west contains less than thirty-nine per cent of species common to it and some one or more of the other basins, and that one of them, viz., that of New Jersey and Pennsylvania, has seventy-two per cent of its plants common to other basins, while that of North Carolina has fifty-two per cent, and that of Virginia thirty-nine per cent. All who are familiar with the evidence from fossil floras must therefore admit that it is strongly in favor of the general parallelism of the four eastern basins, while the minerals are too scanty to base a safe conclusion upon relative to the great western area with fifteen per cent of its species common to it and the eastern deposits.

Considering the subject from the second point of view above mentioned, or that of the foreign distribution, it is found that forty of the hundred and nineteen species occur in other deposits of the world, while seventeen others are represented elsewhere by closely related forms, giving fifty-seven of what may be termed diagnostic species. Omitting all details as before, it appears that the largest number of these, viz., thirty-two, occur in beds that have been authoritatively referred to the Keuper of Old World nomenclature, the Rhetic coming next, with thirty-one, followed by the Lias with twenty, and the Oolite with nineteen.

The general conclusion, therefore, is that, so far as the evidence from fossil plants goes, the precise horizon, relatively to the European deposits, of our American older Mesozoic plant-bearing rocks must be at the summit of the Triassic system, with their nearest representatives in the Keuper of Lunz in Australia and at Neue Welt near Basle, in Switzerland; while there is also a close affinity in the types to those of the Rhetic of Franconia and South Sweden.

BIRDS IN HIGH GALES.

AT first it seems difficult, says the *London Spectator*, Oct. 31, to believe that the petrels, gifted with such powers of flight that, like their first cousins, the albatrosses, they make the central ocean their chosen home, should so far succumb to the Atlantic storms as to fall wholly under the dominion of the wind, and drift for thousands of miles to unknown and inhospitable shores. But any one who has watched the flight of a "lost" bird in a gale on land may form some idea of the danger to which the petrels are exposed when a hurricane bursts in the Atlantic.

Near Oxford, when the last gale was at its height, the writer was watching the "centre-board" rushing up and down over the floods on Port Meadow, with a strong current and the wind on their quarters; the geese were flying over the flood to avoid the canoes and small craft; and the wind was blowing a full gale from the south-west, with a brilliant sun, occasionally hidden by a white, drifting cloud. Far away to the north was a long-winged bird, beating up against the wind. At one time it rose high in the air, facing the gale; then it descended with a rapid swoop progressing westwards, but at the same time "falling off" still further to the north. It was a young herring gull, its checkered gray-and-white plumage showing clearly in the bright light as it approached. It was easy to conjecture from the gull's flight the power of storms to drive birds from the course which they aim at. The bird's point was clearly westward. It used every shelter and every lull of the wind to make it; but the gale was two powerful, and it appeared that it must either stay on the inhospitable land until the wind dropped, work its way slowly to the west with a rapid drift to the north, or abandon its struggle and drift with the wind.

But all birds seem to have an instinctive knowledge that if they once surrender to the force of the wind, and allow themselves to drift like leaves, there are unknown dangers in store for them. They will hardly ever do so unless to escape pursuit, and then only for a few minutes, when their pace is so marvellously rapid that, in the case of land-birds, a few minutes is sufficient to carry them out of the district they know into others from which they will perhaps never be able to find their way back to the fields which are their native home.

In the gale on Sept. 1 of the present year the writer saw a successful effort made by partridges to avoid the consequences of thus abandoning themselves to the gale. A covey of very strong birds, which had been hatched on the highest part of the Berkshire Downs, was flushed down-wind, and, rising high in the air, the whole brood were carried in a few seconds to the extreme edge of the hill, below which was a sudden fall of some three hundred feet to a country quite unknown to these hill-birds. As they approached the limit of their own district, the partridges made an extraordinary effort to release themselves from the power of the wind, and to avoid being forced over the hill-top. Closing their wings, they sank almost to the ground, and so gained the slight shelter of a low bank. This enabled them to wheel, and so to face the gale. Even then they might not have achieved their object had not a small thorn-bush broken the force of the wind just on the edge of the down. The whole covey used the respite so given, and skimming up almost in single file, they alighted one by one behind the bush, on the extreme limit of their native ground. But recent instances are not wanting in which partridges have been carried out to sea when drifting on the wind. At Sizewell, in Suffolk, nine partridges were blown out to sea, and dropped in the water some four hundred yards from the shore; and in another case thirteen of the "red-legged" variety attempted the flight across the estuary of the Stour, and, falling exhausted, were picked up by some boatmen fishing for "dabs," a welcome and unlooked-for haul.

ASTRONOMICAL NOTES.

THE *English Mechanic* of Oct. 30 is authority for the statement that Dr. Hind, the superintendent of the English Nautical Almanac, will be succeeded by Mr. A. M. W. Downing, one of the chief assistants at the Greenwich Observatory, of which fact mention was made in a recent number of *Science*. The change will take place at the commencement of the coming year.

In *Knowledge* for November are given reproductions of four photographs, taken from a baloon by Mr. C. V. Shadbolt, in England. The several photographs were taken at a height of 500, 1,500, 2,100, and 6,000 feet, respectively. We understand that Mr. Shadbolt is the first to secure at these altitudes a recognizable plate.

Fathers Hagen and Fargis, astronomers connected with the Georgetown, D.C., Observatory, have just published a paper entitled "The Photochronograph and its Application to Star Transits." The aim of these gentlemen has been to secure an instrument that would photograph the transit of a star across the meridian. A reproduction of the transit of Sirius, as photographed, is given as an illustration of the work performed. In brief, the instrument these gentlemen have contrived consists of an electro-magnetic shutter, or "occulting bar," which is secured to the eye-end of the transit instrument. The apparatus is so formed that the current

pressing through a break circuit clock moves the occulting bar every second in such a way that the image of the star is for the instant allowed to form on the photographic plate behind this bar. The impression left by the star in transit is a row of dots, which are afterwards developed in the usual way. These dots are referred to the collimation axis of the telescope by means of a glass reticule plate, ruled with one vertical line. This plate is permanently fixed in the tube, directly in front of the sensitized surface, and touching it. After the star transit is over, the light from a lantern is allowed for a few seconds to fall upon the photographic plate, which gives an impression of this reference line. The row of dots which have just been photographed can not be "fogged" by this light, as they are shielded behind the occulting bar. After the plates are developed they are measured by the aid of a micrometer.

In the *Monthly Notices of the Royal Astronomical Society* (LI., No. 9), Professor Barnard of the Lick Observatory gives the result of his observation of Jupiter and his satellites during the year 1890, made with the 12-inch equatorial. One of the most interesting points in his paper is the fact that he saw the first satellite elongated in a direction nearly perpendicular to the belts of Jupiter. This observation was made on Sept. 8, 1890, when both Mr. Barnard and Mr. Burnham saw the satellite distinctly double. The distance between the two images was about 1″, and at a position angle of 173°. Mr. Barnard gives two drawings, which represent the object as it appeared on two different dates. Two explanations are suggested. The first is that the satellite at the time of observation was crossed by a white belt parallel to those on Jupiter, or, second, that the satellite is actually double. We are strongly of the opinion that Mr. Barnard has solved his problem in his first assumption. This is explained in an article written subsequent to the one from which we have quoted. His assumption is that the satellite is crossed by a white belt, the remaining portion of the disk being dark. Now, should an object of this character transit a bright portion of Jupiter's surface, we would have the effect of two small, dark disks close together, which would appear round on account of irradiation and glare from such a bright object as the large planet. As the little moon passed across the face of Jupiter, the bright belt on the former would be lost in the bright surface of the latter. Now, if the satellite were to transit a dark portion of Jupiter's surface, we would have the opposite effect, that is, a white spot elongated in a direction parallel to the dark portion of Jupiter's surface on the large planet. Mr. Barnard, in the early fall, has reobserved these phenomena, and has found both of the conditions above mentioned fulfilled. However, these observations are very interesting, and only go to show that some of our large telescopes can be put to a good use in determining the markings on the satellites surrounding Jupiter, and assist in determining their period of rotation.

The following are the positions for comet Tempel-Swift. They are given for Paris midnight.

Date.	R. A.			Dec.	
	h.	m.	s.	°	′
Nov. 23	22	52	41	+17	22
25	23	4	6	18	27
27		16	9	19	30
29		28	48	20	33
Dec. 1	23	42	1	+21	34

The comet will reach its maximum degree of brightness on Nov. 23.

The following are the positions for Wolf's comet. They are given for Greenwich midnight.

Date.	R. A.			Dec.	
	h.	m.	s.	°	′
Nov. 18	4	32	53	−9	58
20		31	35	10	38
22		30	16	11	14
24		28	55	11	47
26		27	35	12	19
28		26	15	12	46
30	4	24	57	−13	11

The comet has now reached its nearest approach to the earth.

G. A. H.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The Man of the Future.

IN his criticism of my contribution to *Science* (Oct. 16) entitled "The Man of the Future," which was called forth by a former letter from Dr. Langdon (No. 452), Mr. Snell has expressed his views on the subject with great fulness and clarity (*Science*, Nov. 6). In several instances, however, the present writer can in no way agree with him, and as those points of disagreement are of prime importance, they will be briefly dwelt upon here. When Mr. Snell says that "The problem of human progress seems to have a fivefold aspect, physical, material, social, moral, and intellectual; and it therefore involves questions belonging to sciences as widely divergent as physiology, technology, sociology, and psychology" (p. 259), we must believe that biologists, as a rule, will not be fully in accord with him in the statement. Granting for the nonce that human progress has such a fivefold aspect, surely the consideration of his "physical" progress falls within the science of morphology rather than that of "physiology"; the "material" progress of man is quite secondary to the question at issue, and it hardly seems to be encompassed by the restricted science of "technology"; finally, strictly speaking, "psychology" is but a department of physiology, as sociology is of biology, and consequently both those sciences properly fall within the province of biology for treatment. Every biologist being more or less familiar with the factors in operation in the premises, we take it that the main object of the present discussion has to do more with a speculation upon the probable morphology of the man of the future, rather than it has to do with a discussion of the aforesaid factors, though undoubtedly in some instances it will be desirable to make somewhat extended reference to them.

As Mr. Snell remarks, he has not far to seek to find excellent authority to support his statement that "Although in the subhuman state the environment may have made the man, in the human state the man, generally speaking, makes his environment." But surely if this factor be in operation at all, which I do not fully deny, it is purely an exceptional one, and by no means the rule. In our estimation, it has been very much overrated by biologists. Take, for example, the ferine tribes the world over,—in what way do the majority of them "make their environment" any more than do the individuals in a community of beavers? Many tribes, apart from the mere possession of speech, pass an existence quite comparable with the lives led by some of the lower mammals in a state of nature. Coming up to the so-called semi-civilized races of the earth, the same principle in the main still holds true, although operative upon a somewhat higher plane. One may as well assert that the average Turk "makes his environment," and we may ask in what particular? If it be that he makes it, I, for one, should like to see the experiment of his attempting to step out of it. He probably would feel very much as the monkey does on the hand-organ or in the menagerie. Even in a highly civilized nation like our own, few there be indeed who really