School of Physic and the Schools fo Experimental and Natural Science of the University of Dublin, by a committee consisting of the heads of three of the scientific departments of the college.

THE will of the late D. A. Dunlap includes bequests of £50,000 to Victoria University, one of the colleges of the University of Toronto, and £20,000 to the University of Toronto for medical research.

DR. SUSUMU NUKATA plans to establish a medical college for women in the suburbs of Tokyo. The school will have a capacity of about 700 students and will be opened this spring.

DR. R. A. EMERSON, professor of plant breeding in the College of Agriculture, has been elected dean of the Graduate School of Cornell University, in the place of Dr. R. H. Keniston, who has resigned.

DR. SAM F. TRELEASE, formerly assistant professor of plant physiology in the University of Louisville, has been appointed associate professor of botany in Columbia University.

DR. H. C. TRIMBLE has resigned his position as assistant professor of chemistry at the University of North Dakota to become assistant professor of biochemistry at the Harvard Medical School.

DR. MARK R. EVERETT, a teaching fellow in the department of biological chemistry of the Harvard Medical School, has been appointed professor of physiological chemistry and pharmacology in the Medical College of the University of Oklahoma.

DR. E. M. SPIEKER has been granted leave of absence from the U. S. Geological Survey to give a course of lectures in geology at Ohio State University.

MAJOR R. V. SOUTHWELL is leaving the National Physical Laboratory of England in July to take up a lectureship in mathematics at Trinity College, Cambridge, where he will occupy the post formerly held by Professor G. I. Taylor until he became Yarrow professor to the Royal Society.

AT the University of Paris, M. Blaise has been appointed to the chair of organic chemistry to take the place of Professor Haller, who has retired; M. Tiffeneau to the chair of chemistry to take the place of Professor Joannis, retired, and M. Bougault to the chair of analytical chemistry to take the place of M. Villiers, also retired.

## DISCUSSION AND CORRESPONDENCE

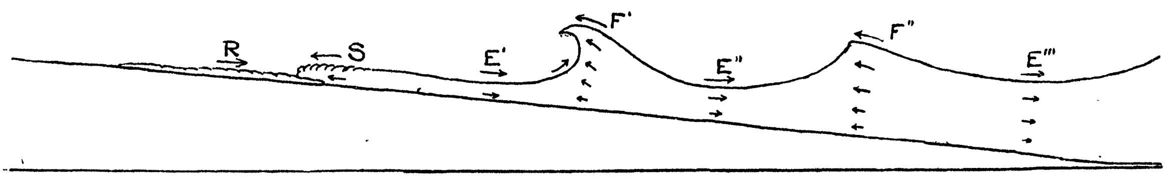
### THE UNDERTOW MYTH

WHAT is the undertow? Repeated inquiry fails to discover any definite account of it, although among summer visitors to the seashore it is generally reputed to be a treacherous current that creeps or sweeps seaward along the bottom beneath the surf, and drags the unwary bather out beyond his depth where he is in danger of drowning. It is usually not thought to be of constant and universal occurrence, but to be stronger at certain times and places than at others; but when and where it does occur it is popularly believed to be a continuous seaward underflow, or bottom current of menacing strength.

The reputation that the undertow enjoys fails for two reasons to lead to a conviction of its reality. First, because the accounts of a supposed bottom current do not clearly distinguish it from the temporary seaward movement or wave-ebb, which normally takes place in an inter-crest trough, involving the whole depth of water from surface to bottom, but which in a few seconds is reversed into an equally temporary shoreward movement, or wave-flood, in the next inter-trough crest, where it again involves the whole depth of water: both of these temporary currents having greater velocity at the surface than at the bottom. Second, because the occurrence of an active and persistent seaward underflow at the bottom demands the occurrence of a correspondingly active and persistent shoreward flow at the surface; and except under doubly specialized conditions of wind direction and shore configuration, no such shoreward surface flow is to be expected.

The following sequence of events may ordinarily be noted: A surge of water, impelled by the plunge of a surf crest, rushes up the gentle slope of a beach, and is shortly followed by a reflux or seaward return of the same volume of water, R, Fig. 1: this down-slope reflux may be continued a short distance beneath the advancing front of the next surge, S; but it can not continue very far, because each surf-plunge by which the surge is impelled up the beach, is felt to the bottom, as may be known from the manner in which it stirs up a short-lived cloud of sand. An inexpert bather may be nearly swept off his feet by the reflux, as it swirls around his knees; and flustered mentally if not physically by the next inrushing surge, which foams waist-deep around his body. Then after a moment of still-standing water, he will be drawn outward again by the tide-like ebb[1]

[1] Waves and tides are so truly homologous that either of them may be described in terms of the other. Thus, a wave crest is high water, and the shoreward orbital water movement over the crest is flood tide; similarly, a wave trough is low water, and its seaward orbital movement is ebb tide; the front of a wave is rising tide, the back is falling tide; slack water, or the condition of no horizontal movement during the rise or fall of the tide has no corresponding term for waves, although the corresponding behavior in a wave is easily recognized. The




of the following wave-trough, E; and before he is balanced to resist it, he may be overwhelmed by the tide-like flood of the roaring surf, F′, head or shoulders high, and completely toppled over if he does not know how to escape the onrush by diving deep through it and coming up in the next trough. He is then, while trying to regain his footing, in no condition to notice that the seaward movement in that trough is only a second ebb, E″, 8 or 10 seconds after the first, but he may well be aware of the drag that it gives him toward the next wave crest, F″, where he may be once more immersed and more or less bewildered. Thus buffeted about, his most conscious moments will probably be during those 5 or 6 seconds when his head is out of water over a wave-trough; and as those moments are characterized by the seaward ebb of the shallowed water, while only the moments of confusion, 3 or 4 seconds in duration, are characterized by the shoreward flood of the higher and deeper water in the wave-crest, the ebb may make the stronger impression: and that this impression should be one of a rapid, undertowing current moving seaward, is not surprising when it is understood that the ebb current is felt around his body so strongly that he must brace himself to withstand it, while the most rapid shoreward over-flowing movement is high up in the wave-crest, where it is less easily recognized because the bather there, if he keeps his head out of water, can not touch the bottom with his feet.

On the other hand if a surf swimmer keeps his presence of mind, he may easily dive under the advancing waves and note by looking at the sandy bottom that the water is there moving slowly shoreward for a few seconds; or if he leaps up into the surf just before it breaks he will feel that the shoreward rush in the crest is a good match for the seaward sweep in the trough; and he may discover also that the fastest movement in the seaward ebb of the inter-crest troughs, as well as in the shoreward flood of the inter-trough crests, is at the water surface and not at the bottom. Is it not therefore probable that the idea of a persistent and dangerous seaward undertow comes more from the excited imagination of unpracticed bathers than from the deliberate observation of good surf swimmers?

Is it not also reasonable to insist that no continuous seaward under-towing current can be maintained unless it is supplied by an equally continuous shoreward surface flow? Under ordinary conditions there is practically no shoreward flow at the surface, in spite of the shoreward advance of the waves, as may be easily proved by watching any floating object: it rises and falls as wave crest and wave trough pass it; but in calm weather or under light winds, the float moves neither to nor from the shore; but it may move slowly parallel to the shore with the flood or ebb of the tide or with the drift of 'long-shore wind currents. During an off-shore wind, the surface water will be slowly brushed away, against the advance of the waves, and a float will then drift slowly seaward; and at such times a slow shoreward creep of the bottom water must be combined with the oscillatory movement of the water under the waves. During an on-shore wind, a corresponding seaward creep of the bottom water may be expected; but on a shore of simple outline such creep must be slow, too slow to overcome the rather active shoreward oscillation of the bottom water under a wave-crest.

It is only on a reentrant, bay-head beach—a pocket beach—between two salient headlands, and even there only while an on-shore wind is blowing, that a fairly active seaward undertow can be expected. At such a place and time, the surface water that is brushed into the whole breadth of the bay at its entrance may make a seaward escape chiefly by an undertow from near the middle of the beach; and such an undertow may acquire, under these doubly specialized conditions, a considerable velocity. But the reports that one hears of a dangerous undertow do not by any means all come from pocket beaches, or from days of on-shore winds.

It would be a favor to the incredulous author of this article if any of its readers who have had experience with "undertow" would send an account of it to the editor of SCIENCE; and the favor would be still greater if they would state whether they are good swimmers or not; and if they would describe the

fact that a wave period is ordinarily only 6, 8 or 10 seconds and a crest-to-crest wave length in shore surf is only 100 or 200 feet, does not destroy the homology, although the period of the tide waves is 12$^{h}$ 26$^{m}$, and tide-wave lengths near the shore may be many hundred miles. The chief unlikeness of the two phenomena is that the orbital water movement in surf waves is nearly circular, and seldom more than 5 or 10 feet in diameter, while the orbital movement in the tide is a very excentric ellipse, 6, 8 or 10 miles in length, and commonly only as many feet in height.

form of the shoreline where they felt the undertow, and the strength and direction of the wind with respect to the shore; also, if they would discriminate as carefully as possible between the oscillatory movement of the whole depth of water in the wave-crests or troughs and the supposedly persistent creep of the bottom water that is implied by the term, undertow; and finally, if they would state whether this discrimination was made on their own volition at the time the undertow was felt, or whether it is introduced as a memory record of the phenomena under consideration.

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## TRIPLOIDY IN THE TOMATO

IN the late summer of 1923 a single unfruitful seedling plant was observed among ninety plants of the tomato variety Dwarf Aristocrat at Riverside, California. While all other plants of this variety were producing a heavy crop this plant, although flowering freely, had not set a single fruit and maintained a more erect habit of growth than the other plants which were borne down by weight of fruit. Cytological examination of this plant showed 36 chromosomes in the cells of the root tip. The somatic number of chromosomes in the tomato is typically 24, a number which was found in root tip cells of typical Dwarf Aristocrat and correspondingly 12 dyads in the pollen mother cells. The exceptional plant is therefore triploid. The plant has the general character of the variety but is conspicuous for its darker green color and for the "gigantic" character of certain organs. The leaves are larger and thicker, the petioles and stems stouter, giving the general effect of a plant exceptionally well nourished especially with nitrogen. The corolla and stamens are larger, the style on the average thicker but not as a rule longer, so that the stigma is more retruded than in a diploid plant. The form of the floral organs appears to be normal. Both under field and greenhouse conditions at Riverside the plant is nearly male sterile. The amount of pollen is much less than in a diploid and from 50 to 75 per cent. of the grains appear to be empty or their contents in process of disintegration. No germination of this pollen has been obtained in artificial medium and attempts to effect crosses with it have failed. On the other hand pollen of a diploid plant appeared to contain only about 5 per cent. of empty grains and over 50 per cent. germinated. Measurement of one hundred pollen grains of the triploid and of the diploid showed little difference in the *mean* size, but in the triploid the amount and range of variation is greater. When cross-pollinated the triploid readily sets fruit; it has also produced four fruits without artificial cross-pollination, perhaps owing to insect or wind-borne pollen. The fruits are less than half the normal size and contain extremely few, usually about 5 or 6 viable seeds as compared with over 100 for a diploid plant. In 1924 a second triploid plant has appeared among a hundred plants of the same variety from the same lot of seed, rather suggesting a common origin for the two triploid seedling plants. Progeny have been raised from the first found triploid, some of which contain extra chromosomes. A cytological and genetic study of these plants is now being made.

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## MOSELEYUM

A RECENT paper by Bosanquet and Keeley in the July number of the *Philosophical Magazine* shows that the search for the missing element of atomic number 43 is scientifically under way. Though their results were negative in this attempt, it is quite probable that we shall soon have definite evidence of its existence.

It would be an advantage to the cause of true science if we could avoid all possibility of a conflict of claims over names such as occurred in connection with the name "Hafnium" for element No. 72.

My suggestion is to call this missing element of atomic number 43 Moseleyum (symbol Ms), in honor of the young British physicist Moseley who did so much to establish the important facts concerning these missing elements, their location in the periodic scheme, with all that this means, and the limited number of the same. In fact no one who has studied modern physics can fail to appreciate the all-important significance for us of the original plate made up by Moseley from the little separate X-ray photograph which he pasted together in step-like fashion one above the other, showing the wonderful scheme of atomic steps. In every land to-day copies of this plate are to be found, and it is not too much to say that such will be the case for many years to come.

There are still five missing elements, those of atomic numbers 43, 61, 75, 85 and 87. The one indicated by Moseley himself on the original plate of atomic number 21 was discovered and named Scandium. It would have been very suitably termed Moseleyum, in honor of the one who presented the first undeniable evidence of its existence. Let us remedy this situation while it can still be done. Of the five, 85 and 87 are among the radioactive substances, 75 lies between Tungsten 74 and Osmium 76, while 61 is one of the rare earths. It would seem that either 43 or 75 would be located soonest of the five. Number 43