with a series of topics for observation, the stars, moon, planets, &c., assuming that the readers are supplied only with an opera glass or small telescope. It is to be in no sense professional, "except to be accurate in statement of fact and principle without being technical in terms." The first number can be ready by September of this year if the subscribers are forthcoming.

OPTICAL TESTS FOR OBJECTIVES.—In a small pamphlet entitled "Optische Untersuchung von Objectiven," by Dr. Ludwig Mach of Prague, the contents of which have appeared in the *Photographischer Rundschau*, the writer describes a very simple means of obtaining photographs of objectives showing defects in the glass. After first referring shortly to the methods adopted by Schröder, Alvan Clark, &c., giving some excellent small photographs of some of the results obtained by these means, he describes his method of making small optical errors visible. He casts, by means of an achromatic lens, an image of the sun on a screen in which is a small hole. Behind this screen, at some distance from it, he places the object glass to be tested, together with the camera at its focus, and it is found that in all places where the object glass is not perfect a system of interference marks or rings is formed. Experimenting with an object glass of 10·2 cm. aperture and 143 cm. focal length, by Sir Howard Grubb, the writer shows a photograph taken after this means.

PHOTOGRAPH OF A BOLID.—Although on fine nights many telescopes carrying with them photographic plates are turned towards the starry heavens for special objects, none, except a very few exceptions, have had the good luck to record the passage of a bright meteor. M. Lewis, at Ausonia (Connecticut) seems to have been very fortunate in this respect (*Bulletin Astronomique*, tome x., March), for on January 13 of this year, while photographing the comet Holmes, a very bright meteor crossed the field of view. An examination of the plate showed that the trail commenced at about 1h. 38m. R.A., and + 33° 40′ declination, terminating at 0h. 8m. R.A., and + 32° 12′ declination. Under the microscope he says that the centre of the trail is crossed by a very dark axis, clearly defined, while the other part is bounded by fringes of very irregular forms, indicating that fragments of matter had been detached from the meteorite: signs of rotary movement during its passage before the sensitised plate were also visible. For orbit determinations, photographs such as these, if they could be more often obtained, would be very valuable, for one could then fix the different points of the trajectory with far greater accuracy than is now done by the necessarily very approximate method of naked eye estimations.

GEOGRAPHICAL NOTES.

AN amusing instance of newspaper science occurred in a morning paper last week. A note on the salinity of the North Pacific, published in this column (vol. xlvii. p. 590), was reproduced without acknowledgment, but with annotations. After the quotation, "a tongue of considerably fresher water stretches nearly across the ocean about 10° N." came the interpolation, "caused no doubt by the dilution of the sea by the melting snow and ice of the northern regions," a far-fetched hypothesis, which ignores the rainy belt of calms. A worse error was to say that the curves of equal salinity "run through Behring Strait," when the original said Bering Sea. The use of a map would probably have prevented the blunders.

THE *Mouvement Géographique* publishes a useful *résumé* with route-maps and portraits of the officers of the various expeditions of the Katanga Company from May, 1890, to April, 1893. In July, 1890, the expedition of M. A. Delcommune left Europe for the Congo, went by the Lomami, discovered Lake Kassali, and reached Bunkeia, in Katanga on October 6, 1891. This expedition spent a year in exploring the upper Lualaba and the western side of Lake Tanganyika, then descended the Lukuga, crossed the Congo basin in a west-by-north direction to Lusambo, and arrived in Brussels on April 15, 1893. An expedition under Le Marinel left Lusambo on December 23, 1890, reached Bunkeia on April 18, 1891, and after taking possession of Katanga, returned to Lusambo in August of the same year. On July 4, 1891, Captain Stairs left the east coast, and travelling by Lake Tanganyika reached Bunkeia in December, but the leader died on the Zambesi on his way home on June 8, 1892. In September, 1891, Captain Bia's party left Stanley Pool, ascended the Sankuru, discovered Lakes Kabele and Kabire, near the Lualaba, and reached Bunkeia in January, 1892. Thence in June they reached Lake Bangweola, and after Captain Bia's death, Lieutenant Francqui led the expedition through the upper regions of the Lualaba, and in January, 1893, joined Delcommune at Lusambo, returning with him to Europe. The discoveries made by these four expeditions are of great importance; they fill in much of the detail of the Congo basin hitherto very lightly sketched on the maps.

A RUMOUR has been current that Dr. Nansen's polar expedition is likely to collapse at the last moment for lack of funds; but it is satisfactory to learn that this is not the case. The *Fram* is practically ready for sea, and the party will embark in the month of June, as originally intended.

THE recent advance in Arctic navigation is strikingly shown in the announcement by a Norwegian firm of a pleasure-trip to Spitzbergen, planned for this summer, with a vessel strengthened for ice-work and fitted with every comfort.

MM. FOUREAU AND MERY have during the past year carried out some important journeys in the Sahara. They have succeeded in reaching the country of the Tuaregs, which has not been visited by Europeans since the Flatters' mission was massacred in 1881, and they have induced the chiefs to acknowledge French protection. The French officials are diligently extending the cultivable area of the oases in the northern Sahara by sinking artesian wells and securing artificial irrigation.

THE USE OF HISTORY IN TEACHING MATHEMATICS.[1]

I HAVE ventured to make some suggestions to this Association as to the use of history in teaching mathematics, and the restrictions and limitations under which it may be advantageously employed. It will be perhaps the most convenient course to begin with the restrictions and limitations.

The three most important of these are:—

(1) The history of mathematics should be strictly auxiliary and subordinate to mathematical teaching.

(2) Only those portions should be dealt with which are of real assistance to the learner.

(3) It is not to be made a subject of examination.

Unless these conditions are observed, it is to be feared that the effect of the introduction of new matter for instruction would be injurious rather than beneficial. The ordinary schoolboy or schoolgirl now takes in hand quite as many subjects as he or she can satisfactorily study, and nobody wants the number to be increased.

When men look back on their school days, they constantly feel some things they have always remembered and often applied came to them from their masters not as part of the regular course or as included in the work done for examination. It is just this outside illustrative position that I propose history should occupy in respect to mathematics. I want at the outset to free myself from any imputation of desiring to add one grain's weight to the heavy burden boys and girls have to bear in these days of competitive examination.

Coming now to the main question, which is in what ways history makes mathematical study easier, clearer, or more interesting, it may first of all be remarked that it gives us stereoscopic views instead of pictures and diagrams. A particular subject may be looked at from many sides, each aspect suggesting a different mode of treatment. Thus, although we do not want to go back to the method in Whewell's Mechanical Euclid, where the main truths of elementary statics were all derived from the fundamental axiom that a ruler would balance if its middle point were supported; it is yet a good thing for the pupil to know that such a method was successfully adopted. We do not want in arithmetic to go back to the old-fashioned rules of single and double false position, but the student is all the better for knowing what they were, and what could be effected by their means. Possibly some of us might really like to go back to the proof of Euclid I. 47 in the "Vija Ganita," depending only on the almost obvious truth that triangles of the same shape have their sides proportional, but at all events a student should know about this proof, even if he were to be warned of the objections to using it.

In some instances there is a further direct advantage in recalling old methods that are now superseded. Though the change

[1] Abstract of a paper by Mr. G. Heppel, read before the Association for the Improvement of Geometrical Teaching.