them to have their origin in the mountainous regions of Hodna. Fortunately the exact moment of their appearance may be predicted, and steps can be taken to destroy them. With this object M. Künckel has made charts of the localities where they laid their eggs last autumn, and has arranged a methodical system of campaign. The destruction of eggs is an uncertain and expensive process, he thinks, whereas one man can destroy a million young insects in a day.

A CHINESE native paper published recently a collection of some zoological myths of that country, a few of which are worth noting. In Shan-si there is a bird, which can divest itself of its feathers and become a woman. At Twan-sin-chow dwells the Wan-mu Niao (mother of mosquitoes), a fish-eating bird, from whose mouth issue swarms of mosquitoes when it cries. Yung-chow has its stone-swallow, which flies during wind and rain, and in fine weather turns to stone again. Another bird when killed gives much oil to the hunter, and when the skin is thrown into the water it becomes a living bird again. With regard to animals, few are so useful as the "Jih-kih" ox, found in Kansuh, from which large pieces of flesh are cut for meat and grow again in a single day. The merman of the Southern Seas can weave a kind of silky fabric which keeps a house cool in summer if hung up in one of the rooms. The tears of this merman are pearls. A large hermit-crab is attended by a little shrimp which lives in the stomach of its master; if the shrimp is successful in its depredations the crab flourishes, but the latter dies if the shrimp does not return from his daily excursions. The "Ho-lo" is a fish having one head and ten bodies. The myths about snakes are the strangest of all. Thus the square snake of Kwangsi has the power of throwing an inky fluid when attacked, which kills its assailants at once. Another snake can divide itself up into twelve pieces, and each piece if touched by a man will instantly generate a head and fangs at each end. The calling snake asks a traveller "Where are you from, and whither are you bound?" If he answers, the snake follows him for miles, and entering the hotel where he is sleeping, raises a fearful stench. The hotel-proprietor, however, guards against this by putting a centipede in a box under the pillow, and when the snake gives forth the evil odour, the centipede is let out, and, flying at the snake, instantly kills him with a bite. The fat of this snake, which grows to a great size, makes oil for lamps and produces a flame which cannot be blown out. In Burmah and Cochin-China is a snake which has, in the female sex, a face like a pretty girl, with two feet growing under the neck, each with five fingers, exactly like the fingers of a human hand. The male is green in colour, and has a long beard; it will kill a tiger, but a fox is more than a match for it.

A SERIES of regulations with regard to patents and designs has just been issued in Japan. All inventors, whose discoveries are beneficial or are calculated to improve existing processes of manufacture, may apply for letters patent. No patents, however, will be granted in the case of articles of food or drink, or in case of medicines. Inventors who do not receive letters patent are powerless to sue in respect of piracy of their inventions. In order to register an invention, application must be made to the Patents Bureau, and if the officials are satisfied as to the genuineness of the invention, it is registered, on certain forms being complied with and certain fees paid. A curious omission occurs in the regulations, but it is not plain whether it is intentional or not. Nothing whatever is said as to the rights of a foreigner to patent an invention, but it is presumed that he will not be able to do so. Nor has any provision been made for advertising applications for letters patent. The Patents Bureau is to be the sole judge of all cases submitted to it, and from its decision there is no appeal; but, in certain cases, two judges sit with the Bureau and assist in deciding whether a patent should be granted or not. The duration of a patent is to be five, ten, or fifteen years, according to the amount paid in fees. The patent, of course, passes by assignment *inter vivos*, or to the patentee's heir, but nothing is provided for the cases of bankruptcy or marriage.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus* ♂) from India, presented by Miss Caroline Newton; a Leopard (*Felis pardus* ♂), a Lesser Koodoo (*Strepsiceros imberbis* ♂) Malindi, East Africa, two White-crested Touracous (*Corythaix albocristata*) from South Africa, presented by Mr. G. S. Mackenzie; a Common Squirrel (*Sciurus vulgaris*) British, presented by Mrs. Arthur Faulkner; an Indian Wolf (*Canis pallidus*) from Afghanistan, five Chaplain Crows (*Corvus capellanus*), an Indian Python (*Python molurus*) from Fao, Persian Gulf, presented by Mr. B. T. Ffinch, C.M.Z.S.; two Slender-billed Cockatoos (*Cacatua tenuirostris*) from Australia, presented respectively by Mr. Walter Bird and Mrs. Hunt; an Eagle (*Aquila* sp. inc.) from Foochow, China, presented by Messrs. J. de la Touche and George Siemosen; two Alligators (*Alligator mississippiensis*) from Florida, deposited; a Wanderoo Monkey *Macacus silenus* ♀) from the Malabar Coast of India, an Indian White Crane (*Grus leucogeranos*), six Rose-coloured Pastors (*Pastor roseus*) from India, three Elliot's Pheasants (*Phasianus ellioti* ♂ ♀ ♀), thre Amherst's Pheasants (*Thaumalea amherstiæ* ♂ ♀ ♀) from China, two Swinhoe's Pheasants (*Euplocamus swinhoii* ♂ ♀) from Formosa, two Vulturine Guinea Fowls (*Numida vulturina* ♂ ♀) from East Africa, two Crested Screamers (*Chauna chavaria*) from Buenos Ayres, two Pochards (*Fuligula ferina* ♂ ♂), European, purchased; two Viscachas (*Lagostomus trichodactylus*), a Vulpine Phalanger (*Phalangista vulpina* ♂), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE CONSTITUTION OF CELESTIAL SPACE.—M. G. A. Hirn has recently published an able and interesting work, entitled "Constitution de l'Espace Céleste," in which he inquires into the nature of the medium or agent which establishes and carries on the relationships of the celestial bodies. For all of these, from the most enormous sun to the most infinitesimal meteorite, are in constant relationship to each other, continually attracting each other, continually radiating and receiving light and heat. Newton long ago regarded it as the greatest of absurdities to imagine "that one body might act upon another at a distance, through a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another. Gravity," he added, "must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers."

This question, left unsolved by Newton, Hirn answers as follows:—"The thorough analysis of the most diverse facts revealed to us by science to-day allows us to reply to the first question by the most absolute negation. That which fills space and which establishes relations between the celestial bodies is not diffuse matter."

That "ponderable matter in the state of a diffuse gas" does not fill interplanetary and interstellar space M. Hirn seeks to prove by inquiring what effect such a medium would have on the various members of the solar system, and particularly upon their movements. Many of his conclusions are exceedingly striking, and if accepted certainly prove his main proposition given above. Perhaps the most remarkable is that relating to the secular acceleration of the moon. To explain a secular acceleration of 0″·5 in the mean motion of the moon it would be sufficient if 1 kilogramme of gas were distributed over 975,000 cubic kilometres of space; a rarefaction one million times greater than that of a Crookes vacuum of the millionth of an atmosphere. But the effect of the shock of the particles of this rarefied gas against a body like the moon as it moved forward in its orbit would be to raise the gas to a temperature of

38,000° C., and inconceivably attenuated as this interplanetary atmosphere would be, the moon would yet come into contact with 600 kilogrammes of it in each minute of time. On a body like the earth, surrounded by an atmosphere, the inevitable result of this unceasing collision with the interplanetary atmosphere would be the stripping away of the terrestrial atmosphere layer by layer. Arriving at results of a similar unacceptable character from the consideration of the action of a diffuse interplanetary gas on the other members of the solar system, M. Hirn decides that matter exists only in a sporadic state in space; only in the state of distinct bodies—stars, satellites, meteorites, and the like. It exists in a state of extreme diffusion only in nebulæ, but elsewhere space is perfectly empty, or, at least, whatever remains cannot suffice to explain the relations of stars to stars.

COMETS 1888 *e* AND *f* (BARNARD, SEPTEMBER 2 AND OCTOBER 30).—The following ephemerides for these objects are in continuation of those given in NATURE of April 4, p. 546, and are for Berlin midnight :—

	Comet 1888 *e*. R.A.	Decl.	Comet 1888 *f*. R.A.	Decl.
	h. m. s.	° ′	h. m. s.	° ′
April 30	23 25 51	1 28·1 N.	9 31 10	37 39·4 N.
May 4	23 23 34	1 41·6	9 33 48	37 35·8
8	23 20 54	1 54·1	9 36 36	37 30·4
12	23 17 50	2 5·5	9 39 38	37 23·7
16	23 14 18	2 15·7	9 42 50	37 15·8
20	23 10 15	2 24·5	9 46 12	37 6·7
24	23 5 37	2 31·6 N.	9 49 43	36 56·8 N.

α URSÆ MAJORIS.—Mr. Burnham reports from the Lick Observatory that he has discovered this star to be a close double. He gives the following measures of the companion :—

			Mag.
1889·142	P = 327°0	D = 0″·96	11
1889·151	= 325·9	= 0·83	11

Mr. Burnham was not able to see the companion with the 12-inch telescope, and concludes that it is too difficult for such an aperture, the difference in magnitude between the two components being so great.

THE WHITE SPOT ON SATURN'S RING.—M. Terby, writing to the *Astronomische Nachrichten*, reports that he has not been able to see the white spot again which he observed on March 6 and 12 (NATURE, vol. xxxix. p. 497). MM. Knorre, Knopf, Lamp, Struve, and Schiaparelli have likewise failed to detect it. On the other hand, Prof. McLeod, of Montreal, and Mr. Brooks, of Smith Observatory, Geneva, U.S.A., both state that they have seen it; and the latter reports it variable. If it be a real spot, and not a mere effect of contrast with the shadow of the planet, it evidently would only occasionally be seen in the place where it was first discovered, but would be observed from time to time in other parts of the ring, for it would be carried round with it in its rotation.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1889 APRIL 28—MAY 4.

(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 April 28

Sun rises, 4h. 39m.; souths, 11h. 57m. 20·7s.; sets, 19h. 16m.: right asc. on meridian, 2h. 23·9m.; decl. 14° 18′ N. Sidereal Time at Sunset, 9h. 44m.

Moon (New on April 30, 2h.) rises, 4h. 36m.; souths, 10h. 54m.; sets, 17h. 25m.: right asc. on meridian, 1h. 20·3m.; decl. 3° 3′ N.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. and declination on meridian. h. m.	° ′
Mercury..	4 46	12 12	19 38	2 38·6	15 42 N.
Venus.....	4 9	12 7	20 5	2 33·2	20 42 N.
Mars.....	5 8	12 51	20 34	3 17·9	18 30 N.
Jupiter....	0 15	4 11	8 7	18 35·9	22 55 S.
Saturn....	10 59	18 38	2 17*	9 5·7	17 51 N.
Uranus...	17 15	22 43	4 11*	13 11·7	6 54 S.
Neptune..	5 44	13 30	21 16	3 57·3	18 49 N.

* Indicates that the setting is that of the following morning.

April.	h.	
29	23	Venus in conjunction with and 10° 15′ north of the Moon.
30	12	Mercury in conjunction with and 5° 8′ north of the Moon.
May.		
1	2	Venus in inferior conjunction with the Sun.
1	3	Mars in conjunction with and 4° 21′ north of the Moon.
1	21	Mercury at least distance from the Sun.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei ...	0 52·5	81 17 N.	May 1,	2 12	*m*
U Monocerotis ...	7 25·5	9 33 S.	,, 3,		*m*
δ Libræ ...	14 55·1	8 5 S.	Apr. 30,	0 17	*m*
U Ophiuchi...	17 10·9	1 20 N.	May 1,	1 44	*m*
			,, 1,	21 52	*m*
β Lyræ... ...	18 46·0	33 14 N.	,, 2,	0 0	*M*
U Aquilæ ...	19 23·4	7 16 S.	,, 4,	0 0	*M*
η Aquilæ ...	19 46·8	0 43 N.	,, 1,	20 0	*M*
S Sagittæ ...	19 51·0	16 20 N.	,, 3,	22 0	*m*
R Sagittæ ...	20 9·0	16 23 N.	,, 3,		*m*
T Vulpeculæ ...	20 46·8	27 50 N.	,, 3,	2 0	*m*
			,, 4,	4 0	*M*
δ Cephei ...	22 25·1	57 51 N.	Apr. 28,	4 0	*m*

M signifies maximum; *m* minimum.

Meteor-Showers.

	R.A.	Decl.	
Near ζ Ursæ Majoris	206	57° N.	Slow; bright.
,, α Serpentis ...	234	10 N.	Swift.
,, υ Herculis ...	239	46 N.	May 1. Swift; short.
,, η Aquarii ...	337	2 S.	Swift; very long.

THE CORROSION AND FOULING OF STEEL AND IRON SHIPS.[1]

THE difficulty of obtaining adequate experimental data, and the fact that nearly everyone who has worked at the subject has had a composition of his own to bring before the public, has so hampered and restrained the free discussion and interchange of ideas on this most important question, that at the present time we have made but scant progress beyond the point reached twenty years ago, and my object in bringing this paper before you is more to excite you to discussion, and to show you the known facts of the case, than to tell you of any very new or startling discoveries.

Corrosion generally precedes fouling on exposed metal surfaces, and it is therefore this portion of the subject that will be considered first, together with the means which have been taken to prevent it and to protect the plates of our vessels from decay.

In a paper which I had the honour to bring before you two years ago, I pointed out that in all processes of rusting carbonic acid gas and moisture played an important part, the iron uniting with the carbonic acid and oxygen of the water to form ferrous carbonate whilst the hydrogen was set free, and that the ferrous carbonate then took up oxygen dissolved in the water, or present in the atmosphere as the case may be, and was decomposed into ferric oxide (rust) and carbonic acid, which being liberated in actual contact with the moist surface of the iron carried on the process of "rusting."

This view of the case was confirmed by a paper read by Prof. Crum Brown before the Iron and Steel Institute, at Edinburgh, last autumn, and is generally accepted as the true explanation of the corrosion taking place on iron or steel surfaces exposed to moist air or fresh water; but the rusting of the metal in sea water has by many chemists been ascribed to a more complex action, in which the salt present plays an important part by first forming oxychloride of iron.

This preliminary stage of corrosion in sea water is, I am inclined to think, a myth. When iron filings or turnings are exposed to the action of sea water, hydrogen gas is evolved, and ferrous oxide and carbonate are formed, and this changes, as in air or fresh water, into ferric oxide, by taking up dissolved oxygen present in the water. At no time have I been able to

[1] A Paper read at the thirtieth session of the Institution of Naval Architects, by Prof. V. B. Lewes, F.C.S., F.I.C., Royal Naval College Associate, on April 12, 1889.