

has the normal elytra with the black band across them. As they are kept closed over the abdomen in flight, in this species, the resemblance to the wasp is the same whether the beetle flies or is at rest. The second beetle, *Esthesia ferrugineus* Macleay, has extremely truncated elytra which do not reach the position of the black abdominal band in the wasp. The black band is, in this beetle, across the abdomen itself. So, in this set of examples, the black band is placed on the abdomen in the wasp and one mimic, on a thoracic appendage in the other mimic. The effect is the same, however. This is only one example of the production of the same effect by different means, a phenomenon treated very lightly by Goldschmidt, rather as an inconvenience. Arguments about mimicry based on the statement that the pattern systems of different families of butterflies are in reality not very different are useless for dealing with a wider aspect of mimicry.

Goldschmidt quotes with approval Punnett's statement that cases of mimicry tend to run in series; for example, the African Papilionid species of *Graphium* tend to resemble Danaidæ and Acraeidæ. But, it may be asked, What else is there for them to mimic? For this argument to be valid, it would have to be shown that there also exists in Africa a group of conspicuous distasteful butterflies (such as *Euploea* in the East) which are *not* mimicked because the parallelism between Papilionidæ, Danaidæ, and Acraeidæ keeps the former to these models. It may be confidently stated that should Euploeas find their way to Africa, they would be mimicked.

Finally, exception must be taken to a statement made by Goldschmidt in his discussion of seasonal dimorphism, which is compared with mimicry. He says "The mutant must be such as to effect the primary patterning processes, it can change the pattern thoroughly because the proper developmental system is already available", and then continues (the italics are mine) "Small wonder therefore that *mimetism is about as rare as extreme seasonal dimorphism*, and that it is *confined to a few nearly related members of a few systematic groups*". This most extraordinary statement is presumably due to lack of knowledge, for a glance through such a work as Seitz's "Macrolepidoptera of the World" would have dispelled the illusion. Particularly in the case of the tropical American butterflies is the statement untrue, for in the great humid forests there can be little seasonal change of appearance. I have some experience of African species, and have used volume 13 of Seitz's work on the African Rhopalocera. In order not to seem biased, I have taken none of the examples of mimicry of *Mylothris* by other Pierids as being nearly related, and none of the rather elementary cases of mimicry to be found among forest Nymphalines. I have also omitted resemblances of *Acraea* to their larger relatives *Bematistes*, and resemblances among species of the genus *Charaxes* to each other. On the other hand, the comparatively slight seasonal differences in Satyrinæ have been discounted.

The cases of "extreme seasonal dimorphism" in Africa comprise *Charaxes zoolina* Westw. and six species of *Precis*: total, seven. Against these can be set the following very definite cases of mimicry by species. Papilionidæ, 10; Satyridæ (Elymniinæ), possibly all one species, 1; *Euxanthes* and *Charaxes*, 5; various Nymphalines, 7; *Pseudacraea*, 8 species, of which one, *eurytus*, has a great number of forms; *Hypolimnas*, 5. Among Lycænidæ, one can easily

find 40 mimetic species, and a few Hesperiidæ are known with Acraeid under-sides.

The other statement, that mimetism is confined to a few nearly related members of a few systematic groups, is almost as untrue, and becomes quite ridiculous if a little wider view of the subject is taken: the enormous, complex association of mimics of Lycid beetles at once calls for consideration.

## THE BRITISH INSTITUTE OF PHILOSOPHY

ON April 6 of this year the British Institute of Philosophy (University Hall, 14 Gordon Square, London, W.C.1) completed the first twenty-one years of its existence. The occasion was marked by a letter to *The Times* from Lord Samuel, president, Sir David Ross, chairman, and Lord Lindsay, vice-chairman of the Institute. A leading article in the same issue, "The Sovereign Mind", dealing with the work of the Institute, stressed the need for the pursuit of abstract truth and the scrutiny of ideas offered to the people as springs of action. Founded "to serve as a link between philosophers and the everyday world", the Institute has fulfilled this aim in many ways. It has organised courses of philosophical lectures as well as popular addresses in London. It has founded branches in Bangor, Cardiff, Liverpool, Manchester, Newcastle and Durham, and Sheffield under the auspices of the Universities in those centres, and usually under the direct guidance of the head or some member of their departments of philosophy giving his services free. Its journal *Philosophy*, which ranks with professional journals in philosophy and draws contributions from the leading philosophers in Britain, has performed the feat of compelling philosophers to write so as to be understood by laymen, and has achieved as a result the unique distinction of being read with enjoyment and profit by laymen and philosophers alike. All this has been done with a membership of only a little more than a thousand.

At the reception held on July 23 to celebrate the Institute's coming of age, Lord Samuel was able to announce a fifty per cent increase in membership as a result of the anniversary appeal. The reception was followed by addresses on "The Need for Moral and Intellectual Leadership" by Lord Samuel, Prof. A. V. Hill, Canon Hodgson and Prof. E. R. Dodds. Lord Samuel saw the ultimate sovereignty as residing not in governments but in the people, and the people as needing the leadership of ideas. Such ideas would have to come from religion, science or philosophy, three ways of thought that have frequently beckoned in different directions. He deplored the small influence philosophy commands in the world to-day, due to its absorption in scholastic disputes and its alleged rule of method: "Take no hair and split it", and recalled it to its traditional task—to interpret the human situation.

Prof. Hill saw the question as a problem of finding in a democracy men who combine reasoned ideas with the power of persuading people to adopt them. Science is not enough. The Hippocratic oath is as important as the Hippocratic method: and the necessary and rightful exclusion of moral considerations from the weighing of scientific truth should not be allowed to result in the extrusion of moral values as irrelevant to the wider situation in which the

pursuit of truth is one value among others and commands the devotion of men.

Canon Hodgson spoke of the creeds, or philosophies of life, by which men live, as needing to be at once rational and empirical. The Christian faith has its empirical side, as matter for theology; its rational side, as matter for philosophical criticism. It must hold fast to one, if it is to benefit from the other.

Prof. Dodds focused more narrowly upon the universities as the growing points of an educated democracy. Leadership must carry no suggestion of indoctrination. To train men with an educated intellectual conscience is the function of the universities, which are the very model of the 'open society'.

Prof. Dodds would presumably welcome the disorder in our beliefs to-day as at least a sign of the right of the individual conscience. Yet there may be some middle path. What we have to-day is not divergence within a pattern but divergence of patterns. The intellectual conscience is a fine conception, but it is only one side of man, who cannot be thus dissevered. It is man as indissolubly rational and moral that is the final test of all theories. Some theories are ruled out by this test; but experimentation must go on, because only in this way can they be ruled out. Modern thought has gone too far in proclaiming the irrationality of man, owing to the too narrow conception of reason with which it has operated. As Prof. Hill pointed out in his address, 'reasonable', in English, has a moral as well as an intellectual connotation. On linguistic grounds alone there must be something wrong with a conception of reason which does not do justice to this fact. It is the philosopher's duty to articulate those realms of reason which lie outside science, and it is time for him to take his courage in both hands and set about this task.

The reception was held in the rooms of the Royal Society. The venue was appropriate, if one remembers the wider aims which the founders of the Royal Society had in mind. There must to-day be many men of science who feel the need to discuss the wider philosophical issues of their work, which recent developments have forced into the forefront of the scientific consciousness. Certainly the Institute needs scientific men among its members. In this connexion it is worth noting that its journal has included a large number of philosophical articles by men of science.

It is interesting to compare the breadth of philosophic vision the Institute has shown in its twenty-one years career with the tendency in purely professional philosophy during the same period to contract into a highly specialized study of a narrow range of linguistic problems with the esoteric jargon and parochial pride of the typical sect. While eminent men of science like Jeans and Eddington were being driven into metaphysics by science, some professional philosophers were claiming that a true understanding of scientific inquiry showed that no other kind of inquiry was possible. There are signs that this period, valuable as its results have been, is drawing to a close. The joint session of the Aristotelian Society and the Mind Association, held in Manchester during July 5-7, showed that broader conceptions of philosophy are returning. Unofficial visits by members of the session to the University of Manchester to see the Bush differential analyser and the bust of Samuel Alexander by Epstein revealed an equal reverence for the machine and the metaphysician; and one philosopher was heard saying, as he left a group surrounding the bust, "Never have so many

positivists revered such a metaphysician". If these hopes are to be fulfilled, philosophy needs to be fertilized by contact with other subjects. Now that psychology is a grown-up science, it has no longer that close connexion with philosophy which afforded the latter continual stimulus, not to say provocation. A closer contact with all the sciences must take its place. If, as a result, the conception of philosophy as an activity of the sovereign mind—not in any spirit of dominating or controlling other activities of mind but simply as taking a broad and reflective view of the world as a whole—recovers its proper status, no small thanks will be due to the British Institute of Philosophy, whose lamp has burned boldly and brightly when other philosophical lamps were trimmed almost to extinction.

WINSTON H. F. BARNES

## PRODUCTION AND ANNIHILATION OF NEGATIVE PROTONS

THE only one known equation to describe particles of spin  $\frac{1}{2}$  is that derived by Dirac in his treatment of the electron. It must therefore be employed in any theoretical discussion of nucleons (protons or neutrons), and since Dirac's treatment was able to predict the existence of the positron it is to be expected that anti-nucleons, produced by removing nucleons from negative energy states, also exist.

Experimentally, anti-protons, that is, particles with the mass of a proton but with negative electrical charge, are the more interesting. They have not as yet been observed. The Rev. J. McConnell (*Proc. Roy. Irish Acad.*, A, 50, No. 12, 189; 1945), in a mathematical discussion of the problem of the production and annihilation of negative protons, has shown that the rate of production of such particles is so small that it is not surprising that the negative protons have not been observed in experiments so far performed. With more suitable experimental arrangements, the negative proton could most probably be detected.

Negative protons arise through the formation of nucleon pairs. These pairs could be produced, like electron pairs, from light quanta, but the effect would be extremely small. Alternatively, the pairs could be produced by the collision of cosmic ray mesons with nuclear particles in the atmosphere. The simplest process is that in which two charged mesons collide; and it is shown that if the approximation method due to Dirac is applied to the field, the cross-section for the process increases steadily with the energy—an unreasonable result. It is necessary to make use of the Heitler-Peng theory of radiation damping, and the cross-section for extremely small values of the momentum  $p$  is then proportional to  $p$ , rapidly reaches its maximum value of  $2 \cdot 2 \times 10^{-27}$  cm.<sup>2</sup> and finally decreases as  $p^{-6}$ . The process in which a meson collides with a neutron or proton at rest is also considered. By means of a Lorentz transformation the meson is brought to rest and the nucleon allowed to move, and applying the Weizsäcker-Williams method the field of the moving nucleon is replaced by a field of mesons.

The calculation is admittedly very approximate, but the results are claimed by Mr. McConnell to be of the correct order of magnitude. It is found that pair production does not occur unless the energy of the primary meson is greater than  $4 \times 10^9$  eV. The cross-section then starts from zero, reaches a maxi-