The pair of symmetrical components illustrated at (*a*) is typical of the Balmer series of hydrogen. The separation of such components has been taken as a measure of the field, the constant obtained by Stark being used in each case to calculate the field intensity. The form illustrated in (*b*) is typical of lines which show no appreciable Stark effect. While it is distinctly broadened in its lower portion, there is no doubt that the greater part of that broadening is due to increased intensity in the stronger field. The illustration (*c*) represents those components of He 4388 whose electric vector is perpendicular to the field. It shows, in order from left to right, two components having $a < 0$ and $b < 0$, one component having $a < 0$ and $b = 0$, one having $a < 0$ and $b > 0$, and finally two having $a = 0$ and $b > 0$. The line sketched at (*d*) is He 4922. The type (*e*) is very common in neon as is also type (*f*). A few lines in neon are of the general type illustrated at (*g*). At (*h*) is shown the appearance of a typical new line. It is very broad and intense in the field but does not exist where the field is zero, or at least is so faint that it produces no effect on the photographic plate.

A detailed statement of the results together with a full description of the apparatus and method will be published shortly.

[1] Stark, J., *Elektrische Spektralanalyse chemischer Atome*, Hirzel, Leipzig, 1914; *Ann. Physik, Leipzig*, **48**, 1915, (193).

[2] Koch, J., *Ann. Physik, Leipzig*, **48**, 1915, (98), Cf. J. Stark, *Elektrische Spektralanalyse chemischer Atome*, 73.

[3] Brunetti, R., *Nuovo Cimento, Pisa*, **10**, 1915, (34).

[4] Evans, E. J., and Croxson, C., *Phil. Mag., London*, **32**, 1916, (327).

[5] Lo Surdo, A., *Roma Atti Acc. Nuovi Lincei*, **22**, 1913, (664); **23**, 1914, (82); *Physik. Zs., Leipzig*, **15**, 1914, (122).

NEW ANALYSES OF ECHINODERMS

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Communicated April 18, 1917

In a recent publication of the United States Geological Survey[2] Clarke and Wheeler have reported 250 analyses of the shells and skeletons of marine invertebrates; analyses which were made in order to determine what each class of organisms contributes to the formation of marine limestones. In that investigation the echinoderms and alcyonarians were peculiarly interesting, not only because they were notably magnesian, but also because the proportion of magnesia in them was found to be related to temperature. The warm water forms were all relatively rich in magnesium carbonate, while the cold water forms were much poorer. In specimens from high latitudes or from very deep water the proportion of magnesium carbonate ranged from 7 to 10%, while those from tropical waters contained from 11 to over 14%. Intermediate conditions of environment gave intermediate values.

This strange relation between composition and temperature naturally suggested to us the desirability of comparing a series of echinoderms from one definite locality; and an opportunity to do so fortunately presented itself. An expedition sent by the Carnegie Institution of Washington, to the island of Tobago in the British West Indies, made a large collection of just such material as we needed; and Dr. Hubert Lyman Clark, who had charge of the echinoderms, kindly furnished us with specimens. All of them were collected at Pigeon Point, in shallow water along shore, and at a temperature of about 28°C. That is, all the specimens came from exactly the same environment, and were, therefore, for our purpose, strictly comparable. The list of them is as follows:

1. *Mellita sexiesperforatus*, Leske. A sea urchin. Adult.
2. *Echinometra lucunter*, Linné. A sea urchin. Half grown.
3. *Tropiometra carinata*, Lamarck. A crinoid. Adult.
4. *Asterina minuta*, Gray. A starfish. Large adult. Weight 0.1009 gramme.
5. *Linckia guildingii*, Gray. A starfish. Young.
6. *Ophiocoma pumila*, Lutken. A brittle star. Adult.
7. *Ophiomyxa flaccida*, Say. A brittle star. Half grown.
8. *Ophiomyxa flaccida*. Adult.

The analyses, reduced to uniformity by rejection of organic matter and water, and recalculation to 100%, are as follows and represent inorganic skeletal matter only.

	1	2	3	4	5	6	7	8
SiO_2	0.15	0.13	0.54	} 0.70	0.24	} 0.47	0.66	0.16
$(Al,Fe)_2O_3$	0.39	0.37	0.51		0.26		0.85	0.70
$MgCO_3$	11.91	11.56	13.74	12.53	14.31	12.97	14.95	14.56
$CaCO_3$	85.02	83.87	83.13	86.77	83.42	84.44	79.37	81.02
$Ca_3P_2O_8$	trace	1.85	0.64	trace	trace	0.14	trace	trace
$CaSO_4$	2.53	2.22	1.44	?	1.77	1.98	4.17	3.56
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In these analyses the silica and the sesquioxides are doubtless impurities, due to adherent sand or mud from which the specimens could not be wholly freed. Analysis 4, of *Asterina*, is incomplete; for the amount of material, only 0.1009 gram, was insufficient for thorough work.

In such a small specimen the unavoidable errors of manipulation become serious, for the reason that they are magnified in the calculations. In this instance even so small an error in weighing as 0.1 mgm. would amount to 0.3 of 1% in the final statement. The material for analysis 6 was also hardly adequate. These two analyses, however, are not worthless, for they show the high percentage of magnesium carbonate which characterizes the organisms from tropical waters; and so too do the others.

The two analyses of sea urchins show less magnesium carbonate than was found in the other echinoderms, and so help to confirm our suspicion that as a group these animals are poorer in magnesia than either the crinoids, the starfishes, or the brittle stars. In the previously published analyses of crinoid skeletons, the highest proportion of magnesium carbonate found was 13.37%, in a specimen from the Aru Islands. The one from Tobago is notably richer. As for the starfishes and brittle stars the maximum figure previously found for magnesium carbonate was 14.08% in a specimen from Culebra; a quantity which is exceeded by three analyses in our new series.

The relation between magnesium carbonate and temperature is strikingly illustrated by four new analyses of starfishes, which we append here for comparison with the Tobago series. They are as follows:

1. *Pontaster tenuispinus*, Verrill. *Albatross* Station No. 2095, between Cape Hatteras and Nantucket. Latitude, 39°.29′.00″ N. Longitude 70°.58′.40″ W. Depth of water, 2456 meters. At that depth the temperature must have been low; not far from 0°C.

2. *Plutonaster agassizii*, Verrill. Collected off Marthas Vineyard, Massachusetts. Depth of water, 584 meters. Bottom temperature 6.6°C.

3. *Odontaster hispidus* Verrill. Collected off Marthas Vineyard. Depth, 245 meters. Bottom temperature 11.1°C.

4. *Astropecten articulatus* Say. West Coast of Florida.

	1	2	3	4
SiO_2	0.31	0.35	0.62	0.24
$(Al,Fe)_2O_3$	0.45	0.18	0.12	0.23
$MgCO_3$	8.86	9.09	10.58	13.02
$CaCO_3$	89.34	89.18	87.16	85.08
$CaSO_4$	0.89	1.20	1.44	1.43
$Ca_3P_2O_8$	0.15		0.08	trace
	100.00	100.00	100.00	100.00

For these starfishes we are indebted to the United States National Museum. They form part of a much larger series carefully selected for us by Mr. Austin H. Clark. The other specimens of the series are yet to be analyzed. These four, however, fall into place with the Tobago echinoderms and with those previously published. The progressive enrichment in magnesia, following increase of temperature, is unmistakable.

[1] This paper is here published by permission of the Director of the United States Geological Survey.

[2] Clarke and Wheeler, *Washington, U. S. Geol. Surv., Profess. Paper*, No. 102, 1917.

ON UTILIZING THE FACTS OF JUVENILE PROMISE AND FAMILY HISTORY IN AWARDING NAVAL COMMISSIONS TO UNTRIED MEN

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Read before the Academy, April 17, 1917

We are about to organize an army of 1,000,000 men and to add greatly to our navy. Within the next few months, over 20,000 commissions will be given, largely to men who have never seen service. It is of primary importance to the conduct of this war that they should be properly selected. In our civil war incompetence of officers was responsible for thousands of unnecessary deaths.

In the past, appointments have been made largely as political favors, a very bad method of selecting. As Mahan says: "In the stringent and awful emergencies of war, too much is at stake for easy tolerance." In this paper I suggest a new method of selection in its particular application to untried naval officers. This method is, in brief, the utilization, among other data, of the facts of juvenile promise and family history.

The basis of this paper is the study of the biographies of 30 naval officers, and genealogies and supplementary data relating to their families. It appears at once that naval officers are of different types—there are naval fighters (like Nelson, Farragut, Porter and Cushing), naval explorers (like Sir John Franklin, McClintock, and our own Wilkes), naval inventors (like Dahlgren), naval diplomats (like Hornby) and so on. Of the 30 officers 14 are clearly *fighters*, and these are utilized in this study.

The essential traits of successful fighting naval officers are (*1*) *Love of the sea*—perhaps an elementary instinct, but not yet fully studied: (*2*) *nomadism*, whose inheritance is known to be sex linked; (*3*) *hyperkinesis*, which is inherited as a dominant trait: i.e., does not skip a