

logue, p. 65 (Fig. 2), the stone ball hanging loosely from the handle in a bag of buckskin. The Moquis of this same region use the boomerang; two of these (Fig. 3) are in the Smithsonian

Institution. I am not sure that it returns to the hand of the thrower.

On page 91 of Col. Fox's Catalogue he says: "In California

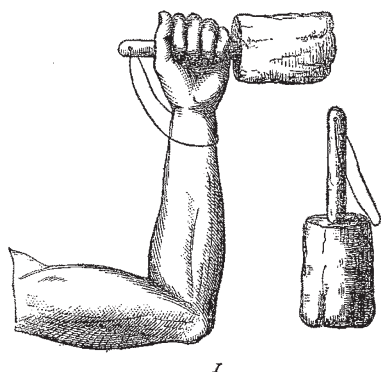


Fig. 1.—Pai-Ute War Club, for thrusting by a backhanded blow into the face of an enemy. Made from the wood of the Mezquite bean.



Fig. 2.—Pai-Ute War Club. Fig. 3.—Moquis Boomerang. Fig. 4.—Numa Reed Arrow, with hard wood foreshaft. Fig. 5.—Klamath River Pointed Arrow; soft wood shaft, hard wood foreshaft. Fig. 6.—Klamath River Arrow, without point; soft wood shaft, hard wood foreshaft sharpened.

and the greater part of the North American Continent the arrows are constructed either in a single piece or with a bone foreshaft; but in no case have I come across a foreshaft of hard wood." Among the Numas of the Great Basin, reed arrows with hard wood foreshaft are very common (Fig. 4). In Northern

California two kinds of arrows have hard wood foreshaft, those with and those without stone points (Figs. 5 and 6). The stripes on the feather end are rancheria marks, and the foreshaft is moveable.

OTIS T. MASON

Washington, D.C., U.S., May 19

Primroses and Cowslips

MR. FORDHAM (NATURE, vol. xii. p. 87) is quite right in conjecturing that it may be without foundation he has thought that primroses are not found in districts in which cowslips are common, and *vice versa*. In the north-east of Staffordshire, for miles round Denstone College, early in the spring, nearly all the hedges and many of the fields are covered with primroses. Later on cowslips abound; I might add that oxlips are also far from being rare.

I have watched closely, but have never found a trace of any destruction of the flower by birds. This, perhaps, may be accounted for by the fact that this being a pasture country, the sparrow, finding no grain, is a *rara avis* about here. I have noticed in Lord Bagot's wood, some twelve miles from here, where sparrows as well as many other birds are found in great numbers, that the primroses nearly always present a very ragged appearance.

D. EDWARDS

Denstone College, Uttoxeter

I COULD name half a dozen spots to the north of London (Mill Hill) where cowslips and primroses have abounded together in the same meadow, to my own knowledge, for the past twenty years. For at least five years I can say that neither the primroses nor cowslips were attacked by birds, though the crocuses were cut up by them more or less every season in the same locality.

R. A. N.

THE VISITATIONS OF GREENWICH AND EDINBURGH OBSERVATORIES

WE have before us the Annual Reports of the Astronomers Royal for England and Scotland, to their respective Boards of Visitors. The Report of Sir G. B. Airy consists mainly of the usual statements under the various heads of the state of the buildings and instruments, the constitution of the staff, and the amount of work done. In all these respects the Observatory seems to be in a satisfactory condition. One important change in the staff during the past year has been the resignation of

Mr. Glaisher, who has for so many years been connected with the Observatory, and which has rendered necessary a readjustment of the duties of the various observers.

Under the head of "Chronometers, Time-signals," &c., the Astronomer Royal refers to the supplemental mechanism which he himself has introduced into some chronometers in order to correct the perceptible defect of thermal compensation which occurs in nearly every case, even in the best chronometers. "There is," he states, "great difficulty in correcting the residual fault, not only because an inconceivably small movement of the weight on the balance-curve is required, but also because it endangers the equilibrium of the balance. To remedy this I have introduced small supplementary weights carried by means of a supplementary bar (rotating with stiff friction in the balance-staff), at whose ends are very light springs carrying the supplementary weights, and constantly pressing them to the interior of the balance-curve. When the supplementary bar is so turned that the supplementary weights are near the end of the balance-curve, the compensation is large; when they are near the root of the balance-curve, it is small. The movement from one state to the other is so simple that probably an assistant of the Observatory will be able to manage it, and it does not interfere with equilibrium. This arrangement has received the approval of some able chronometer-makers, and may perhaps with advantage be adopted generally."

The various time-signals and clocks connected with the Observatory have been worked with praiseworthy regularity and accuracy; the Westminster clock has been so well regulated, under check of automatic report to the Observatory, that in 83 per cent. of the days of the year its error is below one second. Proposals have been made for galvanic determination of the longitude of the Dublin Observatory, and the operation is delayed only for convenience in the arrangements to be made at Dublin. With the aid of a grant from the Treasury three computers are now steadily at work on the Astronomer Royal's New Lunar Theory.

The most novel and interesting part of Sir George Airy's Report is his concluding "General Remarks," in which

he takes a rapid glance over the changes in the Observatory in the forty years during which he has been at its head. "The Observatory was expressly built," he states, "for the aid of astronomy and navigation, for promoting methods of determining longitude at sea, and (as the circumstances that led to its foundation show) more especially for determination of the moon's motions. All these imply, as their first step, the formation of accurate catalogues of stars, and the determination of the fundamental elements of the solar system. These objects have been steadily pursued from the foundation of the Observatory; in one way, by Flamsteed; in another way, by Halley, and by Bradley in the earlier part of his career; in a third form, by Bradley in his later years, by Maskelyne (who contributed most powerfully both to lunar and to chronometric nautical astronomy), and for a time by Pond; then with improved instruments by Pond, and by myself for some years; and, subsequently, with the instruments now in use. It has been invariably my own intention to maintain the principles of the long-established system in perfect integrity; varying the instruments, the modes of employing them, and the modes of utilising the observations by calculation and publication, as the progress of science might seem to require.

"While instruments of the same class, but of increased power, have been substituted for those which I found here, three novel constructions have been introduced; the lunar altazimuth, the reflex-zenith-tube, and the chronograph; and, for a special investigation, the water-telescope (now dismantled). I omit mention of auxiliary instruments. To utilise the observations, the numerical reductions for each current year have always been maintained in the most perfect state that I could devise. From these, elaborate star-catalogues (now in frequent demand) have been formed from time to time. And, for connecting the observations of the moveable bodies of our system in a complete and homogeneous series, beginning at 1750, first the planetary observations, and secondly the lunar observations of my predecessors have been reduced, and orbital elements have been corrected. The lunar reductions are probably the greatest single work ever undertaken in astronomy. This portion of our labours may be considered as applying to the combined subjects of astronomy and navigation. But there are also, peculiar to astronomy, the photoheliography and spectroscopy lately introduced. And, peculiar to navigation and related subjects, there are the investigation of the laws of magnetic disturbance in iron ships, and the correction of the compass by methods now used in the commercial navies through the world; the maintenance of magnetic observations; the incessant attention to chronometers; the extensive dissemination of accurate time-signals; and the daily dropping of a time-ball at Deal.

"The subject of meteorology, which has been followed for many years, is scarcely connected with the two great heads of astronomy and navigation, and hardly deserves the name of a science. It is, however, in great popular request. Mechanical self-registration of some meteorological phenomena was introduced by me shortly after the commencement of my residence. Since that time the practical arts of photography and galvanic communication were invented, and they were quickly made available in many of our operations. In this increase of occupations, the annual expenses of the Observatory have increased, but in a much lower proportion than the work done.

"Experiments have been made, bearing on cosmical physics, by Maskelyne for the attraction of Schehallien, and by myself for the vibrations of pendulums in mines. Preparations have been made for observations of eclipses and of the Transit of Venus. Assistance has been rendered to the Government in training officers for such services as tracing national boundaries, &c., and in refer-

ence to National Standards. The Lunar Theory, though most intimately connected with the highest interests of astronomy, scarcely presents itself to me as a work of the Observatory.

"Turning now from the past to the future, I see little in which I could suggest any change. If it should ever be necessary to make any reduction, I should propose to withdraw meteorology, photoheliography, and spectroscopy; not as unimportant in themselves, or as ill-fitted to the discipline of the Observatory, but as the least connected with the fundamental idea of our establishment. In the nature of addition, I will indicate one practical point. I much desire to see the system of time-signals extended, by clocks or daily signals, to various parts of our great cities and our dockyards, and above all by hourly signals on the Start Point, which I believe would be the greatest of all benefits to nautical chronometry. Should any extension of our scientific work ever be contemplated, I would remark that the Observatory is not the place for new physical investigations. It is well adapted for following out any which, originating with private investigators, have been reduced to laws susceptible of verification by daily observation. The National Observatory will, I trust, always remain on the site where it was first planted, and which early acquired the name of 'Flamsteed Hill.' There are some inconveniences in the position, arising principally from the limited extent of the hill, but they are, in my opinion, very far overbalanced by its advantages."

We quite agree with the Astronomer Royal that a strictly Astronomical Observatory is not the place for such observations as those mentioned in the conclusion of his Report; it would be much, both to the advantage of astronomy and of the important branches of science referred to, that the latter should have one or more Government establishments allotted solely to their investigation, establishments quite distinct from and independent of the Greenwich Observatory.

The Report of the Astronomer Royal for Scotland is a little more fervid than the one just mentioned, or indeed than official documents generally are. The funds of the northern establishment continue to be extremely inadequate to its requirements, and it reflects great credit on Prof. Piazz Smyth that he is able, year after year, to show such a satisfactory output of work.

In reference to Zodiacal Light Spectroscopy, the Report, referring to the results obtained by the expedition, at Prof. Smyth's own expense, to Sicily in 1872, states that he has another research of the same kind in progress, which will require him, for its completion, to visit successively with the same instruments the shores of the Arctic Ocean and a tropical mountain-peak. We hope Government will provide him with the very small sum necessary to carry out this important work. Prof. Smyth is also carrying out, under great difficulties, observations in Auroral Spectroscopy, for which he is very favourably located; but again he is hampered by want of the necessary instruments. No doubt Mr. Cross's recent unexpected official visit, if it meant anything at all, will lead to speedy attention being paid to the very reasonable demands of the Scottish Astronomer Royal.

An appendix to the Report contains some documents intended to show the real position of the Observatory and of its chief, and his relation to the professorship of astronomy in Edinburgh University which he holds. It seems the University Council wish to make out that 300% of his not excessive salary he receives solely as occupant of that chair, and must resign this sum with the chair. Altogether it seems to us the duty of Government to make a speedy and thorough inquiry into the position of the Northern Observatory, and put it into a state of such complete efficiency that there will be no further room for complaints. We regret to see that the new equatorial is still in the contractor's hands.