tricles of *Mytilus, Mya, Haliotis, Lucapina, Limax, Ariolimax, Octopus,* and the decapods examined, very much like the vagus inhibition in vertebrates. In *Ariolimax* and *Mya* the inhibitory effect of single induced make or break shocks is readily demonstrated. If the application of a weak, interrupted current is long continued the ventricle will generally 'escape' from the inhibition during the stimulation. Cessation of the stimulation is generally followed by acceleration in the rate and increase in the magnitude of the beats.

5. The direct current produces make beats, make and break beats, total diastolic inhibition, partial inhibition of beats, acceleration of beats, and increase in 'tone' or a continuous 'tetanic' contraction, according to its intensity and direction, *i. e.,* whether the anode or the cathode is on the auricular end of the ventricles. In *Ariolimax* this difference in the ventricular response, according as the anode or the cathode is on the auricular end, is very manifest even with single induced shocks.

An account of previous investigations touching this subject is deferred to the more complete statement which will accompany the publication of the tracings.

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STANFORD UNIVERSITY,
January 25, 1903.

CURRENT NOTES ON PHYSIOGRAPHY.

SOUTHERN APPALACHIAN FOREST RESERVE.

'SENATE DOCUMENT 84' is a volume of 210 pages, 75 plates and 3 maps with the following title: 'Message from the President of the United States, transmitting a report of the Secretary of Agriculture in relation to the forests, rivers and mountains of the Southern Appalachian region' (Washington, 1902). 'Southern Appalachian Region' is the page heading throughout. The volume, whatever its name may be, is worth owning, as it presents an unusually well-illustrated account of 'the greatest physiographic feature in the eastern half of the continent,' with special reference to the creation by Congress of a national forest reserve, for conservation of the forest by use, rather than a national park, for conservation without use, as the Secretary of Agriculture puts it (p. 167). Chapters on topography and geology by Keith, hydrography by Pressey and Myers, and climate by Henry give concise accounts of these topics. Many of the plates are excellent. The text and the explanatory titles of some of the plates give, to our reading, too much importance to forest clearing as a cause of destructive floods. There seems exaggeration also in the statement under a fine view of Stone mountain, near Atlanta, Ga. (Pl. XIX.), that 'the ax and fire have removed the forest, and the heavy rains have removed the soil which once covered the larger part of this rocky knob.' It is estimated that not less than 10 per cent. of the region has a slope of less than ten degrees, while 24 per cent. of the region has been cleared. The hill- and mountain-side fields lose their surface soil in five or ten years, and must then be abandoned for new clearings. Native grasses do not suffice to hold the hillside soils, which are therefore often deeply gullied by rain wash. It is evidently out of the question to adopt the practice of terracing the hillsides, as is done by the crowded population of eastern Asia (see a good illustration in *Geogr. Journ.,* XXI., 1903, p. 116).

The Blue ridge, an important physiographic element of the region, is variously described in different parts of the volume; on one page it is 'a fairly well-defined mountain *range*'; on another, its northern part 'consists of ancient *plateaus,*' while upon 'the southern part of the *chain* * * * are situated a few individual peaks and ridges of commanding height'; again, it is a 'steep and well-defined *escarpment,*' and it fronts the Piedmont plateau 'like a *rampart.*' The italics are here introduced to emphasize the versatility of this remarkable *ridge.*

SOUTHERN PATAGONIA.

REFERENCE has already been made in these notes to Hatcher's exploration in Patagonia. Fuller description of his geographical results has now been published ('Reports of the Princeton University Expeditions to Pata-

gonia, 1896–1899,' Vol. I., 'Narrative of the Expeditions, Geography of Southern Patagonia,' by J. B. Hatcher, Princeton, 1903, 4to, xvi + 314 pp., map and numerous plates). The narrative abounds with interesting details of three journeys. The general account of the geography, in chapters headed plains, mountains, rivers, lakes, coast, climate, and Indian tribes, is most readable and instructive, although rather brief on certain topics where additional details would be welcome. The curious relation of the large piedmont lakes, east of the mountains, to the gorges by which they are drained through the main chain of the Andes, is properly characterized as unique; too little consideration seems to be given to glacial erosion in connection with these lakes. The great transverse valleys by which the plains are broken are, for the most part, followed by small or intermittent rivers; the valleys are shown to have been eroded before the submergence of the region, during the recovery from which the great shingle formation was spread over the plains as a littoral marine deposit. The terraces in the plains are ancient sea cliffs, cut during pauses in emergence, the cliff along the present coast being the last member of the series. Morainic deposits are abundant over the western plains, and extensive lava flows are spread over the central part of the plains; some of the flows are older than the great valleys, some are younger. In one case a river that once followed a valley to the Bay of San Julian was turned southward from its course by a lava flow, so that it now reaches the sea by Rio Chico de Santa Cruz, leaving its former valley dry. The southernmost of the transverse valleys, not yet entirely emerged, forms the Straits of Magellan. The chapter on the Tehuelche tribe gives many examples of the immediate dependence of these savages on their surroundings; they have curiously enough abandoned the use of bows and arrows, remains of which are found in their old camping grounds; since the introduction of horses by the Spaniards, the bolas are the chief weapon of the Indians.

CAPTURED VALLEYS IN THE HIMALAYAS.

FRESHFIELD, Garwood and Sella made a tour around the highest mountain in the world during the autumn of 1899, and some account of their results have lately appeared. The leader of the party gives a narrative of the trip, with a superb panorama by Sella, in an article on 'The Glaciers of Kangchenjunga' (*Geogr. Journ.*, XIX., 1902, 453–472); and Garwood follows with some "Notes on a Map of 'the Glaciers of Kangchenjunga' with remarks on some of the physiographic features of the district" (*ibid.*, XX., 1902, 13–24). From the latter article we learn that the mountain slopes in the forested belt, up to about 10,000 feet, have 'a marked convex curve produced by the thick growth of vegetation,' instead of the typical concave basal curve; that the glaciers of the district formerly extended at least several miles beyond their present ends; that lakes are rare and small; that the 'entire absence of rock basins from valleys formerly filled by ice is not without bearing on the supposed origin of lakes by glacial erosion in other alpine districts'; and that hanging valleys were observed on several occasions in greater or less distinctness.

Two conspicuous examples of the last-named features are illustrated. They are explained as the high-level valley-heads of a former east-flowing consequent river system, now captured by a deep-lying, south-flowing subsequent stream. The excessive deepening of the subsequent valley beneath its hanging laterals is referred to two causes: (1) A hypothetical elevation of the central mountain mass due to the melting off of former supposedly heavy glaciers during an assumed interglacial period or periods, as a result of which the centrifugal south-flowing subsequent stream would deepen its valley, while the streams flowing 'east and west would be merely tilted sideways, and would tend to widen rather than deepen their valleys'; (2) a postulated protection of the hanging valleys by local glaciers, which 'would linger longer in the high-level hanging valleys than in the deeper valleys below.'

Whether the deep subsequent valley was

once occupied by a glacier is not stated; but the hanging valleys join it only three or four miles from the end of a large existing glacier that is fed from the great snow reservoirs of Kabru peak (24,015 feet). Hence Garwood's explanation of these hanging valleys, involving so many hypothetical conditions—even the capture of the headwaters of the assumed east-flowing consequent being hypothetical in a region of so complicated structure and of so much dissection since the capture is supposed to have taken place—can not at present be advisedly accepted in place of the much more probable explanation by glacial erosion. The suggested explanation becomes all the less satisfactory when it is perceived to depend on two very doubtful postulates: (1) the discordant relation of trunk and branch valleys is assumed to result in part from a supposed tilting of the drainage basin, yet no proof of the principle underlying this assumption is adduced from demonstrably tilted basins in non-glaciated regions; (2) the hanging valleys are supposed to have been occupied by glaciers that maintained a highly specialized and persistent relation to the valley mouths; yet no examples are adduced to show that this relation prevails in any region of existing glaciers.

One more point; Garwood argues for the 'superior erosive power of water over ice,' and this implies a misapprehension. It is not essential to the glacial origin of hanging valleys that the *erosive power of ice should be superior to that of water,* but only that the *erosive work of ice should be unlike that of water.* How long a time the main glaciers of a mountain range may have taken to scour out their over-deepened main channels and to leave the channels of smaller side glaciers in the form of hanging valleys, and what amount of work might have been accomplished by rivers in the same time and place, no one yet knows. W. M. Davis.

BOTANICAL NOTES.

TWO MORE BOTANICAL TEXT-BOOKS.

Within a couple of months two books for beginners in botany have been offered to the high schools of the country. The first is the 'Introduction to Botany' prepared by Professor Stevens, of the University of Kansas, and brought out by Heath & Company. It is an attempt to introduce the beginner to all departments of the science. Accordingly, he is directed in his studies of seeds, seedlings, roots, buds, stems, leaves, growth, movement, modified parts, flowers, seed dispersal, selected spermatophytes (twenty-five kinds), slime moulds, bacteria, yeasts, algæ, fungi, lichens, mosses, ferns, horsetails, adaptation to environment, plants of different regions, plants of past ages and classification. In all of these topics the subject is treated comprehensively. There is something of structure, morphology, physiology, ecology, as well as of the philosophy of botany. Throughout the chapters are scattered nearly two hundred observations and experiments to which the pupil's attention is directed. Part II. of the book describes the school herbarium, laboratory equipment, reagents and processes, and Part III. is devoted to a pretty complete but not very satisfactory glossary. A short 'flora' is appended to the volume, in which selected spermatophytes are briefly described. The treatment here is quite conservative, the old nomenclature being strictly followed, although the sequences of families are those of Engler.

The book contains a great deal of valuable matter, but it is open to the pedagogical criticism of not separating the elementary and fundamental from the advanced and more technical aspects of the science. In the hands of a wise and well-trained teacher it will be a helpful book, but in too many cases its use will leave the pupil in a more or less dazed and confused state of mind, on account of the fact that too many things have been brought to his notice in the short time allotted to the study. The author should prepare another book in which only the elementary and fundamental parts of the subject are presented to the beginner, and then the present work might be enlarged and elaborated for the use of advanced students.

The second book, with the suggestive title 'Botany all the Year Round,' is from the hand of E. F. Andrews, of the High School