petence provided they are intelligently taught to observe and investigate rather than to listen and collect.

Other meetings included a lecture demonstration by the Gramophone Company on "Sound Recording and Reproduction"; different types of recording apparatus were dealt with and some of the difficulties met with were discussed. A discussion on "The Social Sciences in the Grammar School" was opened by Mr. K. G. Collier, of Lancing College. Points covered were the social sciences as the science of human nature and human society; the emergence of a synthesis of views in this field; the potential educational value of the social sciences for integrating the sixth form curriculum, showing the nature and potentialities of scientific method to arts students and conveying to science students the special adaptation and limitations of scientific method in the human sphere.

The exhibitions of apparatus and books attracted much attention, and the members' exhibition revealed once again this year the considerable thought and ingenuity which are being brought to bear on the teaching of science in secondary schools in Great Britain. The apparatus due to Mr. F. A. Meier (Institute of Education, University of London) formed the major contribution—more than forty items, ranging over many branches of physics; some, like the apparatus for making spiral springs, appealed on account of usefulness; others, like the home-made biprism and Fresnel mirrors, were remarkable for their simplicity; but all reflected the genius of their author.

DEFINITION OF THE PLIOCENE- PLEISTOCENE BOUNDARY

THE question of defining the Pliocene-Pleistocene boundary has become important in recent years, because the practices of different geologists have varied to such an extent that deposits described in one publication as Lower Pleistocene may, in fact, be of the same age as deposits elsewhere called Upper Pliocene. A similar problem is presented to geologists and palaeontologists at the boundaries of other geological systems; but the problem of where best to draw a boundary between Pliocene and Pleistocene is one which concerns also prehistorians and anthropologists.

At the eighteenth session of the International Geological Congress, one section devoted itself to the discussion of this topic. Opinions of geologists, palaeontologists and prehistorians from many different countries were expressed, and there appeared to be a wider measure of general agreement than had been expected. While these discussions were taking place, the Council of the Congress appointed a temporary commission to advise on the question. The following served as members of the Commission: Prof. Kirk Bryan (United States), Prof. G. Dubois (France), Dr. A. T. Hopwood (Great Britain), Prof. W. B. R. King (Great Britain), Dr. L. S. B. Leakey (Kenya), Prof. C. I. Migliorini (Italy), Dr. K. Milthers (Denmark), Dr. Hallam L. Movius, jun. (United States), Dr. K. P. Oakley (Great Britain), Dr. L. L. Ray (United States), Prof. I. M. van der Vlerk (Netherlands), Dr. D. N. Wadia (India), Prof. D. M. S. Watson (Great Britain), Mr. E. J. Wayland (Bechuanaland), Prof. F. E. Zeuner (Great Britain).

At the conclusion of the meetings, the Council of the Congress accepted the recommendations of the Commission, which were as follows:

(1) The Commission considers that it is necessary to select a type-area where the Pliocene-Pleistocene (Tertiary-Quaternary) boundary can be drawn in accordance with stratigraphical principles.

(2) The Commission considers that the Pliocene-Pleistocene boundary should be based on changes in marine faunas, since this is the classic method of grouping fossiliferous strata. The classic area of marine sedimentation in Italy is regarded as the area where this principle can be implemented best. It is here, too, that terrestrial [Continental] equivalents of the marine faunas under consideration can be determined.

(3) The Commission recommends that, in order to eliminate existing ambiguities, the Lower Pleistocene should include as its basal member in the type-area the Calabrian formation (marine) together with its terrestrial [Continental] equivalent, the Villafranchian.

(4) The Commission notes that, according to evidence given, this usage would place the boundary at the horizon of the first indications of climatic deterioration in the Italian Neogene succession.

From the papers read in the section of the Congress devoted to this topic, which are being summarized in the *Geological Magazine*, it is clear that this definition has wide application.

The following table indicates what we consider to be its implications in parts of Europe.

	Italy	Netherlands*		East Anglia*	Human culture
		<i>continental</i>	<i>marine</i>		
Lower Pleistocene	Sicilian (<i>sensu stricto</i>)	Lower Brabantian		Wey- bourne Crag	Abbevillian
		Tiglian	Icenian	Norwich Crag	
	Villafranchian Calabrian I, II	Pretiglian	Amstelian	Upper part of Red Crag (But- leyan)	Pre-Abbevillian?
Pliocene	Upper- most part of Astian	Reuverian	Poederlian	Middle part of Red Crag (New- bourn- ian)	

* Based on a paper submitted by Prof. I. M. van der Vlerk (Netherlands).

This table is based on studies of the faunas of shallow-water marine deposits, and of their continental equivalents where known. The Villafranchian is characterized by a fauna which includes *Elephas*, *Equus* and advanced bovines. This fauna is widespread and has been used for correlating deposits of the same age in different continents. Thus, the apparent equivalents of the Villafranchian are as follows: in Africa, the Kageran beds (with Pre-Abbevillian pebble-tools); in India, the Pinjor stage of the Upper Siwaliks; in China, the Nihowan stage; in Java, the Djetis beds; and in the Central Plains of North America, the Blanco beds.

While it is evident that the Calabrian stage corresponds with the onset of cool conditions in the type-area, correlation with the glacial sequence in the Alps is not yet agreed. Thus, Dr. R. Selli and Dr. G. Ruggieri, in their paper submitted to the Congress, on the Plio-Pleistocene stratigraphy in Emilia (northern Italy), claim that the Calabrian stages I and II are probable equivalents of the Günz and Günz-Mindel stages of the Alpine sequence, and that the Sicilian (*sensu stricto*) corresponds with the Mindel glaciation. On the other hand, a more widely held view is that the drop from the Sicilian high sea-level was brought about by the first major glaciation (Günz). On this latter reading of the data, the basal or Villafranchian division of the Lower Pleistocene is in large part older than the first important growth of ice-caps, and corresponds with the climatic deterioration which was marked in the Alps, for example, by the Donau phases of glacier-growth. Judging from the great thickness of deposits accumulated during the Villafranchian stage, it was of considerable duration.

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LOCUST BEHAVIOUR AND AIRCRAFT SPRAYING

AERIAL spraying has for long seemed to offer the only means of attacking swarms of winged locusts, and an article in *Nature* of March 6, 1948, outlined the history of the latest attempt to develop this method. "We set out", wrote Dr. D. L. Gunn in that article, "systematically to find whether aircraft methods are applicable to locust destruction and to work out where and when they may compete in effectiveness and in cost with other methods"—something that had not been done before. The full story of the attempt is now appearing; the two present publications*† show how formidable the task was and indicate the very remarkable level of teamwork achieved among the entomologists, physicists, chemists, meteorologists and airmen who were involved.

The object of the behaviour studies on the desert locust in Kenya* was to discover what governed the time a swarm remained on its roosting site before flying away in the morning, since it was against roosting swarms that spraying operations were then contemplated. Swarms were watched on seventeen mornings, with simultaneous intensive recording of air temperature, humidity, locust body-temperature, radiation and wind. The start of 'stream-away', when the locusts moved off *en masse*, was usually quite sudden. Among all the factors measured, only the air temperature showed some consistency at this time on different days (*Nature*, 156, 628; 1945). Apart from its possible practical value, this finding raises interesting physiological and behavioural

* "Behaviour of the Desert Locust (*Schistocerca gregaria* Forsk.) in Kenya in relation to Aircraft Spraying." By Dr. D. L. Gunn, F.O. F. C. Perry, F/Lt. W. G. Seymour, F/Lt. T. M. Telford, AC/2 E. N. Wright and D. Yeo. (Anti-Locust Bulletin 3.) Pp. 70+8 plates. (London: Anti-Locust Research Centre, British Museum (Natural History), 1948.) 8s.

† "Locust Control by Aircraft in Tanganyika: an Experimental Campaign with BHC (Benzene Hexachloride) and DNOC (Dinitro-ortho-cresol) Solutions against Adult Red Locust, *Nomadacris septemfasciata* (Serv.), in an Outbreak Area, the Rukwa Valley, from August to November, 1947." By Dr. D. L. Gunn, H. A. F. Lea, D. H. Botha, S. Callaway, J. R. Clackson, A. Immelman, J. J. Taljaard and J. Ward. Pp. 153+10 plates. (London: Anti-Locust Research Centre, British Museum (Natural History); Pretoria: Locust Control and Research Centre, Department of Agriculture, 1948.) n.p.

questions, which are discussed. In seeking for an explanation for the variations in the air temperature at stream-away, a correlation was found between that temperature and the previous day's maximum temperature. The latter is regarded as a measure of the general temperature conditioning to which the insects had been exposed, and it is suggested that a form of physiological temperature adaptation may be involved.

The authors succeeded in tracing the roost-to-roost displacements of a single swarm for eighteen consecutive days. The swarm showed an over-all trend northwards, but zig-zagged a good deal. The displacements of a second swarm were roughly consistent with its being carried by the wind. This type of information on insect migration is very rare, and does not support the idea that migrants drive on undeviatingly towards a hypothetical goal.

The spraying trials against roosting red locusts in Tanganyika† demonstrated the inferiority, for this purpose, of the traditional method of trying to fly low enough during spraying to minimize the spray-drifting action of the wind, as compared with the method, new to insecticide work, of flying at a height calculated to use the existing wind to give the desired spray pattern on the ground. 20 per cent dinitro-ortho-cresol (DNOC) solution in oil proved so effective, with complete mortality at about one gallon per acre, that it was used in an intensive series of practical operations, 3,700 gallons being sprayed on a total of 3,335 acres. The authors are cautious; but it appears that their operations may well have averted a serious outbreak of the red locust.

By unexpected good fortune, the swarms were virtually stationary during the campaign. The work would have been very much more difficult had they migrated every day. After giving some estimates of costs, the authors suggest that roosting swarms might be tackled more economically with ground machinery, but that aircraft might be more efficient against flying swarms than against roosting ones.

Both publications contain a mass of factual material on subjects which have had little such foundation hitherto, including detailed estimates of locust numbers and densities made by photographic and other methods.

+2" FORTHCOMING EVENTS

(Meetings marked with an asterisk * are open to the public)

Monday, January 31

INSTITUTION OF THE RUBBER INDUSTRY, LEICESTER SECTION (at the College of Art and Technology, Leicester), at 7 p.m.—Dr. C. M. Blow: "Late".

INSTITUTION OF ELECTRICAL ENGINEERS, CAMBRIDGE RADIO GROUP (joint meeting with the CAMBRIDGE UNIVERSITY WIRELESS SOCIETY, at the Cavendish Laboratory, Cambridge), at 8.15 p.m.—Mr. L. A. Moxon: "Noise and Band Width".

Tuesday, February 1

UNIVERSITY OF LONDON (in the Anatomy Theatre, University College, Gower Street, London, W.C.1), at 1.15 p.m.—Dr. R. Ogilvie Buchanan: "Some Geographical Aspects of the Economic Development of New Zealand".* (Further Lecture on February 8.)

UNIVERSITY OF LONDON (in the Department of Civil, Mechanical and Chemical Engineering, King's College, Strand, London, W.C.2), at 5.30 p.m.—Mr. A. H. Willis: "The Mechanical Properties of Matter".* (Further Lecture on February 8.)

Wednesday, February 2

UNIVERSITY OF LONDON (at Bedford College for Women, Regent's Park, London, N.W.1), at 5.15 p.m.—Sir George Stapledon, F.R.S.: "The Ecology of Food Production".*

UNIVERSITY OF LONDON (in the Senate House, Malet Street, London, W.C.1), at 5.30 p.m.—Sir John Cockcroft, F.R.S.: "The Application of Atomic Piles in Nuclear Physics".* (Further Lectures on February 9 and February 16.)