## The Syrian Arc.

THE Syrian Arc is the name proposed by Dr. E. Krenkel for a mountain chain which can be traced around the south and east of the Levant from Tunis to the Taurus. The name is given in a short but important paper (" Der Syrische Bogen," *Central-blatt für Mineralogie*, 1924, No. 9, pp. 274-281, and No. 10, pp. 301-313) which correlates the mountain movements which have determined the position of the south-eastern Mediterranean. According to Dr. Krenkel, this mountain chain begins to the west in Tunisia, where there are two sets of fold mountains. The predominant set belong to the Atlas System and its members trend to the north-east. The set in southern Tunis trends east and west and is obviously a distinct mountain group from the Atlas.

According to Dr. Krenkel, this southern set is the westernmost element of the Syrian Arc. It is cut off by the Great Syrtis from Cyrenaica. Dr. Krenkel, from the writer's work on the geology of Cyrenaica, interprets its plateau as one of the inner members of the Syrian Arc. In Egypt this arc is represented by three fold ranges, those of Abu Roasch, Wadi Araba and Quëna. It continues with a trend to the east-north-east, across the deserts of northern Sinai, where it has been determined by Messrs. Moon and Sadek. The Egyptian and Sinaitic members of the Syrian Arc are separated by the Gulf of Suez.

According to one view, the Clysmian valley of Dr. Hume, which includes that gulf, is the direct continuation of the Rift Valley of the Red Sea. According to another view, it is a synclinal. According to Dr. Hume, it is due to a combination of faulting and a series of Erythrean folds. Dr. Krenkel supports the first of these interpretations as the Gulf of Suez lies in a rift valley which has broken across the Syrian Arc nearly at right angles; and the structures which have been interpreted as due to a series of Erythrean folds Dr. Krenkel explains as due " to the tossing and tilting of uniclinal sedimentary blocks which appear on the floor of the rift valley." He denies the existence of Erythrean folds due to pressure in a westerly or easterly direction.

From Sinai the Syrian Arc passes north; it is bounded westward by a series of steps down to the Mediterranean and eastward, according to some accounts, by flexures. Dr. Krenkel represents these flexures as fractures which have broken across pre-existing folds. He attributes the topography of this area to a combination of an older folding with the younger rift valley fractures. In Syria, however, where the structure has been represented by Diener and most of his successors as determined by simple block structures, Dr. Krenkel insists on the importance of folds. In middle Syria, the Lebanon on the west is separated by the great valley of the Bakaa from Mt. Hermon and the Anti-lebanon. This valley he attributes to a down-fold lasting from the end of the Cretaceous to the Upper Miocene; but the Bakaa in its present form he describes as a rift valley made by Pliocene fractures. The Damascus Arc is a branch from the Syrian Arc and is marked by the presence of the only overfolding recognised by Dr. Krenkel anywhere along the Syrian Arc; it happened there to a slight extent owing to the pressure of the Damascus Arc against the northern edge of the Arabian Foreland. Farther north the Syrian Arc ends against the cross folds of the Taurus. The line of separation is defined by Dr. Krenkel as the Afrin line which divides the African element from those of Asia Minor.

The Syrian Arc was upraised by folding in three stages: the first movement was in the uppermost Cretaceous (Upper Danian); the second in the Lower Miocene; the third and most important was in the Upper Miocene. The crumpling was due, according to Dr. Krenkel, to pressure from the south and east toward the Mediterranean. It was therefore in the opposite direction to that in the Dinaric-Taurus Arcs, which extend along the eastern side of the Adriatic, through Greece and the Archipelago to the southern chains of Asia Minor. The general course of the Syrian Arc conforms closely to that of the Dinaric and Taurus Mountains; and both of the mountain arcs moved toward the great depression of the Eastern Mediterranean which lies between them.

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## Permanent Magnets.

MR. S. EVERSHED read an important and valuable paper on permanent magnets to the Institution of Electrical Engineers on March 19. The paper gives the results of many years' research, and ought to prove of immediate value in improving the quality and cheapening the cost of high-grade permanent magnets. In 1616 Barlowe wrote concerning the medieval art and mystery of magnet making—" The compass needle, being the most admirable and useful instrument in the whole world, is so bungerly and absurdly contrived as no other." Although the permanent magnet has become an indispensable adjunct of modern engineering, yet industries rooted in tradition are generally backward, and magnet making is no exception.

The hardening of iron and the making of steel were probably discovered accidentally. Metallurgists have found that ordinary pure iron exists in various allotropic forms depending on the temperature. At ordinary temperature it is called Alpha iron and is the commonest of all metals. Its specific heat at 0° C. is 0·1055 precisely, which is in excellent accord with theory. This specific heat gradually increases until about 750° C. The author calls this the precursor effect, as it indicates that the heat is not all expended in raising the temperature; some of it is doubtless expended in effecting a change of some kind in the structure of the iron. At about 770° C. Alpha iron begins to change into Beta iron, and the transformation is practically complete at 810° C.

Alpha iron is magnetic, Beta iron is entirely non-magnetic. As the molecule of Beta iron must be quite different from that of Alpha iron it is practically a new element. Throughout the narrow zone of temperature of 40° C. Alpha and Beta molecules can exist together, and this explains the loss and recovery of magnetism in iron as shown by experimental curves. At between 918° and 920° C. Beta iron is converted into Gamma iron, and at between 1404° and 1405° C. Gamma iron becomes Delta iron, its specific heat suddenly increasing by 50 per cent. At 1528° C. pure iron melts. Assuming that specific heat is inversely proportional to atomic weight, it would follow that these varieties of iron should have atomic weights of about 56, 37, 41, and 27, which are the atomic weights of iron, chlorine, calcium, and aluminium. The molecules have not changed successively into the molecules of these elements, but they must have done something equally revolutionary.

The carbides used in manufacturing magnet steels dissolve freely in Delta, Gamma, and Beta iron, but