A British Medical Association Lecture ON THE REPRODUCTIVE ORGANS IN RELATION TO MENTAL DISORDERS.*

BY
SIR FREDERICK W. MOTT, K.B.E., M.D., LL.D., F.R.S.,
DIRECTOR OF THE PATHOLOGICAL LABORATORY OF THE LONDON
COUNTY COUNCIL MENTAL HOSPITAL, MAUDSLEY HOSPITAL,
DENMARK HILL.

[With Special Plate.]

MR. PRESIDENT AND GENTLEMEN,—Allow me first to thank the East Yorks Division of the British Medical Association for the honour they have done me in asking me to give this address upon the reproductive organs in relation to mental disorders, a subject to which I have recently given much attention. Before proceeding to discuss the facts bearing upon this subject let me call attention to the inborn characters of mind in relation to personality.

The Inborn Characters of Mind.

The furniture of the mind is the memory store of our experiences and the bonds that unite them. The quantity and quality of the furniture of the mind depend firstly upon the inborn germinal raw material begotten with the body and derived from species, sex, race, and ancestry, giving each individual a special predetermined plasticity to receive and store impressions and react to them. This raw material of inheritance upon which psycho-physical energy, durability, educability, imagination, temper, emotivity, moral and aesthetic sense—personality, in fact—so largely depend, is inborn. These fundamentals of mind are begotten with the body and predetermine character and conduct, as was clearly proved by Francis Galton's inquiry into the history of similar and dissimilar twins, which proved that dissimilar twins remained dissimilar in mental and bodily characters when brought up in the same environment, while similar twins brought up in different environment remained similar in mental and bodily characters. This is a convincing proof of the fact that the organic basis upon which the quality of the mind depends is begotten with the body. If inborn good qualities are deficient or absent there will be, in spite of favourable environment after birth, intellectual, aesthetic, or moral feeble-mindedness of various forms and gradations. Again, if there be inherited a disproportion and a lack of harmony and integration of the inborn factors of the raw material upon which mentality is based, an unbalanced mind is likely to develop which will show itself in various departures in conduct from that of the normal stable individual: it may be in the form of eccentricity, mysticism, fanaticism; or the psychoneuroses—for example, hysteria, neurasthenia, psychasthenia, epilepsy, megrim; or the psychoses (the true insanities)—amentia, confusional or toxic psychoses, dementia praecox, manic depressive or periodic insanity, dementia precox, and involutional melancholia, as distinct from acquired organic brain disease, such as general paralysis of the insane.

That this tendency to departure from the normal well-balanced mind is largely a matter of inheritance is shown by the study of family pedigrees for several generations, where many or all of these variations from the normal may generally be found in different members of the ancestral stocks. This neuropathic inheritance is often mingled with a streak of genius, especially of the artistic or aesthetic nature.

Photographs of patients showing different forms of insanity were exhibited, including two pairs of sisters with a marked family history of insanity, who were admitted to asylums in early adolescence suffering with dementia praecox, and who are still living and are over 40 years of age. Prior to the war there were 10,000 of the 20,000 odd inmates of the asylums who had been resident for over ten years and 5,000 over twenty years. A considerable proportion of the chronic cases are these cases of dementia praecox.

Neuropathic and Psychopathic Predisposition in Relation to Psycho-physiological Stress.

The study of relatives in the London County asylums by a card system, and by the method of systematic inquiry and construction of a large number of pedigrees, and the investigation of statistical data relating to the age of onset

of insanity in the offspring of insane parents, afford to my mind conclusive evidence of three facts in relation to the causation of mental disease:

1. The importance of a neuropathic and psychopathic heredity.
2. The special liability of the neuroses and psychoses to occur in adolescence and the involutive periods of both the male and female sexes, when the sexual function matures and wanes.
3. The influence of child-bearing and lactation in women, acting as exciting causes.

That the inborn predisposition is the most important fact in the development of neuroses and psychoses is also shown by the frequency with which these various psychoneuroses and psychoses occur at periods when normal physiological changes occur in the body—for example, adolescence, when the sex instinct is aroused and matured, and the involution period, when it wanes. Again, in women, pregnancy, parturition, and lactation are normal physiological processes of the sex instinct, yet a number of cases of insanity in women designated puerperal mania or lactation mania occur as a result of a normal physiological process. Even in cases of septic origin predisposition cannot be excluded. For many women have puerperal septicaemia but do not become insane. The term "puerperal mania" is a misnomer in a way, for the cases belong to three groups: (1) Exhaustion psychosis or toxic psychosis, (2) manic depressive insanity, and (3) dementia praecox.

1. The greater the influence of the extrinsic cause, especially if it be pathological—for example, toxic conditions—the more probable is the recovery by treatment removing the source of the sepsis, and less the liability to a recurrence.

2. Emotional shock, worry, anxiety, insomnia, and exhaustion are also regarded as important exciting factors. But the war has shown that these are not of such primary importance as was suspected, for it was observed that there was no great increase of insanity among the women in Galicia and East Prussia when they had to flee on account of the invasion by the Russians in the great war. Moreover, Bonhöffer found only five insane among 10,000 Serbian prisoners who had been subjected to every form of stress of war and disease.

If "E" (Fig. 1) represents mental and bodily extrinsic factors, and "I"

FIG. 1.

inborn predisposition, the more of "E" that we can find as a causal factor the more favourable is the prognosis.

Statistical Data Relating to Inheritance and Insanity in the Periods of Adolescence and Involution.

The importance of these physiological states of adolescence and involution in the incidence of the onset of insanity is shown by two graphs (Figs. 2 and 3), based upon an investigation of the age at the time of first attack in 508 pairs of parents and offspring, from records of 464 insane parents of 500 insane offspring.

These curves in the offspring show 47.8 per cent. of 500 offspring who became insane in adolescence at or before the age of 25. The 47.8 per cent. of cases of adolescent insanity may be divided into four groups:

1. Exhaustion psychosis, confusional insanity, or amentia, who were discharged recovered.
2. Recurrent insanity—manic depressive—discharged but readmitted on one or more occasions; as a rule the length of the period of asylum detention increases upon each attack, some cases finally passing on to dementia and detention till death.
3. Primary dementia of adolescence or dementia praecox. In the vast majority of cases progressive and permanent detention till death; these cases make up a large proportion of the chronic lunatics in asylums.
4. The imbeciles are relatively few in number, as they are sent to the asylums of the Metropolitan Asylums Board. A few are admitted to the London asylums on account of the onset of acute symptoms. There are also a few cases of juvenile general paralysis, but the great bulk of the cases belong to 1, 2, and 3, and especially 3.

These statistical data were prepared in 1911.

In 1917 I made a further analysis of relative cards since 1911, a period of six years. This analysis was limited to

* Delivered to the East Yorks Division of the British Medical Association on February 10th, 1922.

insane parents of offspring, of which a diagnosis of dementia praecox was made, and instead of 47.8 per cent. there were 75 per cent. of the 69 cases diagnosed as dementia praecox admitted at the age of 25 or under (Fig. 4). Seeing that a great many of these cases were either insane before certification, or by their conduct had given prodromal evidence of oncoming dementia, it is highly probable that all the cases really commenced in the adolescent period.

Prior to the war the two sexes were about equally represented in the admissions. During the war the male cases of dementia praecox were diminished by one-half. This may easily be accounted for by the fact that a number were conscripted in the undiagnosed early stages of the disease, or the disease developed after their admission to the army. It was found that 14 per cent. of the total insane who had served in the army were cases of dementia praecox, which proves the truth

of the assumption I have made in respect to the great fall in the admissions on the male side during the war.

A comparison of the two curves of the parents shows a notable difference. The curve of the fathers does not commence to rise till after 25, and the 30-40 peak corresponds with the incidence of general paralysis of the insane (Fig. 2). It may here be remarked that males suffering with general paralysis are four to five times as numerous in the asylums as females, but this does not account for the main difference in the curves of fathers and mothers. This is due to the incidence of child-bearing and lactation, which causes a steady continuous rise to the climacterium in the maternal curve (Fig. 3). The 50-60 peak corresponds to the involutive period.

It was also computed that only 7.9 per cent. of the children were born after the first attack of insanity in the parent.

Recurrent Insanity in Women and Child-birth.

An analysis of 642 female admissions to three London County Council asylums during the year 1911 showed 148 recurrent cases, of whom 32 (21 per cent.) had children between their respective dates of admission. The inference that can be drawn is that rather less than one-fifth of the recurrent cases have children after their first attack of insanity. This may be explained by the adoption of contraceptive methods, but my investigations suggest another important cause—namely, early involutional changes in the ovaries in all the psychoses.

Two Schools of Thought in Relation to Dementia Praecox: the Psychogenic and Physiogenic.

There are two schools of thought—one physiogenic, the other psychogenic; the former attributes the mental disorder to a bodily pathological condition, the latter to a non-adaptable psychological function. The frequency with

which psychoses and psychoneuroses follow emotional shock connected with the sex impulse, the character of the dreams and their interpretations, the nature of the hallucinations and delusions in a great number of the cases suggest an origin in excitement or repression of the sex instinct.

Because by the aid of the microscope we cannot show an organic cause in epilepsy, neurasthenia, or hysteria, and other psychoneuroses, it does not follow that the deranged mental function is not due to deranged bodily function. It was thought, and is still, by the psycho-analyst

school that in the primary dementia of adolescence—dementia praecox, as it is called—there were no bodily changes sufficient to account for the signs and symptoms of mental disease. The physiogenic changes that are met with, it is stated by Jung, are the result, not the cause, of the psychogenic disorder. Thus this author in his work *Analytical Psychology* states:

"The difference between us is as to the question whether, in relation to anatomical basis, the psychological disorders should be regarded as primary or secondary. The resolution of this weighty question depends upon the general problem as to whether the prevailing dogma in psychiatry—'disorders of the mind are disorders of the brain'—presents a final truth or not. This dogma leads to absolute sterility as soon as universal validity is ascribed to it."

And—

"Such an idea is only incomprehensible to those who smuggle materialistic preconceptions into their scientific theories. This question does not even rest upon some fundamental and arbitrary spiritualism, but upon the following simple reflection. Instead of assuming that some hereditary disposition, or a toxæmia, gives rise directly to organic processes of disease, I incline to the view that upon the basis of predisposition, whose nature is at present unknown to us, there arises a non-adaptable psychological function which can proceed to develop into manifest mental

disorder; this may secondarily determine organic degeneration with its own train of symptoms. In favour of this conception is the fact that we have no proof of the primary nature of the organic disorder, but overwhelming proofs exist of a primary psychological fault in function, whose history can be traced back to the patient's childhood."

But when doctors speak of psychogenic, what do they mean? The furniture of the mind is made up of past

FIG. 2.

FIG. 3.

Fig. 4.—Broken line=ages of parents upon first attack of insanity. Uninterrupted line=ages of offspring upon admission to asylums.

experiences and the bonds that unite them, but there can be no mind without memory, and there can be no memory without body. All psychical processes are subordinate to physiological processes, and all physiological processes are associated with, and dependent upon, oxidation processes. That the mind reacts on the body and the body on the mind is certain, and that the bodily symptoms of many functional neuroses, such as hysteria and anxiety neurosis, can be cured by suggestion and persuasion is certain. In the former of these conditions we have a perseveration of an idea, brought about by auto-suggestion or hetero-suggestion; in the case of the conscript it was an unconscious defence mechanism connected with the instinct of self-preservation; in civil life it is connected with the sex instinct in the majority of instances. The anxiety neuroses are, in a number of instances, dependent upon a wound of the *amour-propre*.

Time, however, will not permit me to do more than refer to the psychoneuroses, and I shall devote my attention to mental diseases which may be directly associated with the function of reproduction.

The Insanity of Adolescence.

The insanity of adolescence was first described by Clouston, who recognized two types—a curable, and an incurable which went on to progressive dementia. To this latter type was given the name "dementia praecox" by Kraepelin, who divided it into three clinical groups: the katatonic, the hebephrenic, and paranoid. Whether such a classification is justifiable or not on these lines is open to question; it is certainly of less value to know what a thing is called than to know what it is, and to find out how it has come about that an individual's mind is deranged. This can only be effected by careful investigation* to ascertain what an individual was born with and what happened after birth, and in this respect psychological inquiry to ascertain the development of the mind is as necessary as to know the development of the body. It may be, as Jung says, that a primary psychological fault in function, whose history can be traced back to childhood, will be found in most of these patients. This fault, he would say, is a predisposition of which we know nothing. I would urge that there is evidence to show that, at any rate in dementia praecox, there is an inborn genetic lack of durability and reproductive formative activity. Kraepelin discusses and discards the idea that this disease is due to masturbation, and does not, as Clouston did, recognize a "masturbational insanity." Onanism, according to Kraepelin, is a symptom; but it may be a contributory cause of the mental disorder. Most psychiatrists recognize the association of the disease with the sexual functions. Kraepelin, Urstein, and other authorities suggest toxins from the sex glands as a probable cause of the mental disease.

Morbid Histological Changes in the Brain.

Most psychiatrists accept the findings of Nissl, Alzheimer, and those who have followed them in associating the mental symptoms with the microscopic changes in the ganglion cells of the cortex, mainly affecting the nucleus and causing thereby a defective metabolism and function of the ganglion cells with pigmentary or lipoidal degeneration, akin to that met with as a result of senile change.* Jung, as we have seen, takes an entirely different view of this question.

The Physiogenic Explanation of the Vital Impulse in Relation to Mental Disorders.

I have endeavoured by my researches to show that the mental breakdown in adolescence, in the puerperal and lactational states in women, and in the involutive period in both the male and female sexes, is due to a failure of the vital impulse (*élan vital*) or libido of the psycho-analysts. But this vital impulse is an inborn character, and, like longevity and durability, it is due to bodily conditions. Up to puberty, this vital impulse is manifested in the psycho-physical reactions for self-preservation by nutrition for the growth of the body and for its defence against injury. But Nature is unmindful of the individual, mindful only of the species, and the body is, after all, but the vehicle for the germ cells, so that all the vital energy over and above that which is necessary for the functional activities of the somatic tissues is in adolescence available as psycho-physical energy for the formative productive energy required for reproduction. In adolescence a complete mental revolution occurs peculiar to each sex, and the vital impulse is now directed mainly towards

the fulfilment of the instinct of propagation, as well as, and even more than, self-preservation. The vital impulse to psycho-physical activities is manifested in new emotions, passions, and sentiments, and the reactions are peculiar to each sex. If these sex activities are not frustrated and repressed, which so often happens, owing to the taboo of society, and the disharmony which exists between physiological sex relations and social customs, usages, and traditions, the sex impulse to propagate is accompanied by a *joie de vivre*, "a new and unaccustomed spirit," an *élan vital*, so admirably expressed by Shakespeare in *Romeo and Juliet*:

"My bosom's lord sits lightly on his throne;
And all this day an unaccustomed spirit
Lifts me above the ground with cheerful thoughts."

Now what will happen if there should be a suspension or suppression of this libido or vital (love*) impulse due to an inherent potential deficiency or owing to physiological stress or pathological conditions? In what structures of the body should we expect to find evidence of functional organic deficiency? We should expect to find a deficiency of organization in the germ cells, for it is by them that the vital energy is genetically transmitted. This energy, characteristic of every living organism, to build itself up according to a certain inherited type or pattern, is embodied in the nuclear substance of the fertilized ovum derived from the male and female gonads, in virtue of which it can turn to account both the food and the force which it derives from without. The productive energy, which in the normal male is manifested by an almost unlimited nuclear formative spermatogenic activity for more than two-thirds of a man's life, and in the normal female by a fertility and capacity of bearing and nourishing offspring, the mother remaining in good mental and bodily health during the reproductive period, denotes an inborn endowment of formative vital energy.

It follows that evidence of a primary regressive atrophy of the spermatogenic functions, and of a regressive atrophy and failure of the primordial follicles of the ovary to develop Graafian follicles, is indicative of an hereditary deficiency of the genetic vital impulse. Now I have shown in a large number of cases of dementia praecox, in both the male and female sexes, that a primary regressive atrophy of the reproductive organs occurs. In the female the disease is often manifested after the birth of the first child. Thus the woman suffers with puerperal mania which terminates in dementia, from which the patient never recovers, although she may with care live a vegetative existence for a number of years in an asylum. Can anything more tragic happen to a young husband than this? Yet I have investigated not a few such cases of puerperal mania, terminating in dementia praecox, affecting a young married woman after the first confinement. Some few of the cases occurred in unmarried women, sometimes of the imbecile type. Emotional shock and social degradation may in such cases act as exciting factors in the production of the mania. In these cases of post-puerperal dementia I have found in the ovary macroscopic and microscopic evidence of failure of reproductive power. The organs are small, shrivelled, and densely fibrous, showing no Graafian follicles, a totally different appearance from the ovaries of a young woman dying of acquired organic brain disease—for example, general paralysis of the insane. Microscopic examination shows a few old corpora albicantia or corpora lutea, but no recent follicle formation; the primordial follicles are greatly diminished in numbers and are seen in all stages of degeneration and replacement by the fibrous stroma. Examination of the nucleus (germinal vesicle and germinal spot) of the ovum shows a deficiency in the chromatin substance, consequently indicating a failure of the productive vital energy necessary to stimulate the development of the zona granulosa cells and formation of the Graafian follicles. This nuclear defect in the female germ cell has been said to be due to the effects of chronic disease—for example, tuberculosis, from which so many of these patients die; but we know that tuberculous women are not infertile and do not develop mental symptoms—indeed, the tuberculous woman while pregnant seems to put forth a supreme effort of the body to resist the disease, and thereby enables the child to develop and be born alive, afterwards to be followed by a "rapid decline" and frequently death of the mother, which to my mind affords a proof that every cell of the body has an organized impress—or, if you like, a pre-organized mneme—that its great mission is the preservation of the species. A more direct argument, however,

*Lantern slides were shown illustrating these changes, for a full account of which the reader is referred to "Studies in the Pathology of Dementia Praecox."

* Used in the broad sense of Jung.

against chronic disease being the cause of the ovarian regressive atrophy is that occasionally I have had a case of dementia praecox in a female who was in good bodily health, and died of acute disease after a few days' illness. I have found the same atrophic changes and fibrotic substitution as in the cases dying of chronic disease. In the ovaries of a general paralytic woman, dying before the involutive period of life is reached, although she may have suffered with chronic disease for years before death, yet we shall find evidence, especially if she is a married woman, of numbers of corpora albicantia and of corpora lutea, a history of having had a number of children, in some instances miscarriages or abortions, or children born dead—the result of the syphilis. The evidence of an inborn germinal defect is, in the greater number of cases, absent in general paralysis. There is no primary regressive atrophy of the ovaries. In spite of the mental and bodily disease from which she suffered, the ovaries usually show follicles undergoing development in all stages; most of them, however, become atretic. In the dementia praecox cases there is usually no sign of atretic follicles, although there are old corpora atretica (see Plate, Fig. C, 1, 2, 3, 4).

Dr. Iris Fox has been good enough to abstract the notes of my observations upon a large number of ovaries in various forms of insanity. The conclusions are highly suggestive of the fact that all forms of insanity are associated with a tendency to failure of reproductive power and early involution, yet we know that chronic disease will produce the same effects. Still there can be no doubt that dementia praecox, an inborn disease, shows this loss of reproductive power to a far greater degree than general paralysis of the insane, an acquired disease, which accords entirely with my observations on the testes in these two diseases.

Summary of Results from Examination of Clinical and Pathological Data of 97 Cases of Patients under 50 Dying in Asylums and of 8 Dying in Hospital.

I.
(a) Diminished follicles occur in most types of mental disease and in many controls. The details suggest that this diminution may be a more constant feature of dementia praecox than of the other forms of insanity.

(b) Sclerosis (which has been assumed to be absent when not noted) is also common, but is remarked in a much higher proportion of the dementia praecox cases than in any other disease.

(c) Vascular thickening may accompany sclerosis, or occur independently (for example, in general paralysis of the insane).

II.
Degeneration of follicles is found in a very high proportion of all the ovaries examined. No deduction can therefore be drawn from it here.

III.
The nuclear condition of ovum has been noted in 44 cases. The figures show a high proportion of cases of nuclear degeneration in dementia praecox. The other figures are too small for generalization, but suggest a special freedom from degeneration of the nuclear chromatin in general paralysis. With regard to other mental diseases there is no evidence here to show that they differ in this respect from dementia praecox. The figures suggest that the nuclear degeneration is probably unrelated to circulating differences, since the general paralysis of the insane cases show a fair number with vascular degeneration. The figures, however, are too small to establish this point.

IV.
(a) Some degree of maturation of the follicles is present in the great majority of cases, the exceptions being almost always cases of dementia praecox, or (?) dementia praecox.

(b) No clear deductions seem possible from either the corpus luteum content or the menstrual history—from the former because the type of corpus luteum is not generally noted, and, if it were, its dating would be somewhat empirical; from the latter because of the possible inaccuracy of the record.

(c) Shows a connexion between the duration of the disease and ovarian change as a rule. But this does not establish any special relationship beyond that existing between other chronic and acute diseases and ovarian function.

I am at present pursuing the investigation by an intensive study of the ovaries and endocrine glands in a number of

cases in which adequate clinical data have been obtained. So far as the investigation has proceeded, regressive atrophy of the ovarian functions is a marked feature of dementia praecox.

Now if we turn to the male adolescent who develops dementia praecox—and I have investigated now the testes in thirty fatal cases, and in many of these the brain and endocrine glands—we find evidence of a primary regressive atrophy. The first account of these investigations was published in the *BRITISH MEDICAL JOURNAL*, vol. ii, 1919, pp. 655, 698, 737, under the title "Normal and Morbid Conditions of the Testes from Birth to Old Age in 100 Asylum and Hospital Cases," and subsequently in "Studies in the Pathology of Dementia Praecox," *Proceedings of the Royal Society of Medicine*, vol. xiii, 1920, Section of Psychiatry; "The Psycho-pathology of Puberty and Adolescence," *Morison Lectures*, 1921; "Second Maudsley Lecture"; published in the *Journal of Mental Science*, July, 1921.

I will briefly summarize the results of these investigations together with the results of a further investigation on dementia praecox and other psychoses, especially in relation to the interstitial cells of Leydig, which is now in the press and will be published in the next number of the *Proceedings of the Royal Society of Medicine*. There is, generally speaking, a correspondence between the degree of regressive atrophy of the testes and the duration of the mental symptoms. The atrophic process may result in all stages of failure of nuclear formative activity of the spermatogenic epithelium terminating in a complete

disappearance, leaving only the Sertoli cells. There are also profound nuclear and cytoplasm changes in the interstitial hormone cells. This primary atrophy resembles the changes met with in the testes of cases of involutional melancholia, post-adolescent dementia praecox, and terminal dementia and manic depressive insanity. Besides the failure of spermatogenesis, there is pigmentary degeneration of the interstitial cells in 25 per cent. of the cases of dementia praecox dying in adolescence, a sign of senile decay. This regressive atrophy was not found as a rule in general paralysis and other forms of organic brain disease. These investigations appear to show that in the male and female suffering with these various psychoses there is a failure of the vital formative impulse of reproduction, especially marked in cases presenting the clinical signs and symptoms of dementia praecox. Lantern slides were exhibited in illustration of these facts, and the reader is recommended to consult the communications referred to for further precise and detailed information.

In conclusion, it may be noted that these observations on regressive atrophy of the male reproductive organs have been confirmed by the researches of Tiffany.

THE Medical Faculty of Vienna has issued a programme of a special post-graduate course beginning on June 19th. The course is in medicine and the diseases of children, and will have special reference to treatment. There will be two sessions on each day—in the morning from 8 to 11 and in the afternoon from 3 to 6. The course will be conducted by the professors, privatdozenten, and assistants in the medical faculty; it will consist of lectures, clinical demonstrations, and demonstrations in the pathological laboratory, and will range over a wide field. The last day, Saturday, July 1st, will be chiefly occupied by a visit to the neurological and psychiatric clinic. The registration fee for foreigners is 10,000 kronen. A supplementary course on radiology will be given in the following week; it will begin on Monday, July 3rd, and end on July 9th, when a visit will be paid to the special lupus institution in Vienna. The fee to be paid by foreigners will be 100,000 kronen. Full particulars of both courses can be obtained from Dr. A. Kronfeld, Porzellan-gasse 22, Wien; the Editor of the *BRITISH MEDICAL JOURNAL* has a few copies of the programme; one will be sent to applicants on receipt of postage.

DESCRIPTION OF SPECIAL PLATE.

FIG. A.—Ovary of G.; dementia praecox. Age at first attack, 25; pregnant seven months; died eighteen months later. Weight of ovaries, 3 grams and 2 grams. Old corpora lutea vera; thickened vessels indicative of involutional change; no maturing Graafian follicles; one small degenerated immature follicle on the surface; very few primordial follicles left (Fig. C). (Magnification 10 × 1.)

FIG. B.—Portion of cortex of ovary, showing complete absence of follicles—sclerosed fibrous irregular surface with dense stroma beneath. (Magnification 100 × 1.)

FIG. C.—Four primordial follicles. These were in a group and show: (1) Lining epithelial cells intact containing ovum with oval swollen nucleus; the epithelial cells of the zona granulosa have already separated from the theca interna, a sign that further maturation will not proceed. (2) Lining epithelium degenerated. (3) The same more marked. (4) Commencing ingrowth of stroma. This group was the best that could be found. (Magnification 800 × 1.)

FIG. C.

FIG. A.

FIG. B.