

COMET 1888 *a* (SAWERTHAL).—The following ephemeris for Berlin midnight is by Herr Berberich (*Astr. Nach.*, No. 2838), from elliptic elements which he has found for it, and which closely resemble those of Prof. Boss given in NATURE of May 24 (p. 88):—

1888.	R.A.	Decl.	Log <i>r</i> .	Log Δ .	Bright-ness.
	h. m. s.	°			
June 23...	0 55 11	46 11'5 N.	0'2760	0'3129	0'042
25...	0 57 1	46 40'5			
27...	0 58 42	47 8'9	0'2887	0'3173	0'039
29...	1 0 16	47 36'6			
July 1...	1 1 42	48 3'7	0'3009	0'3212	0'036
3...	1 3 0	48 30'2			
5...	1 4 9	48 56'0	0'3127	0'3247	0'033
7...	1 5 9	49 21'2			
9...	1 6 1	49 45'7	0'3241	0'3278	0'031
11...	1 6 44	50 9'6			
13...	1 7 18	50 32'8 N.	0'3352	0'3306	0'029

The brightness at discovery is taken as unity.

THE Kazan Observatory has celebrated its "Jubilee" by publishing an interesting report about its activity since it was founded by Littrow fifty years ago. The mapping of the stars between 75° and 80°, which was begun by Prof. Kovalsky, was continued and extended by his successor, Prof. Dubyago.

THE Tashkend Observatory has just issued the second volume of its "Works."

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 JUNE 24-30.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on June 24

Sun rises, 3h. 46m.; souths, 12h. 2m. 13'7s.; sets, 20h. 19m.; right asc. on meridian, 6h. 14'5m.; decl. 23° 25' N. Sidereal Time at Sunset, 14h. 33m.
 Moon (Full, June 23, 21h.) rises, 19h. 57m.*; souths, 0h. 9m.; sets, 4h. 20m.; right asc. on meridian, 18h. 19'6m.; decl. 21° 5' S.

Planet.	Rises.		Souths.		Sets.		Right asc. and declination on meridian.	
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	
Mercury..	5 33	...	13 25	...	21 17	...	7 37'2 ... 19 52 N.	
Venus.....	3 23	...	11 41	...	19 59	...	5 53'7 ... 23 36 N.	
Mars.....	13 28	...	18 53	...	0 18*	...	13 6'5 ... 7 39 S.	
Jupiter....	17 6	...	21 29	...	1 52*	...	15 42'7 ... 18 47 S.	
Saturn....	6 29	...	14 19	...	22 9	...	8 31'3 ... 19 34 N.	
Uranus ...	12 56	...	18 36	...	0 16*	...	12 49'3 ... 4 35 S.	
Neptune..	1 59	...	9 45	...	17 31	...	3 56'9 ... 18 47 N.	

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Comet Sawertal.

June.	h.	Right Ascension.	Declination.
		h. m.	h. m.
24	...	0 55'2	46 12 N.
28	...	0 58'7	47 9

Occultations of Stars by the Moon (visible at Greenwich).

June.	Star.	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image.
			h. m.	h. m.	h. m.
24	...	50 Sagittarii	6	22 6	23 16 ... 65 250
28	...	50 Aquarii	6	2 28	2 59 ... 163 215
June.	h.				
25	...	9	...	Mercury stationary.	
27	...	23	...	Mercury at greatest distance from the Sun.	

Meteor-Showers.

	R.A.	Decl.	
Near 52 Hercules	...	253	47 N. ... June 25-30. Swift.
,, 8 Cygni	...	295	40 N. ... Slow.
,, e Delphini	...	305	9 N. ... June 28.

Variable Stars.

Star.	R.A.		Decl.		h. m.
	h. m.	°	h. m.	°	
U Cephei ...	0 52'4	...	81 16 N.	...	June 25, 22 54 <i>m</i>
R Geminorum ...	7 0'6	...	22 53 N.	...	,, 30, 22 33 <i>m</i>
δ Libræ ...	14 55'0	...	8 4 S.	...	,, 27, <i>M</i>
U Ophiuchi...	17 10'9	...	1 20 N.	...	,, 29, 2 2 <i>m</i>
					,, 28, 2 52 <i>m</i>
					,, 28, 23 0 <i>m</i>
W Sagittarii ...	17 57'9	...	29 35 S.	...	,, 24, 2 0 <i>m</i>
T Herculis ...	18 4'9	...	31 0 N.	...	,, 27, <i>M</i>
U Sagittarii...	18 25'3	...	19 12 S.	...	,, 30, 2 0 <i>m</i>
β Lyræ...	18 46'0	...	33 14 N.	...	,, 28, 22 0 <i>m</i>
S Vulpeculæ ...	19 43'6	...	27 1 N.	...	,, 26, - <i>M</i>
η Aquilæ ...	19 46'8	...	0 43 N.	...	,, 24, 21 0 <i>m</i>
R Sagittæ ...	20 9'0	...	16 23 N.	...	,, 27, <i>m</i>
X Cygni ...	20 39'0	...	35 11 N.	...	,, 26, 22 0 <i>M</i>
δ Cephei ...	22 25'0	...	57 51 N.	...	,, 27, 21 0 <i>M</i>

M signifies maximum; *m* minimum.

GEOGRAPHICAL NOTES.

LIEUTENANTS KUND AND TAPPENBECK have been conducting an expedition into the Cameroons interior during the latter part of 1887 and the beginning of the present year. Starting from Batanga they succeeded in penetrating as far as 12° 30' W. long., when, being attacked by Soudan Negro traders they were forced to retreat, both of them seriously wounded. They succeeded in tracing the course of the Beundo or Njong River far into the interior, and brought back much information concerning the people and the products of the country. With regard to general results, they found that the water-parting between the rivers that discharge in the Cameroons interior and those that flow into the Congo Basin lies not near the coast as has hitherto been supposed, and therefore it is hoped that a navigable route may be discovered that will lead well into the interior. The water-parting between the left tributaries of the Binué and the rivers in the German Cameroons also lies far in the interior. The division between the Soudan Negroes and the Bantus is not to be looked for in the direction of Adamawa, but southwards is formed by the Zannaga River and eastwards lies at a distance of 150 miles from the coast. Lieutenants Kund and Tappenbeck assert that the area of Mohammedan influence extends much farther south than has hitherto been thought. No signs of volcanic action have been met with as far as the Zannaga River or in the mountains to the north. The profile which accompanies the report shows a coast plain about 70 feet high, succeeded by a sharp slope rising to a height of from 3000 to 4000 feet, beyond which the country slopes gradually to the inner African plateau, about 2500 feet above the sea.

THE June number of Petermann's *Mitteilungen* is mostly occupied with a memoir by Dr. Supan on "A Century of African Exploration," written in commemoration of the centenary of the British African Association, founded in June 1788. Dr. Supan traces the gradual opening up of the continent and its various regions, the text being illustrated by a series of most instructive maps. In indicating what yet remains to be done, Dr. Supan maintains that it is a mistake to assert that the days of pioneer exploration are over. He shows that while a few patches have been surveyed with some care, while of others we have a general knowledge, and while in other regions lines of travel have been run through, there are great regions that still remain absolutely blank. In the north, in the region of the Sahara, which has been so long known to Europe, the blanks are almost greater than elsewhere, leaving ample room for pioneer work, which may very well be carried on alongside of more minute exploration.

TECHNICAL INSTRUCTION.¹

IN celebrating as we are now doing the fifty-first annual meeting of the Yorkshire Union of Institutes, one's thoughts naturally revert to the foundation of that Union and to the educational progress which our country has made since the earlier years of the century; and round these thoughts will gravitate recollections of the life and labours of your revered President,

¹ Address delivered by Sir Henry Roscoe, M.P., F.R.S., at Castleford, on Wednesday, June 20, on the occasion of the fifty-first annual meeting of the Yorkshire Union of Mechanics' Institutes.

Sir Edward Baines, for in him we have a living picture of the history of the educational progress of the century. Truly, he has been a witness, and an active witness, of English educational reform from his earliest years, nor have his efforts in the great cause from that time forward ever ceased. Was he not even as a boy in Leeds so long ago as 1809 an earnest listener to the expositions of one who may be justly regarded as the founder of our present system of national education, I mean Joseph Lancaster? The name of Baines, again, is intimately connected with those of Birkbeck and Brougham in the great work of founding mechanics' institutes.

The English character is ever prone to consecutive action, sudden revolutions are contrary to its spirit, and this characteristic is evidenced by the present phase of interest in so-called technical education, for this is doing nothing more than carrying out in accordance with the necessities of the hour the old principle enunciated by Birkbeck, Brougham, and Baines in 1825 in the founding of mechanics' institutions, which have for their object the teaching to our workmen the principles of art and science which underlie the trades they practise. This, too, is our definition of technical instruction. We do not attempt to teach trades, but the principles, artistic or scientific, upon which these trades depend. The school can teach how to make the best article, how to apply the principles which lie at the foundation of the manufacture. The workshop, on the other hand, teaches what the workshop alone can teach—how to produce the article most economically. This I take to be the essential distinction between school teaching and workshop practice. The boy at school learns how to do the work well, the man at the factory or shop must learn to do it not only well but most cheaply. If we keep these two parts of the question separate, give to the school what belongs to the school, and to the workshop what belongs to the workshop, we shall avoid all conflict between the so-called theorist and the practical man, we shall preserve what is greatly to be prized, our English workshop experience, but add thereto a knowledge of principles which have hitherto been greatly wanting. Each does necessary work; what we desire and need to develop and to foster is the proper union of theory and practice, without which the supremacy in manufacturing industry, the chief glory and mainstay of our country, will be endangered in the industrial warfare in which all civilized nations are now engaged.

This, then, is the problem which Baines sought to solve, and which your Union and all ardent educationists of the present day are striving to accomplish. For this end we now seek Government aid, and are asking for national recognition of a national necessity. What else is the meaning of the Bills for the promotion of technical education now before Parliament? We ask simply for powers to develop and to strengthen the work which mechanics' institutes were founded to accomplish. We desire to carry on that work on sound lines; that, whilst asking for Imperial aid and for the imprimatur of a national system, we shall be left to decide for ourselves the exact mode of carrying out that system which each locality and each special industry knows is best adapted to satisfy its peculiar requirements. These should be the main objects of any Technical Bill. Are these objects properly put forward, and are these conditions properly safe-guarded in the Government Technical Bill now before Parliament? This is the pressing question of the hour. It is for you, and for similar associations throughout the length and breadth of the land, to say whether this is so or not, to satisfy yourselves on this point, and to urge your representative in Parliament—than whom none is more willing or more able to assist you—to see that your claims and opinions on this subject are made known to the Government which is responsible for bringing this great subject forward. For, gentlemen, it is a great question, one which lies at the foundation of the future welfare—I had almost said the future existence—of the nation.

May I, then, venture to call your attention to one or two of the salient points in this Bill, and to point out to you what I consider some of its valuable provisions as well as some of its defects? In the first place, then, the chief and leading principle of the Bill is the recognition that the time has arrived for giving national aid, whether from local rates or from Imperial sources, for the promotion of technical instruction. The establishment of this principle is one, I venture to think, of the highest possible importance, which if once admitted may well cover a multitude of minor defects. Still, every benefit may be purchased too dear, and it is well to look at the conditions with which this concession to public opinion is coupled. Here I am speaking to educationists, but I am also speaking in Yorkshire and to Yorkshiremen,

who have always upheld, and especially at the present moment do uphold, the standard of Liberal opinion in political as well as in educational matters, and I therefore feel that in expressing my opinion against certain conditions attached to the Bill—conditions which are diametrically opposed to the ideas and principles upon which the Liberal party has always acted—I say in expressing these objections I may claim your support as well as your attention.

Clause 2 of the Bill makes it compulsory on every School Board adopting its provisions as to technical instruction—that is, upon every School Board undertaking to rate its district to the limited penny in the pound—to aid the supply of technical instruction in any other public elementary school not under its management in like manner as it aids the supply of such instruction in its own schools. This clause, which as you all will see may be most sweeping in its effects, must be entirely rejected; indeed, it could not stand one hour's scrutiny in the House of Commons, for it offends against the cardinal principle that those who pay the rates should have a voice, either directly or indirectly, in the spending of them, and this is not provided for. But whilst strongly objecting to this compulsory clause—the only compulsory one in the Bill—I, for one, am willing to consider, and to deal fairly with, the just claims of the voluntary schools; for although I am a believer in the Liberal creed, I am before all things an educationist, and I cannot forget that if we are to have our children made more fit for succeeding in the modern battle of life, we must endeavour to bring to bear upon them all, without distinction of creed or of party, the lever which will raise them in the social scale and enable them to use their heads and their hands to their own benefit, and therefore to that of the nation of which they form the units.

Hence, remembering that more than one-half of our population are educated in voluntary schools, and that in many localities these schools are the only ones in existence, and moreover that they are doing excellent educational work, I, speaking for myself, whilst strongly opposed to any compulsory powers, do not feel the same difficulty in admitting the provisions of the first clause in the Bill by which "any School Board in England may from time to time supply, or aid the supply of, such manual or technical instruction or both, as may be required, for supplementing the instruction in any public elementary school in its district, whether under its own management or not." This clause, you will perceive, enables School Boards if they think fit to assist voluntary schools in their districts by aid from the rates for the special purposes of technical instruction, and through the School Board the ratepayers have a voice as to whether their rates shall or shall not be thus spent. But here comes in the limiting clause that not more than 1*l.* in the pound shall be spent. I object to this limit. It will obviously be very difficult for any School Board to ascertain how far the expenses of giving technical instruction can be accurately defined, and I should prefer to leave the amount spent on this object to the good sense and judgment of the locality as represented by the School Board. But how about districts which possess no School Board? Are they to be left out in the cold? No. Provision is made in a further clause by which any local authority having adopted the Free Libraries Acts may hand over to the voluntary schools in its district a sum not exceeding 1*l.* in the pound for the purpose of supplying technical education to be given in its district public elementary schools. Here again the clause is a permissive one only, and the local authority as representing the ratepayers is the judge of whether and how far such aid is to be given. I do not like the plan of mixing up the vexed question of free libraries with that of technical education, and should much prefer the names of the authorities to be simply scheduled, as I see grave objections to the necessary *plébiscite* in districts which have not already adopted the Acts. Still I do not know that on this account I should wish to see the Bill rejected.

Another grave defect in the Bill is a limit is placed on the teaching of technical subjects in Board schools at the seventh standard. This deals a fatal blow at the higher elementary schools. Thus in the Central School in Manchester at the present moment no fewer than 500 scholars who have passed Standard VII. are now learning the sciences—subjects included within the term technical instruction. These scholars cannot continue thus to be taught under the Bill. We must have a similar provision introduced to that in the Scotch Bill, by which the Boards are empowered to use the rates for the maintenance of higher-grade schools; and these matters must be attended to if we are to have a Technical Bill worthy of the name. The higher technical education, as that given in the Colleges, may be

assisted by rates levied by local authorities or by Imperial grants, in addition to those made now by the Department. All acknowledge the importance of this higher training. If the head is not educated, the hands are apt to get into mischief. Hence, as these University Colleges can never be self-supporting, it is greatly to be hoped that they will receive that national aid which their importance to the State demands.

But we have a second Bill before the House of Commons—one introduced by myself on behalf of the National Association for the Promotion of Technical Education. I naturally prefer the provisions of my own Bill to those of the Government. They are much simpler, less clogged and hampered by conditions, and confer the same benefits as the Government Bill proposes to confer, with one exception only, viz. aid from the rates to voluntary schools, for to this many of my friends are strongly opposed; but, so far as I am myself concerned, I am free to admit that I should not object to see the difficulty settled by permissive powers being given to the School Boards to aid voluntary schools in their district, just as it is proposed that local authorities shall have power to do the same where no School Boards exist; for, as I have pointed out, the ratepayers have it in their power to refuse such payments by electing members who will oppose such an application of the rates.

Now, to turn to the more immediate question relating to your Union, you may, I think, be gratified with the results of your fifty-one years' work. You can look back upon half a century of admirable endeavour. You have now 260 institutions in union, containing upwards of 500,000 members and 14,000 technical students. You have spent half a million of money in buildings contributed by voluntary subscriptions, with the exception of 1 per cent. derived from S.K. grants for building. All the members of your committees are unpaid, and many of them have been at work for you all their lives. Your claims for national aid are therefore high, and such aid is much needed, for, though the progress you have made is great, you have not nearly accomplished all that has to be done. We want continuation evening schools established on a new and generous basis. We want a new and more elastic evening school code. We want to emancipate from the rigid lines and requirements of payment on individual results. We want an attendance and merit grant for evening continuation schools—say 12s. per head for attendance of sixty nights to insure good and continuous teaching. Above all, we wish that existing institutions should be rendered effective. The 260 institutes are in existence, but need help.

When we look abroad we see that both Governments and municipalities vie with each other in aiding technical schools. They are proud to do so, for they know their value. "Do you suppose," said an intelligent German to me, "that we, weighted as we are with heavy taxation for our military and civil services, would willingly further tax ourselves for the purposes of technical schools unless we were convinced that the outlay will repay us over and over again?" This is German opinion, and it is the opinion which we need to inculcate in the minds of our own people, for then we shall get what we want.

Nor need we be ashamed of the beginnings which we have already made; many of our existing institutions will bear favourable comparison with Continental models. Take Huddersfield for example; the school there exactly meets the requirements of the district, and it has already exerted a very marked and beneficial influence on the trades of the district, especially as concerns dyeing and design. This school cost £20,000, all raised by voluntary effort, but though doing excellent work it is heavily in debt, and its friends have difficulty in raising funds to keep it going—not for lack of pupils, for the school is largely attended, but for the reason that such higher schools cannot be self-supporting, and the greater the number of pupils the greater the cost. Surely, if our people understood their true interests as well as our neighbours and competitors do, they would not rest until such an institution is placed in a position to do all it can to raise the condition of their industries by supplanting the too common and worn-out rule of thumb by scientific knowledge always new and always productive. Then again at Yeadon, a small place, you have a school which cost £7000 to build, and in which 350 students are being instructed. But here, too, funds are urgently needed to carry on the work. Surely there ought not to be many who grudge spending a penny in the pound on such objects. In Castleford itself, your Mechanics' Institute has done during its forty years of life, and is now doing, good work. The building is, however, too small for the requirements of the day; your numbers have increased from 80 to 210, and the necessary appliances for teaching science and

technology are deficient. Let us hope that when the Technical Bill becomes an Act, Castleford will be one of the first to take advantage of its provisions.

But you may ask, What good will come to our leading industries here—coal and glass—by your technical education? How shall the employers and employed benefit therefrom? In the first place, then, there is no industry in which the value of even a little scientific training is so important for both masters and men as in that of coal-getting. Such a training may, for instance, be, and indeed has often been, the means of saving hundreds of valuable lives. One ignorant man may place in jeopardy or even sacrifice by a single careless act the lives of his comrades, an act which no one acquainted with the properties of explosive gases would dare to commit. In a thousand other ways scientific knowledge—which after all is only organized common-sense—will help all concerned in this great industry. So again in glass-making, how great is the aid given by scientific and artistic knowledge. What a step was the introduction of the Siemens regenerative tank furnace, and how much more remains to be achieved. Then your bottle trade might, by the application of artistic knowledge, be made the foundation of a higher and more tasteful industry which might successfully compete with the wares of Bohemia and Venice. Why not? Are not our workmen both mentally and physically superior to the foreigner? I believe them to be so. They only need teaching, and that we have hitherto withheld from them.

It has been well said that whilst we have confined our attention to improving our machines, the Germans have devoted themselves to educating their men. Let us lose no time in following their lead. "What we fear," said one of the masters to me, "is not either free trade or protection. What we fear is that some day you English will wake up to the necessity of educating your manufacturing population as we do, and then with your racial and physical advantages it will become difficult, if not impossible, for us to compete with you." Let us, then, take to heart the old adage that victory comes to the strong, but remember that it is not to the bodily strong, but only to the strong mentally and morally that the victory comes. Let us see that in this struggle for existence our people are healthy and vigorous in all these three essentials; and act upon the true and eloquent words of Huxley, "You may develop the intellectual side of a people as far as you like, and you may confer upon them all the skill that training and instruction can give, but if there is not underneath all that outside form and superficial polish the firm fibre of healthy manhood and earnest desire to do well, your labour is absolutely in vain."

THE INTERNATIONAL GEOLOGICAL CONGRESS.

ADMIRABLE arrangements have been made for the London meeting of the International Geological Congress, from September 17 to 22 next. The following details are taken from a printed letter signed by the General Secretaries, Mr. J. W. Hulke and Mr. W. Topley. The meetings will be held in the rooms of the University of London, Burlington Gardens, where accommodation for the Council, Committees, Exhibition, &c., has been granted by the Senate of the University. There is a refreshment-room in the building, and there are several restaurants and hotels in the immediate neighbourhood. Arrangements will be made at one of these restaurants for a room to be set apart for the social meetings of members of the Congress. The opening meeting of the Congress will take place on Monday evening, September 17, at 8 p.m., when the Council will be appointed, and the general order of business for the session will be determined. The ordinary meetings of the Congress will be held on the mornings of Tuesday, the 18th, and succeeding days, beginning at 10 a.m. In the afternoons there will be visits to Museums, or to places of interest in the neighbourhood of London. Arrangements for the evenings will be made at a later date. The ordinary business of the Congress will include the discussion of questions not considered at Berlin, or adjourned thence for fuller discussion at the London meeting. Amongst these are: the geological map of Europe; the classification of the Cambrian and Silurian rocks, and of the Tertiary strata; and some points of nomenclature, &c., referred to the Congress by the International Commission. Miscellaneous business will also be considered. In addition to these questions, the Organizing Committee proposes to devote a special sitting to a discussion on the Crystalline Schists. An Exhibition will be held during