

tion is turned somewhat intently on the political conditions of the Oriental despotism which has so anomalously maintained itself to the west of our prime meridian. Hence the politician has a temporary interest in what would otherwise have appealed mainly to the geographer and man of science, the publication by the Royal Geographical Society of a "Supplementary Paper," the "Bibliography of Morocco." This is a work of splendid thoroughness, almost, if not quite, exhaustive in its list of 2243 titles, and made convenient for reference by two copious indexes of subjects and authors. But it is much more than a catalogue. Comments, judiciously brief, but in some cases of exceptional interest extending to a couple of pages, give information as to little-known authors, or record some striking circumstance in or concerning the books referred to. There is a specially-compiled map, and an introduction which is really an essay on the growth of knowledge regarding Morocco in European countries. With regard to the map, it is explained that only the coast-line has been surveyed. As to the interior :-

"The best mapped districts are laid down solely from running *reconnaisances* or sketch-maps. Positions fixed by astronomical observations are few. Many wide areas have never been visited by any Europeans, and most of the Atlas is at this hour as little known as it was in the days of Leo Africanus. There are cities within a few hours' ride of Tangier, which no person capable of giving a correct account of his observations has visited; and there are others not much farther away, to attempt to enter which—Zarhoun, for example—would, were the intruder detected, be certain death. There is scarcely a river laid down with even approximate accuracy, and, not to enumerate more distant provinces, the entire Riff country, that bold *massif* which is familiar to the thousands who every year sail up and down the Mediterranean, is less explored than many regions in the centre of the continent."

The present population of Morocco is a puzzle almost as difficult, although on a smaller scale, as that of China. The authors of the Bibliography give 4,000,000 as an estimate, but the guesses of various authorities vary between $1\frac{1}{2}$ and 15 millions. The roads shown on the map are mere mule and camel tracks made by the feet of the pack-animals, unaided by any engineer. Ferries are rare, and, of course, bridges are unknown in the interior. The distribution of towns and villages is often at variance with the rules holding for civilised countries. The villages are built out of the way of the main tracks, because people never travel in Morocco for the good of the inhabitants, and it is safer to live off the path of the tax-collector and the Government official, who demands free food and quarters. The great number of place-names on the map of so thinly-peopled a country is due to the fact that the tombs of saints are such important landmarks that they must be indicated, even if only a few persons live beside them. "All the places beginning with 'Sidi' (Lord, master) are either actually tombs or the tomb has formed, as in so many of our cathedral cities, the nucleus of the town or village." "Sok," another affix of frequent occurrence, means market-place, and many of the established sites for periodical fairs are uninhabited between the gatherings of people from far and near. Many of the place-names on the coast exist in two forms at least—the native word and its Portuguese or Spanish translation; Casablanca and Dar-el-beida (both meaning White house) for example. We regret that the authors did not see their way to lay down precise rules for the spelling of Moorish place-names, either by giving a standard transliteration of the Arabic, or a uniform phonetic system. Indeed, even in the introduction a few anomalous spellings are found, e.g. *Zarhoun* and *Zerhun*, *Moulai* and *Mowlai*.

The physical geography of Morocco appears to be

changing, and the natural conditions of the country are less favourable for agriculture than they were a few centuries ago. The forests have been destroyed with such recklessness that the soil has been dried up and swept away in many places; there is evidence that the rainfall has diminished, lakes have dried, and rivers formerly navigable have become silted up, or alternate as dry tracts of stone and raging torrents.

In one respect alone—the enthusiastic Moslemism of its people—does Morocco show no sign of degeneration. Although the Moors can no longer seize and hold the Christian slaves, whose stories bulk so largely in the bibliography, their hatred and contempt towards "unbelievers" is in no sense abated. Into such a land no Europeans could penetrate far, except in the past as slaves, or now as official messengers of European Powers under special protection, jealously watched and prevented from studying places or people. The last serious attempt at scientific exploration—that of Mr. Joseph Thomson—was again and again almost stopped by the fanatical Kaid, and only his remarkable persistence and daring stratagems carried him as far as he reached. Such stratagems would hardly serve again, and for the present the exploration of the Atlas Mountains, with their half-guessed topography, imperfectly-known flora, and unsurveyed mineral wealth is at an end. The futility of disguise as an aid to exploration is fully proved in the records before us, where the ghastly fate of many who tried to pass as Moslems, and the unsatisfactory results obtained by others who escaped alive, are briefly told.

It seems to us that an attempt might well be made to open communications with fanatical Mohammedan countries either by explorers or diplomatic agents of the same faith, and there must be many amongst the educated Mohammedans of India who are well suited for such work. The religious beliefs of a people with whom belief and conduct are so closely related, must be taken into account in dealing with them, just as much as the physical features of a country. And as Arctic sailors have been proved to be the natural explorers in the Antarctic seas, Swiss mountaineers the safest pioneers on New Zealand glaciers, and Canadian boatmen the most expert in shooting the Nile cataracts, so Mohammedan envoys might be expected to make the most favourable impression on the people of Morocco or of the Mohammedan Sudan.

Sir Lambert Playfair and Dr. Brown deserve the heartiest thanks for completing their Bibliography of the Barbary States in such an admirable way, and we do not doubt that the work will be very widely consulted in the immediate future.

THE RATE OF EXPLOSION IN GASES.

THE following is an abstract of the Bakerian Lecture on "The Rate of Explosion in Gases," delivered before the Royal Society by Prof. Harold B. Dixon, on January 19 :-

1. Berthelot's measurements of the rates of explosion of a number of gaseous mixtures have been confirmed. The rate of the explosion wave for each mixture is constant. It is independent of the diameter of the tube above a certain limit.

2. The rate is not absolutely independent of the initial temperature and pressure of the gases. With rise of temperature the rate falls; with rise of pressure the rate increases; but above a certain *critical pressure* variations in pressure appear to have no effect.

3. In the explosion of carbonic oxide and oxygen in a long tube, the presence of steam has a marked effect on the rate. From measurements of the rate of explosion with different quantities of steam, the conclusion is drawn that at the high temperature of the explosion wave, as

well as in ordinary combustion, the oxidation of the carbonic oxide is effected by the interaction of the steam.

4. Inert gases are found to retard the explosion wave according to their volume and density. Within wide limits an excess of one of the combustible gases has the same retarding effect as an inert gas (of the same volume and density), which can take no part in the reaction.

5. Measurements of the rate of explosion can be employed for determining the course of some chemical changes.

In the explosion of a volatile carbon compound with oxygen, the gaseous carbon appears to burn first to carbonic oxide, and afterwards, if oxygen is present in excess, the carbonic oxide first formed burns to carbonic acid.

6. The theory proposed by Berthelot—that in the explosion wave the flame travels at the mean velocity of the products of combustion—although in agreement with the rates observed in a certain number of cases, does not account for the velocities found in other gaseous mixtures.

7. It seems probable that in the explosion wave—

(1) The gases are heated at *constant volume*, and not at *constant pressure*;

(2) Each layer of gas is raised in temperature *before* being burnt;

(3) The wave is propagated not only by the movements of the burnt molecules, but also by those of the heated but yet unburnt molecules;

(4) When the permanent volume of the gases is changed in the chemical reaction, an alteration of temperature is thereby caused which affects the velocity of the wave.

8. In a gas, of the mean density and temperature calculated on these assumptions, a sound wave would travel at a velocity which nearly agrees with the observed rate of explosion in those cases where the products of combustion are perfect gases.

9. With mixtures in which steam is formed, the rate of explosion falls below the calculated rate of the sound wave. But when such mixtures are largely diluted with an inert gas, the calculated and found velocities coincide. It seems reasonable to suppose that at the higher temperatures the lowering of the rate of explosion is brought about by the dissociation of the steam, or by an increase in its specific heat, or by both these causes.

10. The propagation of the explosion wave in gases must be accompanied by a very high pressure lasting for a very short time. The experiments of M.M. Mallard and Le Chatelier, as well as the author's, show the presence of these fugitive pressures. It is possible that data for calculating the pressures produced may be derived from a knowledge of the densities of the unburnt gases and of their rates of explosion.

NOTES.

THE forty-sixth annual general meeting of the Institution of Mechanical Engineers will be held on Thursday evening and Friday evening, February 2 and 3, at 25, Great George Street, Westminster. The chair will be taken by the president, Dr. William Anderson, F.R.S., at half-past seven on each evening. The annual report of the council will be presented to the meeting on Thursday, and the annual election of the president, vice-presidents, and members of council, and the ordinary election of new members will take place on the same evening. The following papers will be read and discussed, as far as time permits:—Description of the Experimental Apparatus and Shaping Machine for Ship Models at the Admiralty Experiment Works, Haslar, by Mr. R. Edmund Froude, of Haslar (Thursday); description of the Pumping Engines and Water-Softening

Machinery at the Southampton Water Works, by Mr. William Matthews, Waterworks Engineer (Friday).

PROF. CAYLEY, we are glad to learn, is now convalescent.

WE greatly regret to have to announce the death of Mr. H. F. Blanford, F.R.S. He died on Monday at the age of fifty-eight.

PROF. MICHAEL FOSTER, Sec.R.S., has been appointed Rede Lecturer at Cambridge for the present term. His Rede lecture will be delivered early in June.

THE Bill for the introduction of a standard time (mean solar time of the fifteenth meridian) was read a second time in the German Imperial Parliament on Monday. The measure was accepted without much discussion.

AN excellent report on technical education in London has been submitted to the London County Council by a special committee appointed to investigate the subject. The report was prepared by Mr. Llewellyn Smith, the committee's secretary, and displays a thorough grasp of the essential conditions of the problem. It is proposed that a Technical Instruction Board shall be appointed, and that it shall consist of some members of the Council, and of representatives of the School Board, the City and Guilds of London Institute, the City Parochial Charities, the Head Masters' Association, the National Union of Elementary Teachers, and the London Trades Council. The committee think that one-third of the amount derived from the beer and spirits duties should be handed over to this body for the provision of adequate technical instruction in all parts of London.

THE French Minister of the Interior has established at Marseilles, in connection with the university, an institute for botanical and geological research, and a museum. The director is Prof. Heckel, who, as well as a curator and a librarian, gives his services gratuitously.

IN the year 1793 was published Christian Konrad Sprengel's "Das entdeckte Geheimniss der Natur, im Bau und in der Befruchtung der Blumen," the work which first directed the attention of naturalists to the contrivances which, in many flowers, render self-pollination difficult, and promote the visits of insects to assist cross-pollination. The copper-plate illustrations of this work still maintain their character as among the best that have been published in this branch of science. Sprengel was in many respects a forerunner of Darwin, and centenarians have been celebrated on slighter grounds than the publication of this work.

THE chief characteristics of the weather during the past week have been its general mildness and dampness; the day temperatures have at times exceeded 50° in most parts of the kingdom, but at night slight frosts occurred towards the end of last week in Scotland and the south-eastern parts of England. The distribution of pressure has been complex, a series of depressions have passed over the coast of Norway from the westward, while an anticyclone lay over the south-western parts of our islands, the reading of the barometer in the south-west being about an inch higher than in the north of Scotland. The passage of the low-pressure systems in the north was accompanied by strong north-westerly winds and gales in Scotland, with hail or sleet in many places. Owing to the disappearance of the anticyclone from the continent, north-westerly winds became prevalent over western Europe, and a rapid rise of temperature occurred there, amounting to 30° in Germany between the 20th and 21st instant. During the last few days fresh depressions have approached our north-western coasts, with increasing winds from the south-west, and