among all sorts of difficulties in which he is told to sink or swim, such as Prof. Perry advocates, may have a stimulating effect. But let us consider. Prof. Perry's main complaint was that so many are overwhelmed by the poundal. (Oddly enough, he does not seem to mind the dyne, which is on all-fours with it; in fact he has nothing to say against the work of the B.A. Units Committee, beyond a grumble at the fact that they acquiesced in the formula  $4\pi r^2$  as representing the surface of a sphere.) Now, for instance, will a student not be puzzled as to the reason why this new system should bear to the English standards a relation so utterly unlike that which the C.G.S. system bears to the French standards? And it seems to me that there must be students who might manage to keep afloat in presence of the poundal to whom Prof. Perry's definition, that "the unit force is that which would give to a body of  $32 \cdot 18$  times the inertia of the standard object kept in London an acceleration of 1 foot per second per second"—invented out of pure kindness for them—may prove a very millstone round their necks. And they will be no better off if he raises the talismanic number to  $32 \cdot 19$ , as apparently he would now do.

May I conclude by suggesting to Prof. Perry, by way of a small return for the many useful things which I have learnt from him during the past twenty years and more, that an appreciative toleration of rule-of-thumb methods is one thing, but it is another thing to glorify and perpetuate them.

Ashurst Wood, January 12.

M. J. JACKSON.

#### Durham Science Degrees.

I AM surprised to see the letter of your anonymous correspondent "X." in your issue of January 28.

All the six gentlemen referred to, hold important positions on the teaching staff of this college.

They were recommended by the Council of the college to the Senate of the University as deserving such a degree as would make them members of the Convocation of the University.

"X." insinuates that these gentlemen had no qualification for this honour.

The truth is, that one of them is M.Sc. of Victoria University, three of them are B.Sc. of Scotch Universities; the remaining two are the Senior Lecturers in their respective departments, where they have taught graduates of the University for twelve and thirteen years respectively. HENRY PALIN GURNEY.

The Durham College of Science, Newcastle-upon-Tyne,  
January 29.

#### PHOTOGRAPHY IN COLOURS.

THE announcement has been made during the past week of the discovery of a true process of photography in colours. It is too early now to discuss the matter in its many interesting bearings, since the process so far remains more or less secret, but the following communications will indicate how the question at present stands.

The first is a *communiqué* received from Sir H. Trueman Wood, the Secretary of the Society of Arts.

I am anxious to make, through the medium of the Society of Arts *Journal*, at all events a preliminary announcement of a very remarkable process for producing photographs in colours which was brought to my notice the other day. To say that it enables photographs to be produced in natural colours would not, perhaps, be precisely true, since colouring media are employed; but the result of the process is a photograph in colours of nature—a faithful reproduction in colour of the object photographed—and so, for all practical purposes, it may be said that the long-sought object of photographic

research, photography in colour, has actually been obtained.

The inventor is M. Villedieu-Chassagne, of Paris, who has developed a process originally suggested by Dr. Adrian Dansac, and the following is his method:—(It must be premised that he keeps secret, at all events for the present, the nature of the four solutions he employs.) A negative is taken on a gelatine plate prepared by treatment with one of his solutions. This is developed and fixed in the ordinary manner. It shows no trace of colour. From it a print is taken on glass or paper, the plate or paper being specially prepared by treatment with the same solution. The transparency or the paper print in no way differs, to all appearance, from an ordinary positive, and shows no trace of colour by transmitted or by reflected light. It is then washed over successively with three coloured solutions, blue, green, and red, and it takes up the appropriate colours in appropriate parts, these three colours giving, by their various combinations, all varieties of hue. How it is that this power of selective absorption is given to the components of the photographic image (principally, of course, metallic silver) is, it appears to me, the interesting question connected with the process. The action is certainly previously unknown, and it will, as certainly, repay scientific investigation.

As I declined to be convinced by mere inspection of the finished results, M. Chassagne was good enough to demonstrate the whole process for my benefit, and by the kindness of Prof. Thomson, of King's College, the demonstration was allowed to take place in the laboratory of King's College on two mornings last week. Prof. Thomson and Mr. Herbert Jackson, of King's College, were present on both occasions, and Captain Abney on the second. I must not speak for those gentlemen, but I believe they were as much impressed as I was myself by the remarkable nature of the process and its results.

That such results should be obtained by such a process seemed *à priori* in the highest degree improbable, but obtained they certainly were.

The photographs taken by ourselves were poor, the light (on the morning of Wednesday, 20th) being extremely bad. Nevertheless, the positives (made by one of ourselves on the following day) showed with perfect distinctness, when treated as above described, the colours of a bunch of flowers I had bought at Covent Garden, on my way to King's College, and of various other test objects.

Our own experiments were confined to gelatine films, but M. Chassagne treated with complete success some paper positives he had brought from Paris. These looked like ordinary silver prints toned with gold, but I omitted to ask about the toning.

Further experiments and independent investigation (for which M. Chassagne has kindly promised me the materials) will, no doubt, throw further light on the nature of the process; but I cannot believe that any investigation will throw doubt on its genuine character, for it was carried out under test conditions last week, the sole reservation being the nature of the materials employed.

I hope that a fuller account of the method may shortly be presented to the Society in the form of a paper; but in the meantime it appeared to me that members of the Society would be interested by having placed before them the first information about so remarkable and promising an invention. H. TRUEMAN WOOD.

Captain Abney, who was present at the experiments referred to above, writes as follows:—

The process of colour photography, which I had the pleasure of seeing demonstrated at King's College some ten days ago, through the kindness of Sir H. T. Wood, is a very remarkable one. I went as a sceptic.

The process may be described in a very few lines. In the first place a negative is taken on a gelatine plate, which has been specially prepared. The plate is developed and fixed in the ordinary way, and the image appears of the same character as if taken on a good density-giving plate. A transparency (a positive) is next taken on a similar plate from this negative, or a silver print made on specially prepared albumenised paper, on either of which the colour process is worked. The colouring is of a very simple nature. There are three dyes—a crimson-red, a grass-green, and a very good blue, all in solution, and mixed with some other ingredients besides water. There is also what we may call a mordant in the shape of a colourless liquid containing, I should say, albumen and salt.

This last liquid is brushed copiously over the face of the positive (or the silver print), and the blue dye applied a little at a time. If the light be good (and it was stated that the colouring must take place in good daylight), the blue dye rapidly takes hold of those portions of the surface which represent in monochrome what are blues in the original. For instance, a china vase will take the blue tint, and the face or hands a faint amount of the same colour. The green dye is applied in the same manner, and the greens in the original make their appearance in the positive, and so with the red. Finally the print or positive presents a picture in colours, underlying which is the dark brown silver image. It appears as if the image took up selectively these three colours; but why it takes them up, it is hard to see. I have by me a portrait done in the manner described, and the negative has evidently been retouched with the pencil. It is difficult to understand why a pencil mark should be the cause of selective absorption of the colours, or that a special plate should be necessary. That the success of the process does not depend upon the inventor's manipulation is quite evident, for negatives were taken by Sir H. T. Wood, quite independently of him, but of course on prepared plates given him for the purpose, and from these he made positives. These last, when treated with the colouring matter, gave the correct colours of the original. Still I am somewhat sceptical—I believe it is my failing to be so—and I shall not be satisfied till I get the plates that have been promised me by the inventor (M. Chassagne), and taken negatives of certain test objects which will be unknown to the inventor. If he can reproduce their colours it will have to be without any reference to the amounts of silver which ordinarily indicate the colour in the original, for in the negatives sent every colour will be represented by approximately an equal density. Some few years ago a powder process was seen by Mr. C. V. Boys, in which three coloured powders selectively adhered to the surface of paper. The paper was prepared with some glutinous substance and bichromate of potash, and which remained more or less tucky according to the amount of exposure to light it received. These three powders, a red, a green, and a blue, I believe, if applied in a certain order, adhered to the print, and gave approximately correct results of colour, though no special negative was required. Whether this new process now described depends on any similar grounds, it is hard to say at present.

The point that strikes me in the latest process is that it is only from a specially prepared negative that a print suitable for colouring can be made. Were it the negative which took up the colour, one might understand the matter better. To me at present the process as stated is a mystery; but if it does all that it is claimed for, it must be a great success, and the theory of it will have to be investigated in a thoroughly scientific manner. At present the details are a secret; but I am given to understand that the seal of secrecy will be withdrawn before long, as a patent is applied for. We shall then be able to ascertain on what principles the process is worked.

W. DE W. ABNEY.

## BRITISH ASSOCIATION MEETING IN TORONTO.

### I.—LOCAL ARRANGEMENTS.

THE various special Local Committees, organised to make preparations for the British Association meeting, to take place in Toronto this year, have now, after a year's work, to report very satisfactory progress in the arrangements for the occasion. In the case of some of the Committees, their work may be considered as finished. The special Committee on Finance, for instance, has secured promises of financial aid to the extent of 5700*l.* from the Governments of the Dominion of Canada and the Province of Ontario, and from the Toronto City Council. This sum will, it is believed, be fully sufficient for all the expenses of the meeting, which, owing to the special circumstances of the occasion, must be larger than those of any meeting in Great Britain.

The Committee on Rooms also has, for the present, finished its labours. According to its report, which has been adopted by the Local Executive Committee, the reception room, general offices, and the rooms for the sectional meetings are all to be in the various lecture-rooms and laboratories of the University of Toronto and of the School of Practical Science. As the buildings of the University and School are in the centre of the city, and within less than five minutes' walk from the electric car line which communicates with all parts of the city, the selection offers every convenience in the way of conveyance. The rooms selected are large and well adapted for the purposes assigned, and all are within a short distance of each other. Sections A and H (Mathematical and Physical Science and Anthropology) will occupy lecture-rooms in the main building of the University, Sections D, I and K (Zoology, Physiology and Botany) are allotted rooms in the Biological building, Section B (Chemistry) will be placed in the Chemical building, Section E (Geography) in the general reading-room of the University library, while Sections C, F and G (Geology, Economics and Mechanical Science) are to be given large rooms in the University Y.M.C.A. building, Students' Union building, and in the School of Practical Science respectively. The only building to be used by the Association, and not situated on the University grounds, is Massey Hall, in which will be delivered the President's address and the evening lectures. It is capable of seating 4000 persons, and has splendid acoustic properties.

One of the conversaciones will be held in the main building of the University; the other will, it is expected, be given in the new buildings of the Provincial Legislature. A number of gentlemen have kindly offered to give garden parties, while the Faculties of Trinity College and Victoria College have arranged to hold receptions. The various Clubs in the city will be open to the members of the Association.

The arrangements for conveyance are not yet completed, but the concessions already made by the Steamship and Railway Companies may be announced. The Canadian Steamship Companies, the Allan, Dominion and Beaver Lines (Liverpool and Londonderry to Quebec and Montreal) have granted to members of the Association considerable reductions in rates for single and return tickets, and the Anchor Line (Glasgow and New York) offer reasonable rates for single or return first-class tickets. A copy of a circular giving information in regard to Atlantic steamship rates will be sent to each member of the Association in a few weeks. It may be well to note that berths are to be applied for early in the season; for the choice, if made late in June or July, may not be a large one. The Canadian Pacific and Grand Trunk Railway Companies have decided that round