Sciences, Section G–Botanical Sciences, Section N–Medical Sciences, Section Nd–Dentistry, Botanical Society of America, American Society of Agronomy, Gamma Sigma Delta, Society of American Foresters, Genetics Society of America, American Society of Animal Production, American Society for Horticultural Science, American Dairy Science Association, American Institute of Biological Sciences, International Association of Milk and Food Sanitarians, Poultry Science Association, American Genetic Association, American Society of Zoologists, Soil Science Society of America, and Crop Science Society of America: "Germ Plasm Resources in Agriculture: Development and Protection"; 28, 29, and 30 Dec.; arranged by R. E. Hodgson, U.S. Department of Agriculture, Beltsville, Md. Part 1, "Origin of Germ Plasm"; C. O. Erlanson, U.S. Department of Agriculture, Beltsville, Md., presiding. Papers will be presented on geographic origin of plants useful to agriculture (J. R. Harlan, U.S. Department of Agriculture and Oklahoma State University); origin of animal germ plasm presently used in North America (H. H. Stonaker, Colorado State University); untapped sources of animal germ plasm (R. W. Phillips, U.S. Department of Agriculture, Washington, D.C.). The discussion leader will be Henry A. Wallace, South Salem, N.Y., former Vice President of the United States, Secretary of Agriculture and Secretary of Commerce.

Part II, "Need for and Utilization of Additional Sources of Germ Plasm"; H. J. Sloan, Agricultural Experiment Station, St. Paul, Minnesota, presiding. Papers will be presented on horticultural crops (F. P. Cullinan, U.S. Department of Agriculture, Beltsville, Md.); field crops (M. G. Weiss, U.S. Department of Agriculture, Beltsville); small farm animals (A. W. Nordskog, Iowa State College); large farm animals (J. L. Lush, Iowa State College). Discussant: H. A. Rodenhiser (U.S. Department of Agriculture, Washington, D.C.)

Part III, "Developmental Programs in Crops and Livestock"; E. J. Warwick, U.S. Department of Agriculture, Beltsville, Md., presiding. Papers will be presented on use of diverse germ plasm in crop improvement (Herman J. Gorz, University of Nebraska, and W. K. Smith, University of Wisconsin); effectiveness of selection for animal improvement (Gordon Dickerson, Kimber Farms, Inc., Niles, California); use of hybrid vigor in plant improvement (G. W. Burton, Coastal Plain Experiment Station, Tifton, Georgia, and G. F. Sprague, U.S. Department of Agriculture, Beltsville, Md.; extent and usefulness of hybrid vigor in animal improvement (L. N. Hazel, Iowa State College); performance testing in livestock (C. E. Terrill, E. J. Warwick, N. D. Bayley, W. A. Craft, and P. B. Zumbro, U.S. Department of Agriculture). Discussant: R. E. Comstock (University of Minnesota).

Part IV, "New Approaches to Plant and Animal Improvement"; A. E. Bell, Purdue University, presiding. Papers will be presented on contributions of laboratory animals to research in livestock improvement (A. B. Chapman, University of Wisconsin); immunogenetics and its application to livestock improvement (M. R. Irwin, University of Wisconsin); using germ plasm for new products (Quentin Jones, U.S. Department of Agriculture, Beltsville, Md., and Ivan Wolf, U.S. Department of Agriculture, Peoria, Ill.; irradiation and plant improvement (R. S. Caldecott, University of Minnesota); possibilities for genetic improvement of useful insects (Reece I. Sailer, U.S. Department of Agriculture, Beltsville, Md.). Discussant: W. V. Lambert (University of Nebraska).

Part V, "Perpetuation and Protection of Breeding Stocks"; Roy Magruder, U.S. Department of Agriculture, Washington, D.C., presiding. Papers will be presented on perpetuation and protection of germ plasm as seeds (Edwin James, U.S. Department of Agriculture, Fort Collins, Colo.); perpetuation and protection of germ plasm as vegetative stock (Russell E. Larson, Pennsylvania State University); preservation of breeding stocks through semen storage (N. L. Van Demark, University of Illinois); identification and elimination of defects in animals (F. B. Hutt, Cornell University). Discussion will be presented by T. C. Byerly, U.S. Department of Agriculture, Washington, D.C.

There will be two biological papers given at the AAAS General Symposium. On 26 Dec., Sidney W. Fox (Florida State University) will speak on "How Did Life Begin?" and on 27 Dec., Wendell M. Stanley (University of California) will speak on "Genes, Viruses, and Cancer."

The AAAS Popular Lecture will be "The World into Which Darwin Led Us," by George Gaylord Simpson, Museum of Comparative Zoology, Harvard University, with Chauncey D. Leake, Ohio State University and President Elect of the AAAS, presiding.

Many biologists will be interested in the programs of Sections I–Psychology, N–Medical Sciences, American Physiological Society, and American Psychiatric Association which will appear in a later issue.

Meetings

Mechanisms Involved in Conception

The ever-increasing multiplication of the human species has ceased to be an issue which the more complacent among us were wont to regard as a scare that had been needlessly generated by overenthusiastic neo-Malthusians. The pendulum has swung the other way. Everywhere we now find responsible people agreeing that sharp decreases in mortality rates, with corresponding increases in rates of population growth —both resulting from the widespread application of modern medical knowledge—are now threatening to nullify many carefully planned efforts to speed up social and economic progress in the underdeveloped areas of the world, and by so doing to help frustrate the wave of nation building which is now spreading across the globe. At the same time there is a general sense that the miracle pill which was going to prevent all this from happening is as far beyond the reach of the bulk of humanity as is space travel. As conviction grows that this is so, and with the realization of the political implications of the continuing disparity between rates of capital development and of population growth, there has been a widespread call for a realistic assessment of what we know about the processes of reproduction, and about the ways in which they can be controlled. To fill this need the Population Council and the Planned Parenthood Federation of America recently convened, at West Point, New York, a conference under the general title "Physiological Mechanisms Concerned with Conception," to which participants were invited from far and wide, including countries as distant as India, Japan, and Australia.

The preparation of the conference was entrusted to a central committee under the joint chairmanship of Carl G. Hartman and Warren O. Nelson, as well as to the chairmen of the six sections into which the subject matter of the conference was subdivided and to each of which about 12 members of the conference were assigned. The sectional agenda were carefully prepared over a period of months, through correspondence between the participants, and were then discussed in detail during the first 2 days of the meeting. On the following 3 days the results of these sectional deliberations were presented for further discussion before 6 plenary sessions, which were attended not only by the members of the separate sections but also by about twice as many other interested scientists. The proceedings

of all these meetings are now being assembled for publication by the sectional chairmen, under the general editorship of Warren Nelson.

The topics assigned to the separate groups were spermatogenesis; physiology of the male accessory organs; oögenesis and ovulation; sperm physiology and sperm migration; fertilization and implantation mechanisms; and immunological phenomena. Observations which had never been reported before cropped up in every section, but the sense of novelty which the conference as a whole generated derived mainly from the fact that the findings of various fields of study were being reassembled in a new and common framework, within which their relevance to each other could be assessed.

Unlike discussion in the physical sciences, it is often difficult to separate fundamental from applied science in fields of biological or medical inquiry. In the case of the physical sciences, for example, high-energy particles were being studied as matters of basic scientific interest long before anyone thought of applying their properties to explosive or controlled reactions. Even the practical uses of substances of such apparently obvious usefulness as Polythene or the Silicones remained obscure for what today appears a surprising length of time. But behind most pieces of fundamental biological research there always seem to lie urgent and obvious human problems. For example, antibiotics, viruses, and hormones are all subjects of basic research, but at every point they also relate, and are applied, to practical issues. Again, the mechanisms which underlie immunological reactions constitute a fascinating field of fundamental research, but there is no delay between their elucidation and the consideration of their relevance to the problems of transplanting the tissues of different individuals, as, most simply, in the practice of blood transfusion. So it was inevitable that a conference which was designed to focus attention on physiological mechanisms in reproduction should become concerned not only with understanding such mechanisms but also with controlling them.

Spermatogenesis

Among the more absorbing of the fundamental issues which were debated by group 1, which dealt with spermatogenesis, were the different stages in the transformation of spermatogonia into spermatozoa. It has always been recognized that the constellation of cell types seen at any given moment in a single cross section of a seminiferous tubule of a rat testis can be classified in different categories. What has now been done is to show that different steps in the differentiation of the spermatid are always temporally associated with the same phases in the process of multiplication and maturation of the spermatogonia up to the moment of the reduction division. The demonstration of this orderly procession has proved of great value in determining those stages of spermatogenesis in the rat which are normally marked by the highest incidence of cell death, and in studies with radioactive (tritiated) thymidine which were designed to determine the duration of the separate phases, and thus of the whole cycle of change in the seminiferous epithelium. In the course of these studies, which provide the best evidence we have, even if it is not yet decisive, of how long it takes a "stem-cell" spermatogonium to produce a spermatozoon in the rat (48 days), the interesting observation was made that the duration of the meiotic prophase is relatively very prolonged—as it also is (even more so) in the maturation of the oöcyte. These observations of a fixed spermatogenic time cycle are of great empirical as well as theoretical interest, since they make possible a systematic study of factors which may affect and control the different stages of spermatogenesis. A slightly different sequence of stages has been demonstrated in the monkey. But, from the point of view of future work, the most significant fact that emerged from the discussion is that no order has yet been made of the succession of cellular associations in the human seminiferous tubule.

Recent electron-microscopic observation that the four cells which are formed after the reduction division of the spermatocyte remain in a syncytial relationship with one another by means of cytoplasmic bridges excited great interest. This observation applies to every species of mammal that has so far been tested. Since cytoplasmic interchange remains possible between the spermatic cells which make up a single "clone" (sometimes more than four), the chemical products of any activity of the segregated genes could theoretically also traverse the intercellular bridges.

Another series of observations of great fundamental interest, which derive from studies in which inseminations were made with semen obtained by mixing semen from more than one male show that the varying fertility of the spermatozoa of different strains of mice are genetically determined and are generally associated with differences in the size of the sperm head. The fertility of inbred strains of mice has also been found to be considerably lower than that of outbred strains. In the course of a discussion of these findings, the meeting was wisely reminded that an assumption which is basic to all analyses of the problem of differential fertility is that all spermatozoa have the same chance of colliding with an ovum and, depending on their capacity for fertilization, of penetrating the zona pellucida and vitelline membrane. If this assumption proves false, many of our present views about the mechanisms which affect fertility and population genetics may need revision.

Male Accessory Organs

The discussions with which section 2 began its work focused on elegant electron-microscopic and other studies of the physical and chemical properties of the rete testis, ductuli efferentes, and epididymis, with particular reference to the reabsorption of the fluid medium in which the spermatozoa are transported from the testis. The role of the epididymis as an organ in which the spermatozoa undergo specific chemical and physical changes was the subject of interesting debate, which did not, however, resolve certain differences of view. When the moment came for the prostate to be discussed it was therefore not surprising to learn that, in spite of the fact that a great deal is known about the biochemistry and hormonal control of this organ, its functional significance to the whole process of reproduction remains enigmatic.

Oögenesis and Ovulation

Mysteries no less profound revealed themselves at several points in the deliberations of section 3, which dealt with oögenesis and ovulation. The weight of evidence in this field is overwhelmingly in favor of the view that, unlike the male, in whom gametogenesis is continuous, the female mammal begins her reproductive life with a fixed stock of germ cells, of which only a relatively small number ever mature and become fertilized. Practically nothing is, however, known about the process, called atresia, whereby the remainder degenerate and disappear. We know that the rate of degeneration can be retarded by means of hypophysectomy (probably as a result of the slowing down of all metabolic processes), or accelerated by means of ionizing radiations, but the physical and chemical changes which initiate degeneration of the oöcyte are so poorly understood at the moment that their visible manifestations cannot yet be clearly defined. For that reason the microscopic diagnosis of atresia, except in its advanced stages, remains arbitrary.

A series of electron-microscopic and tissue-culture studies which were presented to the meeting revealed very clearly that the granulosa cells which make up the cumulus of cells that surround the oöcyte differ, at least so far as their capacity for multiplication is concerned, from the granulosa cells which line the Graafian follicle. Their ability to proliferate in vitro seems to be determined by the degree of maturation of the oöcyte they surround. These studies could be interpreted as indicating that the separation of the cumulus cells from the mature ovum is due to detachment following death, and not, as is generally supposed, to the depolymerizing action of hyaluronidase on the hyaluronic acid by which it is presumed the granulosa cells are cemented to the zona pellucida.

The general hormonal, and particularly the local tissue, changes which are involved in ovulation remain uncertain, and our understanding of the process is not much advanced by the observation that electrical stimulation of various parts of the preoptic and adjacent hypothalamic areas of the brain of the rat leads to ovulation, whether or not the animal is in pseudopregnancy or under the "blocking" influence of substances like Nembutal. Here the difficulty is, first, that we do not know whether the hypothalamic influence is specific either anatomically or functionally, and second, that there are no facts which allow one to explain how the firing of neurons in the hypothalamus affects the behavior of the secretory cells of the pars distalis of the pituitary. All that seems certain is that they do.

Relevant to this point was the observation that oxytocin, when administered systemically on the third to sixth days of the estrous cycle of the cow will accelerate the onset of estrus and ovulation, as will also the experimental distension of the uterine horns. The latter finding implies that a nervous pathway exists whereby afferent stimulation presumably reaches the hypothalamus, whence it is translated, supposedly by some form of chemical mediation, to the anterior pituitary. If the chemical mediator or "neuroendocrine" substance involved were oxytocin, there are anatomical reasons for supposing that it could reach the pars distalis of the anterior pituitary directly from the neural process of the posterior pituitary, to which it would have passed along the axons in the pituitary stalk. Whether or not this is what happens, the observation that oxytocin produces its effects on the cycle and ovaries when given systemically makes it clear that it is unnecessary to speculate that the chemical mediator could only pass from the hypothalamus to the anterior pituitary by way of the pituitary-portal vessels.

While the precise mechanisms involved in the process of ovulation remain obscure, the timing of the event in women becomes increasingly better understood as new data accumulate. As was, however, pointed out, the various indices which imply that ovulation has occurred (for example, changes in basal body temperature) are of little predictive value in particular cases, so that it would be more correct to say that what we now know about is the period of maximum fertility in women, as opposed to knowing how to tell when ovulation is actually likely to occur in a given individual.

Sperm Physiology and Migration

The deliberations of section 4 were marked by the precision of our knowledge of the biochemistry of sperm, but, paradoxically again, by some uncertainty about the precise physiological role of the secretions of the accessory male organs. Opinion was also divided about the relationship of motility to fertility of spermatozoa, and an even greater uncertainty was manifest about the precise mechanism whereby the sperm traverses the accessory reproductive organs of the female to reach the infundibulum of the uterine tubes, where fertilization normally occurs. Since the spermatozoon is minute in relation to the distance it "travels," it is clear that its "passage" mainly implies a relative change in position, due primarily to contractions of the uterus and tubes.

Fertilization and Implantation

Fertilization and implantation, as the discussions of section 5 showed, can fortunately be treated in a less empirical way than can most other phases of the reproductive process, for here many students are already proceeding in their researches from the formulation of general hypotheses to the derivation of dependent propositions, which can then be submitted to experimental test. The phenomenon of capacitation or incubation of the sperm, which has been very closely studied by several workers, has been shown to be nonspecific from one point of view, since spermatozoa can mature almost as well on the surface of the colonic epithelium as on that of the uterus or uterine tubes. The general theory has now been put forward that the acrosome of the sperm head is normally covered by a lipoprotein which acts as a stabilizer. When the sperm head comes into contact with an epithelial surface, such as that of the uterus or uterine tubes, the lipoprotein is gradually lost, and the acrosome, which is now in an unstable state, falls away on contact with the zona pellucida, and the sperm head then penetrates the ovum.

It was possible at this stage of the discussion to oppose the new suggestion that the cumulus cells separate from the ovum simply because they "die" with the more conventional idea that hyaluronidase carried on the acrosome of the spermatozoon reacts with the hyaluronic acid of the zona pellucida. The resolution of this interesting issue clearly demands many more facts than we now have available. But once fertilization has occurred, chemistry comes in again in incontrovertible fashion, for the varying environment of the tubes plays an important part in the protection of the egg. Then comes implantation, the mechanism of which varies from species to species. In man, for example, the fertilized egg embeds itself in the uterine epithelium before the endometrial stroma has become transformed into decidua. In the rat, on the other hand, decidual formation and implantation are more closely related. The whole process has been thoroughly explored in this species on the basis of the primary hypothesis that the decidual reaction is, in the final analysis, due to the action of histamine, which is correlated with an endogenous estrogen surge, and that the whole process consists of a phase of nidus formation, followed by one of trophoblastic invasion. The formal character of this hypothesis provides a useful model for the analysis of the process in species other than the rat, as became clear from the discussion of the related issue of delayed implantation.

Some outstanding experiments by Chang on the in vitro fertilization of the egg of the rabbit were also discussed by group 5, and it was generally conceded that the evidence that the mammalian egg could be fertilized in this way was now and for the first time incontestable. Given that the experiment is easily reproducible, we therefore have available a preparation which will permit as close a study of the factors immediately involved in fertilization in mammals as is already possible in the case of lower animal forms. But the difficulty will always remain that while experiments can always be done on, say, hundreds of thousands of sea-urchin eggs at a time, it will never be possible to treat more than about 20 mammalian eggs in one single experiment.

Immunological Phenomena

The sequence of discussion of the phases of conception, from gametogenesis to implantation, stopped with the deliberations of group 5. Group 6

was concerned to see whether the principles of antibody formation and of antigen-antibody interaction, insofar as they have been established by studies over a wide field of immunology, could be applied to different aspects of the reproductive process. The general feeling was that they could, and a powerful plea that they should be so applied was made by more than one speaker. As was also pointed out, we were fortunately dealing here with a body of concepts with which many clinicians felt familiar, and with codes of practice to which they were thoroughly accustomed.

There is no doubt that the testis contains antigens which can provoke the production of antibodies, which in turn can lead to sterilization, which according to circumstances may be permanent. The testicular antigens are not completely specific, since they also occur in the brain (they have not been found in other tissues). There appear to be instances of men who have undergone a process of autoimmunization against their own testicular antigens, and as a result have become sterile. There is also an interesting possibility that in rare cases spermatozoa that fail to reach the infundibulum to take part in the fertilizing process might become incorporated in the epithelium and macrophages of the uterus, and could consequently provide a course of antigens. The meeting was, however, reminded that were this a normal process, the antigens in the spermatozoa could provoke antibody formation in the female, leading to an immunological incompatibility between spouses.

Antigens of one sort or another are probably present in various other tissues of the reproductive tract and clearly need to be investigated on planned lines. So, too, does the problem of antigonadotrophic hormones, which can today be explored by far better techniques than were available when the possibility of their existence was first proposed, in the 1930's. The relationship of blood antigens to the antigens of reproductive tissues also needs clarification. We already know that the genetic interaction of the blood-group genes can have major effects on fertility and the survival of offspring (for example, Rh incompatibility). Another application of the principles of immunology in reproductive physiology which merits further exploration is the use of steroid conjugates to block the responses of specific tissues to given steroids (for example, androgens) at the cellular level.

In addition to the use of immunologically produced antibodies as a tool for possible fertility control, there is another more subtle relation of immunological principles to the reproductive process which may have some application in the future. This is that in certain of the reproductive processes, such as fertilization (perhaps also nidation), there occur interactions of an antigen-antibody-like nature. This is exemplified by the interaction of fertilizin on the surface of the sea-urchin egg with antifertilizin on the surface of the sperm, an interaction that appears essential for the union of the gametes. Solutions of either of these substances can block fertilization, as tests with lower animals show.

Practical Aspects

In preparing this brief report it has been none too easy to select out of the mass of information that was discussed at the conference those aspects of the physiology of conception which seemed most significant from the point of view of their basic scientific interest. It is equally difficult to underline those which have, or which promise to have, a practical value in the control of conception. In the section on spermatogenesis we learned about various treatments that have a transient effect on spermatogenesis, and how, for example, ionizing radiations, so-called radiomimetic drugs, nitrofurans, and heat exert their effects at different stages of the spermatic cycle, and also how these stages correlate with those which in the normal individual are associated with the greatest incidence of cell loss. The suppression of spermatogenesis by means of androgens, and the so-called rebound phenomenon, whereby the androgenic treatment, if properly applied, is followed by the restoration of normal spermatogenesis, were also fully discussed.

In the third section, which dealt with the female gamete, and with ovulation, we heard that irradiation, if applied in sufficient doses, is associated with the total and permanent depletion of the stack of oöcytes, of which the youngest and the mature are the most sensitive to the treatment. Indices for determining when ovulation is likely to occur were, as already noted, also discussed critically. But the outstanding issue raised in this section's discussions were the results of the large Puerto Rican clinical trials, and of a few other trials in different centers, of the ovulation-suppressing effects of the 19-nor steroids. There is no doubt about the effectiveness of these compounds as inhibitors of ovulation, but as mentioned below, some hesitation was expressed because collateral reactions may have undesirable effects.

In section 5 the major practical issues discussed concerned the effect on the young zygote of antimetabolites and substances like MER 25. And almost every phase of the discussion of section 6 on immunological phenomena also seemed to have some practical bearing.

Synoptic View

The conference undoubtedly succeeded in its first aim of providing a synoptic view of the field it was designed to survey—even though many who came to see the wood also arrived with saplings in their hands. By setting our knowledge into perspective, the conference also revealed very clearly that vast areas of the subject are still cloaked in an ignorance which prevents a rational and scientific approach to the problem of population control. It was undoubtedly startling to hear expert after expert declaring that little or nothing was known about this or that subject—that, for example, we still did not know what local tissue changes are involved in the so-called rupture of a Graafian follicle, and thus in ovulation; that the processes which result in the loss of most oöcytes in the mammalian ovary are unknown; that the mechanism of the uterotubal junction is still a matter of dispute; or that one can only guess at the precise function of the prostate. The first lesson of the conference is, therefore, that it is necessary to stimulate further basic research into almost every one of the topics that were discussed. Since it is impossible to predict in advance where significant new discoveries will be made, the object of this exercise would be completely frustrated if the scientist studying basic aspects of reproductive physiology were not permitted the freedom to explore where his interest leads.

The subject, as one speaker pointed out, is still littered with legends, which, because of their presumed scientific flavor, continue to command attention. In destroying them, we need to be careful that we do not create others. All ideas have their pedigrees, and many of those which are today evolving within the field of reproductive physiology will undoubtedly become the basis of tomorrow's beliefs, and sometimes of tomorrow's practices. The responsibility of the scientist working on problems related to human reproduction is at least as great, therefore, as that of scientists working in any other field of natural knowledge. While we want more research, we particularly want more good research. Over 100 years ago Pouchét began his *Théorie Positive de l'Ovulation Spontanée* with the observation that to answer the question whether ovulation in animals occurs spontaneously he had had to apply "the three most powerful agents of the human intelligence—observation, experiment, and logic." These three—and the third no less than the other two—are still the

prerequisites of proper scientific advance. Different parts of the field covered by the conference are at different levels of scientific sophistication. Some, such as the study of atresia, are still at the stage of natural history, at the stage where simple facts have to be assembled and judged before even the most primitive hypothesis can be formulated and submitted to experimental test. Others, such as inquiries into nidation, have reached the point where the successful postulation of a general hypothesis has made it possible to subject ideas to experimental test in a logical sequence. And others again, such as the immunological matters dealt with by group 6, are in the fortunate position of being open to analysis on the basis of major scientific generalizations or hypotheses which have been established by vigorous and extensive inquiry in other fields of research.

There is nothing arbitrary in the logic of a true scientific hypothesis. It is the best general statement that can be made at a particular moment of the relation of the facts which it purports to explain. If one cannot deduce these facts from the hypothesis, the hypothesis is not a logical statement. If the hypothesis leads to experimental inquiry the results of which accord with the hypothesis, the hypothesis has been validly tested. If the hypothesis fails to do this, we may be dealing with an unfruitful generalization. And we are certainly dealing with little more than arbitrary speculation if the hypothesis contains within itself, or is coupled to, a statement which cannot be deduced from it, or which is incapable of experimental test, or which does not affect the general validity of the main idea with which it is associated. A lack of logical discipline, not surprising perhaps in view of the vast and difficult subject with which we are dealing, has encumbered our thinking with more than one illusory scientific hypothesis. We need to remind ourselves that the subject of reproductive physiology is difficult enough without our embellishing it with irrelevant speculation.

The very experimental method that physiologists pursue sometimes leads irresistibly to what is not necessarily rational conclusion. Spermatozoa withdrawn from the epididymis can be shown to be fertile; *ergo,* the secretions of the accessory reproductive organs of the male do not play an essential part in the normal processes of conception. A fertilized ovum can implant outside the reproductive tract, say, intraperitoneally; *ergo,* the uterus and uterine tubes are not essential to conception. What the conference clearly revealed was that this method of isolated observation illuminates only a small part of the picture and distorts the whole. At every turn the process of conception can be shown to be a sequential, coordinated, and overlapping series of mechanisms which seem to overinsure against any possibility of physiological breakdown. Few, if any, of the steps in the process seem to be mechanisms in which single factors are concerned. Equally, when one comes to consider the general problem of fertility, one sees that its overt and quantitative expression is the resultant of many different factors or parameters which exercise their various influences at every step in the process of reproduction.

Population Control

While deriving from a consideration of the uneven development of the basic scientific knowledge dealt with by the conference, these general observations are not without relevance to the practical problem of controlling human fertility. Many countries are now officially encouraging measures of birth control, and probably all are seeking to know of better, more natural, and culturally more acceptable methods than are now available. The search will obviously be less empirical, less "hit-or-miss," as our understanding of the scientific processes involved becomes more general and less empirical. The amount of scientific knowledge now available is clearly insufficient to predict all the effects of even such scientific methods as the suppression of ovulation by 19-nor steroids. It is not that any doubts exist about the suppression; the trouble is that it has not been established that steroids can be taken routinely over the reproductive period of a woman's life without damage or danger. We are also still uncertain about the more immediate collateral effects, which could lead to the abandonment of the method. Fortunately, clinicians far and wide are now concerned to discover what these effects are, and one result of the West Point Conference might well be to help coordinate their efforts. Such a move is urgently required, for there can be no question but that all would be better off if clinical trials of such importance were organized under auspices which would be accorded as wide an acceptance as possible. The same issues arise in every other possible application of the basic physiological knowledge discussed at the meeting. Those who take the responsibility of advocating these applications have equally to assume the burden of disposing of fears that continued use may be associated with adverse pathological and genetic effects. In this field of endeavor special responsibility is clearly in inverse ratio with the ease with which one is accustomed to assume that basic knowledge can necessarily and quickly lead to a perfect solution.

But the criterion for acceptability of a method of population control seems far more than merely the scientific certainty that what might be practiced will not have adverse clinical effects. The backscreen of the practical problem is a world in which poverty and illiteracy stalk together. What may be possible and acceptable in advanced countries is very often ruled out by these two factors alone in the less-developed areas of the world. Those countries in which the pressure of population on economic resources has led to the official endorsement of measures of birth control risk a great deal, therefore, if while waiting for the results of the physiological research discussed at the meetings they do not encourage the use of simpler and better-known methods which are within the economic and cultural reach of their peoples. This also is a conclusion which implicitly derives from the West Point deliberations.

S. ZUCKERMAN

Birmingham University, Birmingham, England

Forthcoming Events

December

4–6. American Psychoanalytic Assoc., New York, N.Y. (D. Beres, 151 Central Park West, New York 23.)

5–10. American Acad. of Dermatology and Syphilology, Chicago, Ill. (R. R. Kierland, First National Bank Bldg., Rochester, Minn.)

6. American Acad. of Dental Medicine, mid-annual, New York, N.Y. (A. J. Cannistraci, 2152 Muliner Ave., New York 62.)

6–10. American Inst. of Chemical Engineers, annual, San Francisco, Calif. (F. J. Van Antwerpen, AICE, 25 W. 45 St., New York 36.)

7–12. Algology, UNESCO symp., New Delhi, India. (J. P. Correa, South Asia Cooperation Office, 21, Curzon Rd., New Delhi, India.)

8–10. Application of Electrical Insulation, 2nd natl. conf., Washington, D.C.) (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

9–15. American Acad. of Optometry, Chicago, Ill. (C. C. Koch, 1506–1508 Foshay Tower, Minneapolis 2, Minn.)

11–12. American Rheumatism Assoc., Detroit, Mich. (F. E. Demartini, Presbyterian Hospital, 622 W. 168 St., New York 32.)

11–12. Association for Research in Nervous and Mental Disease, annual, New York, N.Y. (R. J. Masselink, 700 W. 168 St., New York 32.)

11–12. Oklahoma Acad. of Science, Weatherford. (R. Kelting, Life Sciences Department, Univ. of Tulsa, Tulsa, Okla.)

11–12. Salt and Water Metabolism, symp., New York, N.Y. (A. P. Fishman, New York Heart Assoc., 10 Columbus Circle, New York 19.)

11–12. Texas Acad. of Science, Austin. (L. Kennamer, Dept. of Geography, Univ. of Texas, Austin 12.)

16–18. American Soc. of Agricultural Engineers, Chicago, Ill. (J. L. Butt, P.O. Box 229, St. Joseph, Mich.)

25–27. Indian Mathematical Soc., 25th conf., Allahabad, India. (B. N. Prasad. Allahabad Univ., Lakshmi Niwas, George Town, Allahabad 2.)

26–30. American Assoc. for the Advancement of Science, annual, Chicago. Ill. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington 5.)

The following 46 meetings are being held in conjunction with the AAAS annual meeting.

AAAS Committee on Science and the Promotion of Human Welfare (B. Commoner, School of Botany, Washington Univ., St. Louis 5, Mo.). 27 Dec.

AAAS Cooperative Committee on the Teaching of Science and Mathematics (Brother G. Nicholas, Dept. of Biology. Univ. of Notre Dame, Notre Dame, Ind.). 27 Dec.

Academy Conference (A. M. Winchester, Stetson Univ., De Land, Fla.). 27–28 Dec.

Alpha Epsilon Delta (M. L. Moore, 7 Brookside Circle, Bronxville, N.Y.). 29 Dec.

American Assoc. of Clinical Chemists (A. Dubin, Director of Biochemistry, Cook County Hospital, Chicago 12, Ill.). 26–27 Dec.

American Geophysical Union (W. C. Krumbein, Dept. of Geology, Northwestern Univ., Evanston, Ill.). 28 Dec.

American Meteorological Soc. (K. Spengler, 3 Joy St., Boston, Mass.).

American Nature Study Soc. (E. L. Will. State Univ. Teachers College, Oneonta, N.Y.). 26–30 Dec.

American Physiological Assoc. (F. A. Hitchcock, Ohio State Univ., Columbus). 28 Dec.

American Political Science Assoc. (J. Robinson, Dept. of Political Science. Northwestern Univ., Evanston, Ill.). 28 Dec.

American Psychiatric Assoc. (E. L. Bliss, General Hospital, Salt Lake City, Utah). 28–29 Dec.

American Soc. of Criminology (D. E. J. MacNamara, New York Inst. of Criminology, Inc., New York 36). 28–29 Dec.

American Soc. of Naturalists (A. D. Hasler, Dept. of Zoology, Univ. of Wisconsin, Madison). 27–28 Dec.

American Soc. of Plant Taxonomists (L. R. Heckard, Dept. of Botany, Univ. of Illinois, Urbana). 28–30 Dec.

American Sociological Soc. (J. S. Coleman, Dept. of Sociology, Univ. of Chicago, Chicago 37, Ill.). 28–29 Dec.

American Statistical Assoc. (R. F. Winch, Dept. of Sociology, Northwestern Univ., Evanston, Ill.). 29–30 Dec.

Association of American Geographers (A. Cutshall, Univ. of Illinois, Navy Pier. Chicago 11). 29 Dec.

Association for Computing Machinery (W. F. Cahill, Goddard Space Flight Center, Silver Spring, Md.). 29 Dec.

Astronomical League (E. Halbach, 2971 S. 52 St., Milwaukee 19, Wisc.). 26 Dec.

Beta Beta Beta (Mrs. F. G. Brooks, P.O. Box 515, Ansonia Station, New York 23). 27–28 Dec.

Chicago Acad. of Sciences (R. A. Edgren, Chicago Acad. of Sciences, 2001 N. Clark St., Chicago 14, Ill.). 29–30 Dec.

Conference on Scientific Communications (G. L. Seielstad, Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.). 28–29 Dec.

Conference on Scientific Manpower (T. J. Mills, National Science Foundation, Washington 25). 28 Dec.

Ecological Soc. of America (W. C. Ashby, Dept. of Botany, Univ. of Chicago, Chicago 37, Ill.). 28–30 Dec.

Honor Soc. of Phi Kappa Phi (L. R. Guild, 634 S. Western Ave., Los Angeles 5, Calif.). 30–31 Dec.

Illinois Geographical Soc. (Miss M. Grant, Morton Junior College, Cicero, Ill.). 28 Dec.

Institute of Management Sciences (M. M. Flood, College of Engineering, Univ. of Michigan, Ann Arbor). 29 Dec.

Metric Assoc. (J. T. Johnson, Ravenswood YMCA, 1725 Wilson Ave., Chicago 40, Ill.).

Mycological Soc. of America (D. P. Rogers, Dept. of Botany, Univ. of Illinois, Urbana).

National Assoc. of Biology Teachers (H. E. Weaver, 202 Men's Old Gym, Univ. of Illinois, Urbana). 26–30 Dec.

National Acad. of Economics and Political Science (J. Rothrock, Pan American Union, Washington 6). 29 Dec.

National Assoc. for Research in Science Teaching (J. C. Mayfield, Univ. of Chicago, Chicago 37, Ill.). 26–30 Dec.

National Assoc. of Science Writers (P. Fraley, Evening Bulletin, Philadelphia, Pa.). 27 Dec.

National Geographic Soc. (W. R. Gray, NGS, 16 and M Sts., NW, Washington 6). 30 Dec.

National Science Teachers Assoc. (R. H. Carleton, NSTA, 1201 16 St., NW, Washington, D.C.). 26–30 Dec.

National Soc. for Medical Research (R. A. Rohweder, NSMR, 920 S. Michigan Blvd., Chicago 5, Ill.). 29 Dec.

National Speleological Soc. (T. C. Barr, Jr., Tennessee Polytechnic Inst., Cookeville, Tenn.). 28 Dec.

Philosophy of Science Assoc. (W. A. R. Ley, Roosevelt College, Chicago, Ill.). 28 Dec.

Scientific Research Soc. of America (D. B. Prentice, 56 Hillhouse Ave., New Haven 11, Conn.). 29 Dec.

Sigma Delta Epsilon (Miss E. S. Anderson, Stratford Hotel, 25 E St., NW, Washington, D.C.). 26–30 Dec.

Society for General Systems Research (R. L. Meier, Mental Health Research Institute, Univ. of Michigan, Ann Arbor).

Society for the History of Technology (M. Kronzberg, Dept. of History, Case Inst. of Technology, Cleveland, Ohio).

Society of the Sigma Xi (T. T. Holme, 56 Hillhouse Ave., New Haven 11, Conn.). 29 Dec.

Society of Systematic Zoology (R. E. Blackwelder, Southern Illinois Univ., Carbondale). 26–30 Dec.

Tau Beta Pi Assoc. (R. H. Nagel, Univ. of Tennessee, Knoxville). 27 Dec.

United Chapters of Phi Beta Kappa (C. Billman, 1811 Q St., NW, Washington, D.C.). 29 Dec.

27–30. American Anthropological Assoc., Mexico City. (W. S. Godfrey, Jr., Logan Museum, Beloit College, Beloit, Wisc.)

27–30. American Astronomical Soc., Cleveland, Ohio. (J. A. Hynek, Smithsonian Astrophysical Observatory, 60 Garden St., Cambridge 38, Mass.)

27–30. American Folklore Soc., Mexico City. (MacE. Leach, 110 Bennett Hall, Univ. of Pennsylvania, Philadelphia 4.)

27–30. American Statistical Assoc., Washington, D.C. (D. C. Riley, 1757 K St., NW, Washington 6.)

27–30. Institute of Mathematical Statistics (weather control), Washington, D.C. (J. Neyman, Statistical Lab., Univ. of California, Berkeley 4.)

28–29. American Chemical Soc. (Div. of Industrial and Engineering Chemistry), symp., Baltimore, Md. (M. A. H. Emery, ACS, 18 and K Sts., NW, Washington D.C.)

(See issue of 16 October for comprehensive list)