year. It leads to a reflection on the inevitable incompleteness of a catalogue. There is no pause in the publication of books. In spite of the most careful filling up of the lists of missing books by the librarian, and the most liberal expenditure by the Committee, hundreds of new books must have come out, and a large proportion of them added to a library, between the time when the last title is handed to the printer, and the time when the first outsider can purchase his catalogue and examine what are the treasures kept in store for him. And in no production of industry, not even in ladies' adornments, is novelty so important a recommendation as in literature. The disheartening reduction of prices in secondhand catalogues, not of three-volume novels only, but of laborious and important works, is a proof of this. A greedily read daily press makes it inevitable. Any printed catalogue, therefore, with all the books in due order, must be deficient of the favourite, if not of the most important books which the library contains. Catalogues therefore in general should be printed like the most fugitive of literature, and be renewed as frequently as possible. A card-catalogue alone can be kept on a level with the stock of books. A frequent publication by a large library of a list of its new purchases, sold at a remunerative price to students and luxurious readers, would make a library popular among those with a strong appetite for reading, while it would not lead to the older tenants of the shelves being forsaken by the crowd.

In most public libraries an effort is made to combine the functions of the old collection of books with that of the dispensary of useful or pleasing thought, by having two departments. The books more deserving of the old feeling of preservation are wisely placed apart with real works of reference to form the Reference Department. A mischievous result of this arrangement usually is that it makes books of greatest intrinsic value and forbidding costliness least available to the impecunious student. The Halifax Catalogue avoids this by arranging all together in one alphabetical list, marking each of the reference books with an *R*, and leaving the question of lending them out practically to the discretion of the librarian or Committee. We strongly approve of this method and of liberality in working it, and recommend it to the notice of other libraries. W. ODELL

THE "IDENTISCOPE"

IT appears from the *Pall Mall Gazette* of October 21 that there is a prospect of "a campaign being run in the country" on behalf of the "Claimant" by "six of the best orators whom money can collect, . . . supplied with a hundred identiscopes." These are optical instruments, containing on the one side a drawing made from a portrait of the undoubted Roger Tichborne, and on the other side a drawing made from an equally undoubted portrait of the Claimant taken nineteen years later, and the arrangement is such that on looking into the instrument the drawings combine into one. This, it is maintained, leaves no doubt that the two portraits are those of one and the same individual.

The more important of the questions raised by this announcement is whether the fact of two genuine portraits blending harmoniously into a single resultant is stringent evidence that the portraits refer to the same person. Those who have examined the optical combinations and photographic composites that I have exhibited at various times will know that this is not the case. Those who have not seen them and care to know more about the subject should look at my "Inquiries into Human Faculty." (Let me take this opportunity of correcting an error there. The full and profile composite labelled "two sisters," in the middle of the upper row of the frontispiece, is really one of three sisters. I had made many composites of the family, and by mistake sent the wrong one to the printer.) The reason why photographic portraits blend so well together is that they contain no sharp lines, but only shades. The contour of the face is always blurred, for well-known reasons dependent on the breadth of the object-glass; even the contour of the iris in an ordinary photographic print looks very coarse and irregular when it is examined by a low-power microscope. On superimposing a second portrait, the new shades fall in much the same places as the former ones; wherever they overlap they intensify one another; where they do not overlap they leave a faint penumbra which has usually a soft and not unpleasing effect. Judging from abundant experience, there would be no difficulty in selecting photographs of many different persons that should harmonise with the photograph of the Claimant, and it would be amusing to try strange combinations. I could suggest one that I think would succeed excellently: it is of a certain distinguished member of Her Majesty's——but I must be discreet, though probably if I ever come into possession of suitable photographs I may make a private experiment.

It seems, however, that the identiscope is not intended to be used to combine reproductions of the actual photographs, but only drawings in bold lines that have been made from them. The photographs, it is to be presumed, do not agree in aspect, so drawings are made from them that do so, the diameter of the iris being used as the scale unit of the breadth and length of the features, in making the drawings. Although the diameter of the iris is spoken of as an invaluable unit for exact reduction, its disadvantages appear to be great: (1) Its vertical diameter was, I suppose, not used, because in the large majority of cases the upper part of the iris is covered by the eyelid. (2) The horizontal diameter is unavailable unless the eye of the sitter was directed straight at the camera; otherwise the iris is seen in perspective, and its breadth is reduced by an unknown amount. (3) One eye is perspectively larger than the other, unless the face was set truly square to the optical axis of the lens; if not, it would be necessary to measure both eyes and to take a mean; this is a requirement to which I have as yet seen no allusion. (4) The diameter of the iris is only about 1/25th part of the length between the chin and the vertex of the head, consequently any minute error in its measurement would be largely multiplied when applying it as a unit. (5) The diameter of the iris in a photographic print does not, as I have already implied, admit of accurate measurement. The identiscope appears to be the same as an instrument sold some years ago, and of which I have one now by me. The description printed on it is "E. Wolf and Sons' patent Limnoscope, for copying drawings, designs, &c." I bought it for the purpose of experiments with composites, and tried many modifications of its principle, but other plans proved so much better that I discarded it. The principle is easily realised by any one who cares to place a table by a closed window and then to go out-of-doors with an open book in his hand, which he must hold horizontally by the side of the window, at the level of the table. He will then see through the glass an image of the book (a "Pepper's ghost," in short) resting on the table. The reflected image is so faint that the direct image has to be dimmed. Yellow glass serves this purpose. The limnoscope is not suitable for combining ordinary photographs because the reflected portrait is reversed; the left side of one face is combined with the right of the other. Much better instruments exist for making optical combinations; I have described them in my book.

I conclude as follows. First, that the fact of two photographic portraits blending harmoniously is no assurance of the identity of the persons portrayed. Secondly, when drawings made from portraits are shown to blend it does not follow that the portraits from which they were drawn would blend equally well. And lastly, the photo-

graphic print of the iris of the eye does not afford a trustworthy unit of measurement.

FRANCIS GALTON

ON THE ALGIC FLORA OF THE ARCTIC SEAS

AMONG the fields of research opened to science by the Swedish Arctic expeditions of recent years the botanical one is that which has been cultivated the most assiduously and with the best results. The contributions which Swedish men of science have made to our knowledge of the flora of the Arctic regions are varied as well as important. They embrace the higher as well as the lower forms, both the species invisible to the naked eye as well as those of greater size, and the varieties hidden in the lap of the ocean as well as those which the student encounters on *terra firma*. Swedish botanists have particularly increased our knowledge of the remarkable flora of the sea. Thus instead of, as only a few years ago, our being ignorant as to whether there really was a flora at the bottom of the Arctic seas or not, we are now more familiar with the algæ flora of these regions than many another in far more southern latitudes.

Of the Swedish botanists who have particularly devoted their time and energy to the study of the flora of the Arctic seas I must mention the following gentlemen, members of the Royal Academy of Science of Stockholm: Messrs. J. G. Agardh, P. T. Cleve, F. R. Kjellman, and E. G. Kleen. The reason which specially prompts me to discuss this subject here is the recent appearance of an important work by one of these algologists, Prof. Kjellman, viz. "Norra Ishafvets Algflora," with thirty-one illustrations, which forms part of Nordenskjöld's "*Vega*-expeditionens vetenskapliga iakttagelser," a work which has from time to time received favourable mention in this journal.

Prof. Kjellman has, as the representative of botany, and particularly the branch termed algology, participated in four Arctic expeditions, during which he has visited Finmarken, Spitzbergen, Novaya Zemlya, in Europe, and long stretches of the coast of Siberia, in Asia. Two of these expeditions, the one to Spitzbergen, 1872-73, and the *Vega* Expedition, 1878-80, were attended by winterings in the Arctic regions, during which time Prof. Kjellman enjoyed an opportunity, never before accorded to an algologist, viz. that of studying the flora of the sea *at all seasons*. His algæ flora, in consequence, not only forms a complete index of the species and varieties of the algæ of the Arctic seas, their form, construction, and geographical distribution, but it gives us also an insight into the vital functions of these plants, and explains to us the conditions under which they exist. I intend in this paper to refer briefly to the present position of this science, to which Prof. Kjellman has contributed such a great share.

The Arctic Ocean covers, geographically speaking, the sea north of the Polar Circle. Within this area there is, however, a vast tract of sea where there is no ice either winter or summer. This is the sea around Northern Norway through which the Gulf Stream flows. On the other hand, there are tracts south of the Polar Circle which rival the coldest parts of the Arctic Ocean on the point of ice. To these belongs, in the first instance, the part of the Atlantic washing the south-eastern shores of Greenland, which receives from the north a cold Polar current full of icebergs.

From a hydrographical point of view, however, the Arctic Ocean is far more naturally limited if we deduct from it the part around Northern Norway and add to it the sea around Southern Greenland. From a botanical point of view, too, the Arctic Ocean is thus limited in a more natural manner. To the part of the Arctic Ocean cut off by this arrangement Prof. Kjellman proposes to assign the name "The Norwegian Polar Sea," and in the work referred to above he deals with the algæ flora of the true Arctic Ocean, according to the hydrographical and botanical theories, as well as that of the Norwegian Polar Sea. As the conditions under which the flora of the true Arctic Ocean lives lend to the same a heightened interest, I will discuss this flora at more length, and finally add some words on that of the Norwegian Polar Sea.

In a sea like the Arctic Ocean, where ice is found in large quantities all the year round, it seems, at first sight, that no flora could exist, and it is, indeed, true that great parts of the Arctic Ocean are, botanically speaking, mere deserts, but this is not caused, as I will presently show, by the low temperature of the sea, but by other causes. Strangely enough, some algæ have become accustomed to be surrounded by a medium the temperature of which never, or at all events but seldom, rises above freezing-point, and in many instances they have indeed flourished greatly therein, of which their luxuriant growth bears evident proof.

When I just said that large tracts of the Arctic Ocean are botanically deserts, I did not thereby mean that the *deepest* parts of the sea were void of flora, as this is really the case in all, even the warmest, parts of the oceans of the globe. The algæ flora is only to be found within a smaller or larger belt along the coasts of the continents and islands, and even within this belt, where the depth does not prevent the existence of algæ, they are not found everywhere. Another condition too must be present for the existence of algæ, viz. that the bottom be rock, boulders, or marine shells, in brief, formed of large objects which can serve as "moorings" for them. Thus, where the bottom is sand or clay the regular algæ flora is absent. In the eastern parts of the Arctic Ocean the latter kind of bottom is very common. Nearly along the entire coast of Siberia, and in long stretches near Novaya Zemlya and Spitzbergen, the bottom is formed of fine sand and clay. Algæ are here sought in vain, as they are, in fact, in localities with a similar bottom all over the world. Only on the north and north-western coasts of Spitzbergen, and in several places along the west coast of Greenland, the bottom consists of such hard materials as are favourable to a copious algæ flora.

This explains to a great extent the existence of the botanical deserts, referred to above, in the Arctic Ocean, but there are also other causes. Before I deal with these, however, I must explain the manner in which the bottom of the Arctic Ocean is divided according to the flora at various depths, as suggested by Prof. Kjellman.

He distinguishes between three bottom regions, viz. the *littoral*, or what may be called the upper shore-belt, the *sub-littoral*, or lower shore-belt, and the *elittoral*, or deep-sea belt. The upper shore-belt embraces that part of the bottom which lies between the neap and high tides, the lower shore-belt the part that stretches from the former down to a depth of 36 metres, and the deep-sea belt the part below the latter depth.

Of these three belts, one, the upper belt, contributes greatly, and in a striking manner, to make parts of the Arctic Ocean flora-less. Within far the largest parts of the ocean this belt is void of all vegetation, and the cause of this is easily discovered. It lies in the ice. Thus every winter a girdle of coarse, firm ice is formed along the coast, and near the shore reaches to the bottom. In some places this ice lies all the year round, and in others it certainly disappears, but generally late in the season. At Cape Chelyuskin during the *Vega* Expedition the "ice-foot," viz. the shore-ice, was lying firm at the end of August. Where the land-ice thus remains throughout the summer no algæ can, of course, develop, and where it disappears only in the autumn the time is too short to allow of any growth.

Nearly as detrimental to the flora as the land-ice are the broken-up ice-masses, which during the summer are driven hither and thither by winds and waves. These