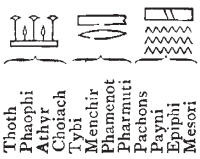
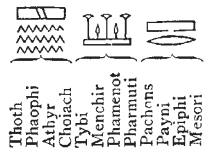
if a reformer of the calendar (and one especially of conservative tendencies) appeared upon the scene, who believed that the ancient sign for the inundation-tetramene was the water sign, and that the ancient name was Thoth. Finding the cycle beginning in 1728 with the signs as shown—



when starting fresh, he would seize the opportunity of effecting a change, not only by dealing with a tetramene, but he would change the names of the tetramenes allocated to the signs.



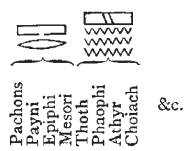
As Krall remarks, it was almost merely a question of a change of the sign! It really was more, because the new tetramene began with the flood.

Assuming this, we can see exactly what was done in 238 B.C., *i.e.* about 380 years later. We have seen that the 380 years is made up of

5 Epacts
30 Mesori
30 Epiphi
30 Payni

95 × 4 = 380

the heliacal rising of Sirius occurring on 1 Payni, having swept backwards along the months in the manner already explained. We had then—



To sum up, so far as we have gone we have the three inscriptions at Philæ, Elephantine, and the still more ancient one of Pepi, indicating on the simple system we have suggested beginnings of Sothic cycles on the 1st Thoth about the years

270
1728
3192
} B.C.

On the other hand, we have the decree of Canopus, giving us by exactly the same system a local revision of the Calendar about 600 B.C. I say *about* 600 B.C. because it must be remembered that a difference of 2¼ days in the phenomena observed will make a difference of 10 years in the date, and we do not know in what part of the valley the revision took place, and therefore at what precise time in relation to the heliacal rising the Nile-rise was observed.

Whenever presumably it took place, New Year's day was reckoned by the Flood, and the rising of Sirius followed nearly, if not quite, a month afterwards. The equivalent of the old 1st Thoth was therefore 1 Payni. In months, then, the old 1st Thoth was separated from the new one (= 1 Payni) by 3 months (Payni, Mesori, Epiphi) and the Epacts.

In this way, then, we can exactly account for the difference of 409 years referred to above as the dates assigned by Censorinus and myself for the beginning of the Sirius cycle.

Difference between 270 and 239	=	31 years.
3 months = 90 days × 4	=	360 ,,
5 epacts × 4	=	20 ,,
		411 ,,

The difference of two years is equal only to half a day!

It seems, then, pretty clear from this that the suggestion I have ventured to make on astronomical grounds may be worth consideration on the part of Egyptologists. If our inquiries have really led us to the true beginnings of the Sothic periods, it is clear that those who informed Censorinus that the year 139 A.D. was the end of a cycle omitted to tell him what we now can learn from the decree of Tanis.

J. NORMAN LOCKYER.

(*To be continued.*)

TECHNOLOGICAL EXAMINATIONS.

THE report of the results of the Technological Examinations, held this year under the direction of the City and Guilds of London Institute, has a special interest, seeing that after this year the system of payment on results in connection with all classes outside the Metropolis will be discontinued. There is no doubt that the offer of payment to teachers helped very greatly in 1879 to stimulate the formation of technical, as distinct from science, classes, and the great extension of this work of the Institute is largely due to the offer then wisely made of contributing towards the cost of instruction. The tables furnished in the report, and the diagram of results, are very interesting as showing the great development of these trade classes. Since 1880 the number of candidates for examination has increased more than tenfold, the numbers being 816 in 1880 and 8,534 in 1892. In 1885 there were 263 technological classes in different parts of the country, and in the session 1891-2 this number had increased to 610. There is, of course, a corresponding increase in the number of students in attendance at these classes. In 1881 the number of students was 2,500, this year it was 16,565. This record of progress is certainly satisfactory, and particularly so, seeing that prior to 1891 there was no sort of organization to carry on the work of directing and assisting technical classes for artisans in different parts of the country. As a pioneer movement, the work of the City Guilds Institute has been eminently successful, and many of the Technical Schools which have now been brought under the control of County Councils undoubtedly owe their origin to the technological classes promoted by the City Guilds. The question now demanding attention is the future of these classes. Much is to be said in favour of associating them more closely with the science classes, which are held in the same schools; but what is wanted for the permanent improvement of such classes is a system of efficient inspection by persons competent to advise County Councils with respect to the important work now under their control.

From the report and programme it appears that year by year the Institute adds to the extent and efficiency of its examinations by the introduction of new subjects and of practical tests. Practical examinations were held this year for the first time in photography, goldsmiths' work, boot and shoe manufacture, and in wood-working in connection with the examination in manual training for teachers of public elementary schools. This last examination is somewhat different in kind from the other examinations of the Institute. It is not a trade examination. Its purpose seems to be to encourage instruction of a distinctly educational character. Moreover, it is a

close examination. None but teachers of public elementary schools are eligible, and these must have regularly attended a course of practical lessons in a registered class under a teacher approved by the Institute. Notwithstanding these restrictions, 615 candidates presented themselves at the first examination held by the Institute, and of these 350 passed, 195 obtaining the Teacher's Certificate.

The report contains full statistics of the results of the examinations in each of the 61 subjects included in the programme, and it also shows the results in each of the 210 towns where the examinations were held. Of the centres outside London, Manchester sent up the largest number of successful candidates, whilst Glasgow, Dundee, and Leeds come next in order. The report calls attention to the fact that the proportion of candidates to the population is far less in London than in Manchester, whilst the hope is expressed that the larger facilities for technical instruction which will be available within the next few years will lead to an increase in the number of students and of candidates for examination. This increase will no doubt take place with the opening of new polytechnic institutions; but we venture to think that the real improvement in technical education cannot be correctly measured by any mere increase in the number of candidates for examination. It depends much more upon the character and quality of the instruction which the candidates receive. The great defect of our present organization is the poverty in knowledge and practical experience of the teachers of our science and technical classes. Some improvement in the qualifications of teachers, and in the conditions of their training, is needed before progress can be measured by the increase in the number of students in attendance, or of candidates for examination.

We notice that in future the Institute proposes to award two kinds of certificates—the one kind to students who have regularly attended a course of instruction under an approved teacher, and the other to candidates who may present themselves for examination without giving any evidence as to their training. In this way the Institute proposes to combine the functions of a teaching and an examining body. The certificate indicating that the candidate has received some training at a school of recognized position will doubtless acquire a distinct value; but much will depend upon the ability and the reputation of the teacher under whom the candidate may have studied.

Of the many alterations in the new programme the most important is the addition of a practical part to the examination in mechanical engineering. This examination of the Institute has never seemed to us wholly satisfactory, as overlapping, to too great an extent, the examinations of the Science and Art Department in applied mechanics, machine construction, and steam. But in future the examination will consist of two parts, one of which will be distinctly specialized with a view to the candidate's occupation. Moreover, in the honours grade, candidates will be required to undergo a practical examination in either machine designing or workshop practice. At the last examination in this subject 966 candidates presented themselves, of whom 536 passed. It is satisfactory to note the continuous increase in the number of candidates in plumbers' work, a trade in the successful practice of which every householder is interested. In this subject a high standard for passing is wisely maintained. Of the 816 candidates who presented themselves, 235 came up for the practical part of the examination, and of these only 85 succeeded in passing in both parts of the examination, and are qualified for certificates.

There is little doubt that the statistics furnished in this report go far to show that a high value is attached by artizans and their employers to the Institute's certificates, and that the progress of technical education has been advanced by the cautious and judicious manner in which the Institute has conducted this department of its operations.

ROBERT GRANT.

IN Robert Grant, who at the ripe age of seventy-eight died at the place of his birth, Grantown-on-Spey, on October 24, 1892, science loses one of her ablest historians. His education was interrupted by a serious illness, which confined him to his bed from his fourteenth to his twentieth year. With surprising energy, however, on his recovery he set about the study of mathematics and the acquisition of ancient and modern languages. After studying for a time at King's College, Aberdeen, he went to London to collect materials for a history of physical astronomy. Thence he proceeded to Paris in 1845, where for two years he attended the lectures of Arago at the Observatory, and those of Leverrier and others at the Sorbonne. Returning to London, he lost little time in beginning the great work with which his name will always be associated. It was published in numbers, the first of which appeared in September, 1848, but it was not until March, 1852, that the whole work was issued. It bears the title "History of Physical Astronomy from the Earliest Ages to the Middle of the Nineteenth Century, comprehending a detailed account of the establishment of the Theory of Gravitation by Newton, and its development by his successors; with an exposition of the progress of research in all the other subjects of Celestial Physics." Most completely do the contents of the volume fulfil every expectation raised by this comprehensive programme. The fame of its author was at once established. Four years later he received from the hands of the late Mr. Manuel J. Johnson, President of the Royal Astronomical Society, the gold medal, then for the first time awarded for literary service to astronomical science. One paragraph of the address delivered on that occasion may here be quoted as characterizing most justly the work as well as its author: "Throughout the book no one can fail to be struck with the rare skill, integrity, and discernment the author has displayed in tracing the successive stages of progress; or with the scrupulous care he has taken to assign to each of the great men whom he reviews their proper share in the common labour. Nowhere is this more conspicuous than in the discussion relative to the discovery of the planet Neptune. By a simple narration of facts he has placed the history of that great event in so clear and so true a light, that I believe I am not wrong in saying he has gained an author's highest praise under such circumstances—the approval of both the eminent persons concerned." Even now, forty years after its publication, the "History" has lost none of its value as a mine of information, and as a delightful guide to those who desire to make a closer acquaintance with the astronomers of the past, as well as their works.

For some time Mr. Grant edited the "Monthly Notices" of the Royal Astronomical Society, and was a member of their Council. In conjunction with the late Admiral Smyth, he translated and edited Arago's "Popular Astronomy" (2 vols. 1855 and 1858). Meanwhile his health had so far improved that in 1858 he was able to go through a course of observational astronomy at Greenwich Observatory. In the following year, on the death of Prof. J. Pringle Nichol, he was appointed Professor of Astronomy, and director of the Observatory in the University of Glasgow.

As a member of the party that went to Spain in the troop-ship *Himalaya*, to observe the total solar eclipse of July 18, 1860, Prof. Grant, from his station near Vittoria, had the satisfaction of seeing a portion of the chromosphere, the existence of which as a thin layer en-