

trigenomal hybrid *N. tabacum* × (*sylvestris* × *Rusbyi*) = *N. triplex* observed before (1933) can also be interpreted by postulating structural exchanges in the chromosomes, a process which contributes a great deal to the increase of the genotypical variability of the composite plant *N. triplex*.

Literature.

Kostoff, Dontcho. 1929. "An androgenic *Nicotiana* haploid." *Zeitschr. f. Zellforsch. Mikr. Anatomie*, 9, 640.

—1930. "Ontogeny, genetics and cytology of *Nicotiana* hybrids." *Genetica* (The Hague) 12, 33-139.

—1933. "Cytogenetic studies of the triple fertile hybrid *Nicotiana tabacum* × (*N. sylvestris* × *N. Rusbyi*) = *N. triplex*." *Bull. Appl. Bot. Genetics and Plant Breeding*, Ser. II, N 5, pp. 167-205.

Skalinska, M. 1928. "Etudes sur la sterilité partielle des hybrides du genre *Aquilegia*." *Zeitschr. ind. Abstmr.*, Suppl. II.

—1928, "Sur les causes d'une disjonction non typique des hybrides du genre *Aquilegia*." *Acta Soc. Botanic. Poloniae*, 5.

Periodic Continence Vs. Contraceptives.

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I. THE KNAUS-OGINO DISCOVERY.

WITH regard to the fertility of women, people have always thought that it is greatest within the period which immediately precedes and follows menstruation. For the last fifty years Dr. Capellmann's theory was often followed. In order to avoid undesirable pregnancy, he counselled abstention the first fourteen, and the last five days, of the menstrual cycle. A reaction set in among standing gynecologists towards the beginning of the century; and, after the researches of Siegel, Jäger and others, it was generally admitted that, though there exist cycle periods of maximum and minimum fecundity, properly speaking, there is no agenesic period.

In 1929 Dr. Knaus showed that, for a normal menstrual cycle of twenty-eight days, ovulation occurs between the fourteenth and the sixteenth day from the beginning of the menstrual flow. Dr. Knaus's researches, which were confirmed by Wittenbeck and Hermstein, did not apply to irregular cycles.

It was the Japanese Dr. Ogino, who, in 1930, solved the problem completely. He showed that, whatever the length of the menstrual cycle, the date of ovulation is separated from the next menstruation by a definite period. In other words, the peak of ovulation always takes place between the sixteenth and the twelfth day before the next menstruation. It is during these five days that fecundity occurs.

But may not ovulation be provoked by coition? Though the positive solution was accepted till recently by many gynecologists it is now almost universally rejected. Thus the human species follows the behaviour

normal among mammals. The statistics, which have been held to demonstrate the contrary, were shown to be unreliable by Ogino.

Another objection was based on the supposed lengthy vitality of the ovum and of human spermatozoa. The researches conducted by Hoene and Behne with regard to the spermatozoa, and by Meyer Allen and Pratt with regard to the ovum, answered the objection, and led to Ogino's rule. *The eleven days immediately preceding menstruation are always sterile.* The law of inertia explains the slowness of medical opinion in accepting these conclusions.

II. PRACTICAL APPLICATIONS.

In Ogino's rule we have a method for obtaining rational fecundity, which consists in regulating the birth of children without injury to the mother, without risking the health of the offspring, without imperilling the harmony of the family, and without running counter the enlightened dictates of sound eugenics.

Yet it has been contended that the rule is unsafe for nearly fifty per cent. of women. This exaggerated view springs from a confusion of normal with pathological cases. Gynecologists tended to regard as normal a twenty-eight-days cycle. Now this estimation is too narrow. Twenty-eight-days cycles, admitting oscillations of a maximum amplitude of five days, may be regarded as normal, and to them Ogino's rule may be applied.

The maximum fecundity occurs within five days. Three more days have to be allowed for the possible vitality of the spermatozoa. Hence, to avoid pregnancy, abstention, for a twenty-eight-days cycle,

must extend to eight days. On the other hand, a cycle 26-27 demands nine days of abstinence. A cycle 26-28, or 28-30 demands ten days, and so on. Formulæ and tables have been published to facilitate the determination of the fertile days, in which intercourse is to be shunned, if conception is to be avoided.

The cycles for which the periodicity of oscillations cannot be assigned must be regarded as pathological. To them Ogino's rule cannot be applied. Hajek found oscillations exceeding 11 days in 192 women out of 1,215. Smulders and De Guchteneere declare that only rarely the irregularity is so great that the method is unsafe. They note, however, that very bad cases can often be improved by proper treatment. The security afforded by periodical continence depends on the exact application of the agenesic formula. It is plain that a competent gynecologist should be consulted, and he will require several months of observation before fixing the final formula. Allowance must always be made for critical epochs, such as marriage, childbirth, miscarriage, which pregnantly modify the menstrual rhythm. In fact, abstinence should be counselled till a regular rhythm is re-established. It should not be forgotten that in "asthenic" women keen emotions, troubles, a change of climate, may temporarily suspend or delay ovulation. Dr. De Guchteneere then recommends only the premenstrual agenesic period, reduced from eleven to nine or even eight days.

Remembering that, though all vital functions follow a definite rhythm, yet man is more than a mechanism, and consequently rigid formulæ are to be mistrusted; remembering also that many mishaps are to be traced to individual carelessness rather than to the deficiencies of Ogino's rule, we may say that periodical continence based on the same rule, affords—not indeed the absolute security of total abstinence—but the relative security of any artificial method.

Future advance in physiology will surely succeed in determining the exact date of the peak of ovulation, and the consequent length of the agenesic periods. Meanwhile, the prudent application of the Knaus-Ogino method will afford relief in the majority of cases, whereas absolute continency is not advisable, and the mother's health, the economic status of the family or other reasonable motives to militate against a new pregnancy. We believe that the con-

ditions of society in industrial centres, among government officials, teachers, clerks, make both unchecked fecundity and absolute continence equally difficult. As long as present conditions last, periodical abstinence offers a fair solution of a most acute problem, which only too often has opened the door to solitary vice, the use of contraceptives or even downright adultery.

III. MORAL CONSIDERATIONS.

It has been contended that the sexual function is on the same level as digestion and consequently is outside the sphere of morality. No doubt, the elaboration of the semen in man, and the menstrual cycle in women, are purely physiological processes, which do not fall under the sway of free will. But, as eating and drinking, at a certain period of development, evolve from purely instinctive operations to actions that are distinctly human; and man, though incapable of suppressing hunger and thirst, can, and has to, regulate their satisfaction, so the sexual function, though based on a physiological mechanism, transcends the same, and in man, rises to the moral order, and in certain of its activities falls under the usual law.

Now we may distinguish the positive moral law and the natural moral law. The natural usual law, regarded in God, is eternal; and it is God's supreme wisdom and will, which commands the keeping of the natural order, and forbids its violation. The natural moral law, regarded in man, is a sharing of the eternal law, through the light of reason, by which we discover what we should, and what we should not do. It is called "natural" because it is based on man's reason, and not on revelation. It is this natural moral law that bids us to speak the truth, to love and obey our parents, not to do harm to our neighbour. We call it natural, because it is not based on a mere precept, but on man's rational nature. To act deliberately against it is to sin against reason, *i.e.*, against the nature of man. It is therefore an offence against the dignity of man, and against God, who is our Creator, and the Maker of our nature.

Endeavouring now to apply these principles to the sexual function, we notice first of all that its obvious scope is the preservation of the race. We may gauge its nobility from the fact that, by its proper exercise, man shares in a way the creative power of God. The pleasure, which is inherent in it, is of the same kind as the pleasure of

eating and drinking. It is perfectly natural, and, when it accompanies the proper exercise of the function, is good, even as the function is good. But just as a gourmand offends against the natural order by severing the pleasure of eating from the nourishment and sustenance of the body, and lives to eat, but does not eat to live, so an unchaste man severs the sexual pleasure from the natural effect of the sexual act. He thereby upsets the order of nature, seeking pleasure as an end, though in connexion with sexual activity, it is a means.

Thus appears the philosophic reason why solitary vice, homosexuality and prostitution are offences against the natural law.

Now, the use of contraceptives (chemical or mechanical) tends of itself to upset the sexual cycle, whose natural end is pregnancy. It deliberately sunders the pleasure of a natural act from the natural consequence of the same. It is therefore unreasonable; it is unnatural. I for one cannot see how in birth control through the use of contraceptives, the act differs morally from solitary vice or even homosexuality. In fact, I believe, it is usually more serious than mere solitary vice, for the continuous and fruitless stimulation of the female genital organs leads to serious disorders, both psychic and physiological.

IV. AN OBJECTION.

I have not great hopes that people endowed with the Neo-Malthusian mentality will readily see the strength of the philosophic argument I have just outlined. Others who admit man's dependence from a Supreme Cause and Ruler, not only in regard to the physical order, but also with respect to the moral order, will perceive the sinfulness of artificially tampering with the generative process. But they will ask themselves how the practical application of the Knaus-Ogino rule is consistent with the demands of morality.

It is to be noted at the outset that a person's intentions are not in question. A married couple may have intercourse in the normal manner, with a lustful mind. The action, which is good in its materiality, is vitiated by intention. But can a good intention "spiritualise" an intrinsically crooked action? We do not think so, for we believe that "the end does not justify the means".

Now to the matter in hand: the natural moral law demands that the sexual act should be performed normally and complete-

ly. It demands also that the health of the mother should be safeguarded, that children should not be brought into the world in utter disregard of the dictates of prudence. Circumstances may arise when a new birth may prove disastrous. Then abstinence is the obvious course. But prolonged abstinence may upset conjugal harmony, may, in individual cases, be unadvisable.

The Neo-Malthusians advise the use of contraceptives. We do not agree with them, for the reasons already given, and for other reasons, which we cannot develop here.

Then we counsel periodical continence, in the sense of the Knaus-Ogino rule.

Here the physiological processes are not interfered with. The natural effect of the act is not frustrated by artificial contrivances. Woman is not unjustly deprived of the benefits both physical and psychic, of certain substances, which are absorbed by the female organs, and act as metabolic stimulants. A new pregnancy is avoided simply by taking advantage of the normal cycles of sterility and fecundity. In other words, the Creator's law is made use of, which consists, in the spontaneous alteration of fertile and sterile days. This law is not of man's invention. It is natural. It is not twisted to immoral purposes, but is applied for good reasons. If women were unfit for sexual intercourse during the agenic days, if they felt normal repugnance to it, we might pause and ask ourselves whether such an attitude were not indicative of moral perversion in the performance of the conjugal act during the sterile period. But no such unfitness, no normal repugnance is discoverable.

Hence we believe that no moral blemish can be attached to those who regulate their conjugal life according to the Knaus-Ogino rule.

It is finally to be noted that while continence is the basis of the Knaus-Ogino system, contraception implies the total denial of continence.

We believe that total continence may be exercised by a few (both in marriage and outside marriage), whose normal training is of a very high order, and whose spiritual ideals are divinised by constant communion with God. For the majority, the normal exercise of the sexual function in marriage is not fraught with any danger or with any serious consequences. They should be generous, and should not shirk the burdens, and blessings of numerous families. To those

unfortunates—and they are luckily few—for whom eugenic reasons, or economic reasons of a serious character, dissuade normal

generation, we counsel periodic continence—and we believe the counsel is good and praiseworthy.

Fruit Research in India : Its Importance, History and Scope.

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INTRODUCTORY.

JUST as the Department of Agriculture forms a minor subject in the administrative classification of the Government of India, the development of fruit industry forms indeed a very small part of the activities of the Agricultural Departments in India, in spite of the fact that India claims to have more than five million acres under fruit and vegetables. Consequently this country, which has great potentialities for development, imports annually fruit worth about twenty million rupees from foreign countries. Not only is this so, but while the acreage under fruit and vegetables has remained practically stationary for several years past, the imports of foreign fruit have increased by leaps and bounds in recent years. The steady acreage under fruit and vegetable and the increasing imports indicate that the total consumption in the country of these commodities has increased but it has not been followed by any extension of fruit and vegetable cultivation.

The importance of the development of the fruit industry is, however, recently attracting the attention of the Agricultural mind in various parts of India, which is indeed a welcome sign of awakening in the right direction. The Imperial Department of Agriculture is now financing some fruit schemes in the different provinces with a view to develop this industry. It is generally recognised that in the economic uplift of rural areas, in the financial success of large irrigation projects which are undertaken at the cost of huge amounts in the Deccan, Sind and other parts of the country, and in the successful development of vast tracts of countryside, where the ordinary agricultural crops are not a financial success, the fruit industry will play a very important rôle. It is then natural that the question of fruit research should play as much part in the agricultural development of the country as any other branch of agricultural science, this being an important and valuable source of income to the peasant. The present time

is, therefore, most opportune to stress upon the minds of the general public the great importance of fruit research in India, and this note will have fully served its purpose if it does so.

HISTORY OF FRUIT RESEARCH.

The fruit research dates back to the middle of the nineteenth century. Ferminger (1863), Woodrow (1877) and Bonavia (1890) have made valuable contributions to the limited volume of literature on the subject in India, by their attempts to describe the existing varieties of fruit and to classify them as far as possible.

The records of the work done under the auspices of the Pusa Institute of Agriculture show but very little headway made in this direction. This work chiefly deals with the establishment of a Fruit Farm at Quetta, and some work on the drying and packing of vegetables.

The United Provinces Department of Agriculture have restricted its activities to the establishment of farms and variety trials of exotic fruits. The Saharanpur Botanical Gardens have contributed substantially towards this work from the early years of the nineteenth century.

The Tarnab fruit farm has shown active interest in the development of the fruit industry in the North-Western Frontier Provinces. The introduction of improved varieties of plums in this Province is perhaps one of the few important projects which this Farm has carried out successfully. Some observations on the improvement of fruit stock have also been recorded in the reports of this Farm.

The Punjab and Central Provinces Departments of Agriculture have also done some work in this line. In the Punjab, a regular Department of Horticulture has been recently organised, and fruit work is making progress.

The Bombay Department of Agriculture organised their horticultural work as late as 1908, when the investigations on fruit trees were allied with botanical research. The