But the component of the angular momentum round the vertical

$$(30) \qquad OC\cos\vartheta + CK\sin\vartheta = G'\cos\vartheta + A_1\sin^2\vartheta\,\frac{d\psi}{dt} = G$$

so that

$$(31) \qquad \frac{d\psi}{dt} = \frac{G - G'\cos\vartheta}{A_1\sin^2\vartheta} = \frac{G - G'z}{A_1(1-z^2)} = \frac{G-G'}{2A_1}\cdot\frac{1}{1-z} + \frac{G+G'}{2A_1}\cdot\frac{1}{1+z},$$

which gives ψ as the sum of two elliptic integrals of the III. kind, their addition into a single integral (Legendre) is shown by (28), (29).

The reduction to the Weierstrassian form is effected by putting

$$(32) \qquad p\mu - e_\alpha = s - s_\alpha = \tfrac{1}{2}M^2(z - z_\alpha),$$

where M is a homogeneity factor at our disposal; and now

$$(33) \qquad nt = \int_s^{s_2}\frac{Mds}{\sqrt{S}}, \quad S = 4(s-s_1)(s-s_2),(s-s_3),$$

$$(34) \qquad p'^2\mu = S = \tfrac{1}{2}M^6Z,$$

$$(35) \qquad \frac{nt}{M} = \int_s^\infty \frac{ds}{\sqrt{S}} - \int_{s_2}^\infty \frac{ds}{\sqrt{S}} = \mu - \omega_2.$$

If v, σ, Σ denote the corresponding values of μ, s, S when $z = E$,

$$(36) \qquad pv - p\mu = \tfrac{1}{2}M^2(E-z)$$

$$(37) \qquad pv - e_\alpha = \sigma - s_\alpha = \tfrac{1}{2}M^2(E - z_\alpha)$$

$$(38) \qquad ip'v = -\sqrt{(-\Sigma)} = M^3\frac{\delta' - \delta E,}{k}$$

$$(39) \qquad z_1 > E > z_2 > z > z_3, \quad s_1 > \sigma > s_2 > s > s_3,$$

so that

$$v = \omega_1 + \psi\omega_3;$$

and (28) becomes

$$(40) \qquad \pi = \frac{\delta}{k}nt + \tfrac{1}{2}\int\frac{ip'vdn}{pv - p\mu},$$

with the elliptic integral of the III. kind in the standard form of Weierstrass.

In the steady motion of the top, $\frac{d\vartheta}{dt} = 0$, $\frac{d\psi}{dt} = \mu$, a constant, H and K coincide, and

$$(41) \qquad \rho = GK = OC\sin\vartheta - CK\sin\vartheta = G'\sin\vartheta - A_1\mu\sin\vartheta\cos\vartheta,$$

$$(42) \qquad Wgh\sin\vartheta = \rho\mu = \sin\vartheta\,(G'\mu - A_1\mu^2\cos\vartheta),$$

and dropping the factor $\sin\vartheta$,

$$(43) \qquad A_1\mu^2\cos\vartheta - G'\mu + Wgh = 0.$$

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CURRENT NOTES ON PHYSIOGRAPHY.

NEW ORDNANCE MAP OF ENGLAND.

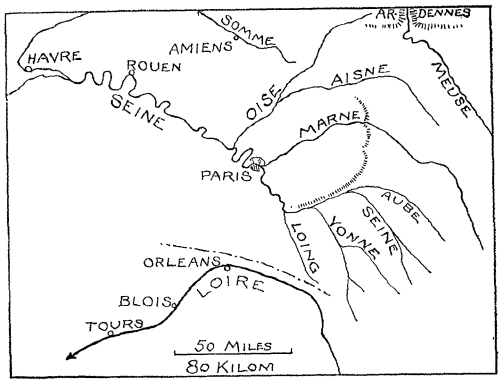
THE 'Colored One-inch Map of England,' now in process of publication, marks a great improvement on both the old and the new series of the earlier ordnance survey inch-to-a mile maps. Relief is shown by brown hachures, drawn with much accuracy of expression, and by red contours at intervals of 100 feet. Water is in blue, with blue contours in the sea for every 25 feet of depth near shore; the chief roads are in ochre, woodland on some of the sheets is green, and culture is black. Most of the sheets represent quadrangles measuring 18 miles east and west by 12 miles north and south; but for southern England the sheets frequently include larger areas, according to some system that is not immediately apparent. Some 130 sheets have now been published, the standard sheets costing a shilling each. While looking over them, local geographical features are brought vividly to mind. The Falmouth sheet, Cornwall, includes the typical drowned valleys of Fal and Helston rivers, open to the sea on the east side of the even uplands back of the Lizard, and of Loe river, closed on the more exposed western coast by Portleven sands, one of the few beaches of this ragged shore line. The contours along the valley sides here and on the neighboring Ivybridge and Boscastel sheets are of much smoother curvature than those that follow the coast, thus showing that the shore line in this district of resistant ancient rocks is in that immature stage of development when its irregularity of detail has become greater than it was in the initial stage. Where the coast consists of weaker Mesozoic rocks, as shown on the Exeter and Sidmouth sheets, a smoother shore line of greater retreat and more mature express sion is found. A little further east, where the Bridport and Weymouth sheets join, the long sweeping curve of Chesil bank is finely displayed.

The relations of rivers to their valleys offer some interesting problems. In certain meandering valleys the rivers sweep around the valley curves in a most competent fashion, pressing against their outer banks and demanding an increased breadth of meander belt; the Torridge in Devonshire (Chulmleigh sheet) and the

Tamar in Cornwall (Tavistock sheet) are of this kind. But it is more common to find the streams incompetent to swing steadily around the curves of their meandering valley floors; the headwaters of the Thames in the Cotswolds offer striking illustrations of this sort. The Evenlode (Oxford sheet) and the Cherwell (Chipping Norton sheet) are typical straggling streams, meandering on so much smaller a scale than their valley that they seem to wander aimlessly about its curving floor. The chief cause of the incompetence of these streams is probably to be found in their loss of volume, from having been beheaded by the (Stratford) Avon; yet some additional cause must be looked for, inasmuch as the Avon, which should be gaining in volume as its obsequent branches increase in length with the retreat of the Cotswold escarpment, is also somewhat incompetent to follow the pattern of its distinctly meandering valley (Worcester and Stratford-on-Avon sheets). No general climatic change towards less rainfall can be appealed to, for the streams cited in Cornwall and Devonshire, as well as certain others in Wales, show no signs of diminished volume by shrinking from the curvature of their valleys. The meanders of the Torridge, above mentioned, are remarkable for their large arc, and for the associated interlocking or dovetailing of the upland spurs that enter the valley meanders. The spurs that enter the meanders of the Evenlode valley appear to have been trimmed and steepened on their up-valley side, the result of the systematic down-valley migration of the river meanders before the decrease of volume took place; the distinctness with which this delicate detail of form is shown being a high tribute to the accuracy of the topographer's work.

HYDROGRAPHY OF THE PARIS BASIN.

The geological structure of the Paris basin has been minutely studied by Dollfus, who makes application of his results in a discussion of the 'Relations entre la structure géologique du bassin de Paris et son hydrographie' (*Ann. de Géogr.*, XI., 1900, 313–339, 413–435, map). The Cretaceous and Tertiary strata that occupy most of the basin have been gently undulated in late Tertiary or in post-Tertiary time; the shallow synclines and low anticlines generally run northwest-southeast, in accordance with the trend of the more closely folded underlying Paleozoic strata, which appear in Brittany and elsewhere. The author recognizes several classes of streams: consequent, inconsequent, obsequent (the definition of this term does not agree with that given by others) and secant (traversing an anticline); subsequent streams are not explicitly noted. He then shows that many streams of the Paris basin are consequent, inasmuch as they follow synclinal troughs. The Somme is a good example of this class, although it does not drain the whole length of its syncline (p. 317). The eastern part of the syncline is occupied by the Aisne, which is led southward



by the Oise, away from what appears to have been its original westward extension to the Somme; the Oise being secant to several anticlines on its way to the Seine just below Paris. This diversion is ascribed to capture (p. 318), though the causes and proofs of capture are not clearly set forth. The diversion might possibly be consequent on a rise in the floor of the syncline between the Oise and the head of the Somme.

While many examples of consequent synclinal streams are indicated, they are usually of relatively small volume. A number of the larger streams frequently follow oblique courses, seemingly indifferent to the anticlines that lie across their way, and for this inconsequent behavior no full explanation is offered. The antecedent origin of the Meuse through the Ardennes is discarded (p. 330) on what seems insufficient evidence; its gorge is explained as the result

of retrogressive erosion by a Belgian stream, which is thought to have captured the Meuse from an assumed westward course south of the uplands, a process that seems inadmissible in view of the continuity of the Ardennes as a divide elsewhere. The numerous subsequent streams in the eastern part of the Seine system are not recognized as such; and the subsequent valley-lowlands, opened on weak strata, between the cuestas that are maintained by stronger strata, are not regarded as certainly due to differential erosion (p. 326), although no specific reasons are given to justify this scepticism. The Loire, whose former northward course from the Central plateau to the Seine is proved by the distribution of crystalline gravels, is explained as having been turned to its present westward course past the site of Orleans by one of the chief anticlines of the region; but its extension southwest past Blois and Tours seems to have been taken with little regard to the numerous anticlinal and synclinal axes mapped there.

The former northward course of the Loire, as above stated, may perhaps give explanation to the peculiar westward deflection of the Aube, upper Seine and Yonne along a subsequent valley south of the cuesta of *calcaire grossier* to the point where the Loing, a smaller stream, turns their united waters through the cuesta towards Paris. The Loing seems to represent the former course of the Loire. While that large river ran here, one of its subsequent branches might, with more or less aid from differential elevation, naturally enough have captured the Yonne, upper Seine and Aube, which then continued in their deflected course after the Loire had been turned away to the west.

HERCEGOVINA.

A students' excursion from the University of Vienna through Bosnia, Hercegovina and Dalmatia, under Penck's leadership, in the spring of 1899, led that geographer to prepare two essays on the physical features of the region visited ('Geomorphologische Studien aus der Hercegovina,' *Zeitschr. deutsch.-oesterr. Alpenvereins*, XXXI., 1900, 25–41, 'Die Eiszeit auf der Balkenhalbinsel,' *Globus*, LXXVIII., 1900, 133–136, 159–164, 173–178). Strongly folded Mesozoic limestones occupy most of the country traversed. They have been extensively denuded and in some areas reduced to plains, while elsewhere mountains of strong relief still remain. Some of the latter possess well-defined cirques and moraines of former local glaciers. Large sinkholes abound in the highlands. Much of the upland surface exhibited bare limestone ledges, the typical Karst landscape. The lower course of the Kerka river lies across one of the plains of denudation whose surface evenly truncates the inclined limestone strata; but the plain is now elevated and trenched by the river, and in the young gorge thus formed extensive travertine deposits have produced a beautiful group of falls, back of which stretches a narrow, branching lake. In other cases, dislocation is believed to have accompanied elevation. Many streams that flowed on the surface of the lowlands before their elevation now escape to the sea from enclosed basins by underground passages, reappearing further on in great springs, and thus leaving the uplifted land forms more than usually intact. The undersigned also, as a member of Penck's party, has written a brief account of this 'Excursion in Bosnia, Hercegovina and Dalmatia' (*Bull. Geogr. Soc. Phila.*, III., 1901, 21–50).

W. M. DAVIS.

NOTES ON ENTOMOLOGY.

WITH the coming of the new century we have two new entomological journals. One, entitled *Revue Russe d'Entomologie*, is issued bimonthly by a committee of six editors, several of whom are well known to entomologists. It is a general journal, containing descriptions of new species, synopses, etc., but most of the articles are devoted to the Russian fauna. Each number contains a bibliography of current entomologic literature appertaining to the Russian fauna. The other journal is the *Zeitschrift für systematische Hymenopterologie und Dipterologie*, published by F. W. Konow, of Teschendorf, Germany. Six numbers are to appear each year. Its title indicates its intended scope, but several biologic articles have already appeared in its pages.

It has long been known that the species of *Orina*, a genus of Chrysomelid beetles, were viviparous. Recently Mr. Champion and Dr.