The Approaching End of the Age by H. Grattan Guinness – Part IV. Section II. The Law of Completion In Weeks. Chapter I. The Week in Relation to the Periodicity of Vital Phenomena.

Continued from Part IV. Section I. Chapter II. Soli-Lunar Dominion in the Organic World.

PERIODICITY IN THE DEVELOPMENT OF INSECTS, FISHES, BIRDS AND MAMMALIA.—PERIODICITY IN THE GROWTH AND FUNCTIONAL ACTIVITY OF MANKIND IN HEALTH AND IN DISEASE.

THE birth, growth, maturity, vital functions, healthy revolutions of change, diseases, decay and death, of insects, reptiles, fishes, birds, mammals, and even of man himself, are more or less controlled by a law of *completion in weeks*.

The hatching of the ova of insects occupies in a large number of cases, intervals varying from two to six weeks. Their continuance in the caterpillar or larva condition is seldom less than seven days, and varies from this period to four weeks, six weeks, or longer periods. The exuviation, or change of skin, which occurs during this larva state, frequently takes place at intervals of seven days.*

* From an interesting series of papers contributed by Dr. Laycock, to the **Lancet**, in the years 1842-3, on the subject of Periodicity in Vital Phenomena, we extract the following:—

"*I found the most remarkable illustration and confirmation of the law in insects.* The changes to be noticed in insects as being regulated, as regards the time they occupy, by this law, are as following:—

"1. The hatching of the ova.
"2. The caterpillar, or larva state, and the moults which take place at that stage of development.
"3. The pupa, or chrysalis period.
"4. The imago state, or puberty.

"The ova are hatched in periods varying considerably in length. The shortest is *half a week* or seven (half) days, as in the wasp, the common bee, and ichneumon; in some, as the cecidomia tritici, the period is *one week*; in others it is a week and a half, as, for

example, the black caterpillar and the gooseberry grub (tenthredo capraea). *In the majority of insects however it is from two weeks to six weeks.*

“The ova of the glow-worm occupy six weeks; of the mole cricket only four weeks in hatching.

“THE LARVA. The period passed by insects in the larva will vary in length as the insect varies; but I think seldom less than seven days. In the common bee it is six days and a half, in the humble-bee (another name for a bumblebee) seven days exactly. *In day papiliones it is four weeks, in moths six weeks*. In many insects it is a long period, continuing for months. The larva of a new British wasp, of the genus oplopus, occupies twelve weeks; namely, from the period when its two first segments coalesced to the throwing off of its exuviae was *three weeks*, and from the time of the latter change to its full development, *nine weeks*. It is worthy of notice that the time occupied between each exuviation of the larva is limited in the same manner as the period of the larva state itself is limited. Thus, the latter period of the common black caterpillar is twenty-one days, or three weeks; during this period it exuviates, or *changes its skin three times, at intervals of seven days each*. The wood-piercer bee is in the larva state four weeks; of these four weeks it fasts exactly one, just before it enters the pupa state.

“THE PUPA. *The period spent in the pupa state is the most in accordance with the general law of limitation by weeks*; in fact, the more exact the observations are as to the length of this period, the more confirmatory are they of the general rule. For example, Mr. Denny had three larvae of the sphinx atropos, which went into the earth on August 22nd, 24th, and September 2nd, respectively. They appeared as perfect moths on October 16th, 18th, and 27th; or, in each case, *in exactly eight weeks*. If the pupa state is entered late in the summer, the perfect insect does not appear until the following spring. Larvae and ova will also hibernate in the same way; *but in all cases the period occupied is a definite number of weeks*, some are forty, others forty-two, and forty-eight weeks.

“THE IMAGO. I have not been able to collate observations as to the duration of the imago state, very few having been made; but the vital actions of the perfect insect appear subject to the same general law. Thus, twenty or twenty-one days after the queen bee has begun to lay the eggs of drones, the bees begin to construct royal cells. If the impregnation of the queen be retarded beyond the twenty-first day (Huber) or twenty-eighth (Kirby and Spence), of her whole existence, she lays only male eggs; and Huber states that after the twenty-eighth day, under these circumstances, she loses all feelings of jealousy towards the young queens in the nymphine state, and never attempts to injure them. Some insects attain puberty almost immediately after leaving the puparium; others are a considerable time before their organs acquire sufficient hardness, especially some of the beetle tribe. Thus the newly-disclosed imago of cetonia aurata remains *a fortnight* under the earth, and that of the lucanus cervus not less than *three weeks*.”

The moults of insects, the exuviation of serpents, the renewal of the plumage of birds, and of the coats of other animals are similarly regulated by a law of weeks. So are the periods of the laying of eggs, and of incubation, in many birds. The common hen, as is well known, sits three weeks; the pigeon two, after having laid eggs also for two weeks. The seal calves on the rocks, and suckles its young for two weeks, when the calf casts its coat and goes into the water.

The ova of salmon are hatched in 140 days, or twenty weeks; and those of the aquatic salamander in two weeks or fifteen days. But the habits and physiology of fishes and reptiles are comparatively little known or observed, so that few confirmatory facts, can be drawn from this department of the animal kingdom.

The periods of utero-gestation in many of the mammalia, and of incubation in

numbers of birds, have been accurately and carefully noted. Out of one hundred and twenty-nine species observed by Dr. Laycock, sixty-seven had periods which were an exact number of weeks or months, twenty-four were so within a day, and only four were exceptions to the rule, as far as could be ascertained,*

* "I turned my attention to the periods of utero-gestation in lower animals, as I felt anxious to learn *whether any such limitation of the period by weeks could be traced as affecting them.* I tabulated the periods of gestation in various mammals, and the period of incubation in birds, as they were stated in works on natural history, and as I could make them out from personal inquiries whenever opportunity offered. Of course rigid accuracy could not be looked for in observations of this kind, but, such as they were *they confirmed the general law of limitation by weeks observed in the sex.* I collected tolerably trustworthy observations of this kind referring to *one hundred and twenty-nine species of birds and mammals* (some being, indeed, rigidly exact), and in sixty-seven of these the periods of utero-gestation and incubation were a definite number of weeks or months; twenty-four exhibited periods being within a day of the definite number, and in the remaining thirty-nine the period was so loosely stated as not to be of much weight either for or against the general law, although by far the greater number were decidedly favourable. Altogether I judged that there were only four available exceptions. As examples of this law may be stated— in the grallidae, tetraonidae, and other birds of about the same size, the period is *three weeks*; in the anatidae, *four weeks*; the cygnidae, *six weeks*; but in small birds, as the musciparae, only *two weeks*.

"The facts I have briefly glanced at are general facts, and *cannot happen day after day in so many millions of animals of every kind*, FROM LARVA OR OVUM OF A MINUTE INSECT UP TO MAN *at definite periods, from a mere chance or coincidence*; and although temperature, food, domestication, and other modifying circumstances, may and do interrupt the regularity with which the various processes, I have alluded to, are conducted, yet upon the whole it is, I think, impossible to come to any less general conclusion than this, that, in *animals, changes occur every three and a half, seven, fourteen, twenty-one, or twenty-eight days, or at some definite number of weeks*." —DR. Laycock.

And it is well known that when we mount still higher in the scale of animated existence, and study the entire system of vital periodicity impressed by its great Creator on the human family, this law of limitation by weeks becomes conspicuous and all-pervading. From the cradle to the grave, and from before the cradle, from the day of conception to the day of death, every man, woman and child of our race, is strangely amenable to it. Consciously to one sex, unconsciously, but none the less really to the other, there is an alternate loss and gain of physical substance, *every four weeks*.*

* "It is well known to physicians, that there is a large class of diseases, the symptoms of which recur at regular intervals of time. It so happened that I had appointed myself the task of investigating those nervous affections belonging to this class, and I directed my inquiries in particular to the rule or law by which the interval between the paroxysms is regulated. Of course *the phenomena of menstruation first demanded my attention as a normal periodic movement*. In the course of my inquiries I ascertained that the interval between each such period was not always four weeks; but occasionally *two weeks, three weeks, five weeks*, and even *six weeks*. Facts being such, I determined on *counting the interval by weeks*. The circumstances connected with menstruation led necessarily to those connected with the period of utero-gestation. This, it is well known, is usually forty weeks; but here again I found exceptions to the general law, like those just now mentioned, that is to say, *the period was exceeded or shortened by weeks*." —Dr. Laycock.

From some "statistical details respecting the menstrual periods," given in Schweig's researches, we learn that 'the results of 200 menstruations in thirty-four individuals,

showed an average of 27-8 days, *the maximum number in the table being 28 days*." (*Medical Review*, July, 1844.)

Even *exceptional* cases to the ordinary monthly period, are regulated by a weekly variation. "I sought the explanation of such cases, and found that, in one half of the *three-weekly cases*, the type was explained by ovario-uterine disease of an organic nature, or by chlorosis; and in more than one half of the *six-weekly* cases, the patient's health was habitually bad, owing in two instances to uterine disease, which was also the case with the one that assumed the *fortnightly* type."—(TILT, On Uterine Inflammation.")

There is an analogous *monthly gain and loss of substance and weight in the case of men*, which was first discovered by Sanctorius. "Nature, animate or inanimate, is full of periodically recurring phenomena. The periodicity of our planetary system is felt by man, for he experiences, by insensible perspiration, a constant *periodical* loss, which was first discovered by Sanctorius, who established—that even those who are in a perfect state of health, and observe the utmost moderation in living, *once a month increase beyond their usual weight to the quantity of one or two pounds, and at the month's end return again to their usual standard*, and that this is accompanied by an important change in the secretions. A further analogy between menstruation and the monthly oscillation in the urinary discharge referred to, as observed by Sanctorius, is that, before the aforesaid crisis happens, there is felt a heaviness in the head, and a lassitude all over the body, which symptoms are afterwards removed.'"—(Tilt, p. 204.)

In the human family, the period of utero-gestation, is accurately forty weeks, nor do differences of age, climate, or circumstances, cause any variation in this period. It is the *rule*, though it has of course exceptions,

Dr. Denman, in his work on midwifery, states, "The common time of utero-gestation is *forty weeks*. . . . I do not mean that it is completed to a minute or an hour, as has been surmised, because the birth of the child may be delayed by a multiplicity of accidents. But parturition will be accomplished, or the parturient disposition will take place, before or at *the expiration of forty weeks from the time of conception*. Nor does it seem reasonable that A LAW OF NATURE, which is not altered by the differences of age, by the diet, by the extremes of climates, by the severities of slavery, or the indulgences of luxury, should be changed by circumstances of less importance."*

*Denman, vol, i, p. 306.

Thus throughout all ages, and in all countries, the initial stage of human existence, the intra-uterine life of every one born into the wide world, is measured by *weeks*; and not till forty weeks have run their course, does the human being attain independent existence. These are phenomena of universal occurrence, and of fundamental importance in the natural history of mankind; they are leading and unquestionable physiological facts. The periodicity of *life*, and the periodicity of *birth*, need no demonstration, for the experience of every individual bears witness to it, as well as to the fact that it is *regulated by a law of weeks*. And if this be the case in health, and with normal functions, so is it also with disease, and in abnormal derangements. From time immemorial, it has been observed that fevers, and intermittent attacks of ague, gout, and similar complaints, have a septiform periodicity; that the seventh, fourteenth, and twenty-first, are critical days.

In his investigation into the phenomena of fevers, Dr. Laycock states that,

“*Whatever type the fever may exhibit, there will be a paroxysm on the seventh day*, and consequently this day should be distinguished by an unusual fatality or number of crises. For analogous reasons *the fourteenth will be remarkable as a day of amendment*, the last paroxysm of a quotidian taking place on that day, and the last of a tertian (a form of malaria causing a fever that recurs every second day) on the day previous; for observation has established that if a tertian is to cease about the fourth paroxysm (the seventh critical day), the second paroxysm will be more severe than the first or third; but if the fourth be severe, and the fifth less so, the disease will end at the seventh paroxysm, and, of course, the change for the better, if this rule be applied to remittent or continued fevers, will be seen on *the fourteenth day*. Should, however, the exacerbation occurring on the thirteenth day end fatally, whether it be the seventh of a tertian or the fifth of a quartan, death will probably take place early on the fourteenth day, namely, about three or four o’clock, a.m., when the system is most languid.”

That these theoretical inferences are borne out by facts, all medical writers agree, and indeed it may be proved numerically by tables of cases, compiled without the least reference to critical days.*

* Forestius relates forty-eight cases of acute fever, without any reference to critical days; five of these terminated on the fourth day, *twenty-two on the seventh*, two on the eleventh, and *seven on the fourteenth*. The cases detailed by Stoll in his “Ratio Medendi,’ exhibit the same general fact; the seventh and fourteenth days, and then the fourth and eleventh, are the most remarkable.

Nor is it in fevers alone that this law of septiform periodicity is traceable. Paroxysms of gout afford another illustration of its operation.

“A fit of the gout going regularly through its stages in a robust subject, observes *the following order*:—

“The patient retires to rest well, or perhaps in better spirits than usual, and is awoke at two o’clock in the morning by rigors, thirst, and other febrile symptoms, and with pain in the great toe, or heel, or other part. This pain and the febrile action go on increasing *for exactly twenty-four hours*, that is to say, until two o’clock, a.m., comes again, when a remission takes place, sometimes an intermission; *the interval it occupies being another nyctemeron, or period of twenty-four hours*, at the end of which another febrile paroxysm comes on. And so paroxysm and remission or intermission alternate, until the fit terminates. A fit of the gout, under the circumstances stated, is a tertian intermittent (in the *measure of its intervals*), and, like a tertian, *it terminates in fourteen days, or after seven paroxysms*.

“If the patient go on luxuriating in his diet, the next fit, if left to flannel and patience, will be of a *double length*, or occupy *twenty-eight days,* and have *fourteen febrile paroxysms*, or exacerbations; or it will be tripled, and be of six weeks’ duration, and *so go on increasing in length by a definite ratio of weeks*, as the predisposing and exciting causes become more efficient, until the viscera and the general system become so deranged that no regular fit takes place.”

It is important also to notice, that not only is *the week* an evident measure in such fevers, and intermittents, but *the half-week also*. His investigations of the subject of vital periodicity forced this fact on the notice of Dr. Laycock, and its agreement with the periods of prophecy, leads us to call attention to his statement.

See Lancet, 1842-3, vol. i., p. 128.

"The complete day of twenty-four hours is the pathological period most generally noticed by physicians; but, as I have shown, there are also periods of *three days and a half*, or *seven half-days. This is, in fact, the ancient division of the whole day, or (Greek word), into two parts*. We must start with *this half-day, or day of twelve hours, as the unit* which will comprise the phenomena of the best-marked class of periodic disease, the intermittents. Dr. Graves is, I believe, the only physician who has made this observation, and applied it to pathology. He observed that, if this period were adopted, '*we should not count three days and a half, but seven half-days*: we would not say seven days, but fourteen half-days.' Reckoning thus, many of the anomalous critical effects, and critical terminations in continued fevers, would, I have no doubt, be found *strictly conformable to some regular law of periodicity*."

* *Lancet*, 1842-3, vol. i. p. 423.

The operation of the law we are considering may be traced also in the growth of children and young people from infancy to maturity, in the duration of the human powers, in their fullest perfection, and in their gradual decay.

Dr. Laycock divides life into *three great periods*, the first and last, each stretching over 21 years, and the central period or prime of life lasting 28 years.

The *first*, which extends from conception to full maturity at 21 years of age, he subdivides into seven distinct stages, marked by well defined physical characteristics, as follows:—

"1. Intrauterine life;
"2. The period between birth and the first dentition;
"3. The time occupied by the first dentition;
"4. The period between the first and second dentition;
"5. The time of the second dentition;
"6. The period between the latter and commencing puberty;
"7. The time occupied in the evolution of the reproductive system.

"The *second* great period will comprise three minor periods:—

"1. The perfecting of adolescence, from 21 to 28;
"2. The climax of development, or status of life, from 28 to 42; and
"3. The septenary of decline in the reproductive powers, extending from 42 to 49 (after which latter age conception rarely takes place).

"The *third* great period comprises also three minor subdivisions:

“1. The grand climacteric, from 49 to 63;
“2. Old age, from 63 to 70;
“3. The years of aetas ingravescence, or decrepitude, from 70 to death.

“In fixing these epochs,” says Dr. Laycock, “I have followed the generally received septennial division, being reluctant to make any innovation thereon. It would I think, however, be more in accordance with modern science, *to date, not from birth, but from the conception of the individual*. If this be done, each great period, should be calculated as commencing forty weeks earlier.”

The process of dentition affords also illustrations of the operation of the law of septiform periodicity in vital phenomena;* and viability, or the probability of life, is highest at 14 years of age. Dr. Laycock puts the results of his careful researches, into the five following propositions:—

“1. That there is a general law of periodicity which regulates *all* the vital movements in *all* animals.
“2. That the periods within which these movements take place admit of calculations approximately exact.
“3. That the fundamental unit,—the unit upon which these calculations should be based,—must for the present be considered as one day of twelve hours. 4. That the lesser periods are simple and compound multiples of this unit, in a numerical ratio analogous to that observed in chemical compounds.
“5. That the fundamental unit of the greater periods is *one week of seven days, each day being twelve hours*; and that single and compound *multiples* of this unit, determine the length of these periods by the same ratio, as multiples of the unit of twelve hours determine the lesser periods. *This law binds all periodic vital phenomena together, and links the periods observed in the lowest annulose animals, with those of man himself, the highest of the vertebrata*. . .”

He concludes his investigation with the following words:—

“The sure and steady course of proleptical science will be from particulars to generals, and if its foundation be firmly established on severe induction, we may hope at some future day to extend its principles to the cycles of the seasons, and to comprise within its sphere, not only individual men and women, but societies generally, and even the whole human race. The axiom that the whole is equal to the sum of all its parts, is universally true, whatever the whole may be; and there is really no reason for despairing that we shall attain to a knowledge of the whole alluded to, (a knowledge which must necessarily be derived from a knowledge of its parts,) because those parts are microscopically small to the intellect. The boundaries of astronomical science have been pushed from small and obscure beginnings, into the infinite in space, time, and number; and who can tell but that *Providence may so assist the humble inquirer into nature, that science shall be extended to the infinite in littleness*, and so man be able to look down, by the light of philosophy, upon the varied phenomena of terrestrial life—their multifarious combinations and complexities, their cycles and epicycles,—as he looks into the planetary world; and see nothing but order and simplicity where now there appears inextricable confusion.” *

* Lancet, 1842-3.

"*There is a harmony of numbers in all nature*; in the force of gravity, in the planetary movements, in the laws of heat, light, electricity, and chemical affinity, in the forms of animals and plants, in the perceptions of the mind. The direction indeed of modern natural and physical science, is towards a generalisation which shall express the fundamental laws of all, by one simple numerical ratio. We would refer to Professor Whewell's 'Philosophy of the Inductive Sciences,' and to Mr. Hay's researches into the laws of harmonious colouring and form. *From these it appears that the number seven is distinguished in the laws regulating the harmonious perception of forms, colours, and sounds*, and probably of taste also, if we could analyse our sensations of this kind with mathematical accuracy."+

+ *Med. Review*, July, 1844.

There are probably few branches of natural science from which additional facts in confirmation might not be culled. But the above may suffice, for our object is less to trace the extent of the dominion of this law, than to prove its existence in nature. The realm of entomology recognises this law, ichthyology and ornithology do the same, and the mammalia equally bear witness to its prevalence. As to man, his birth, growth, dentition, development, maturity, vital functions, reproductive system, health, disease, life and death, all his times and all his seasons, are more or less distinctly controlled by the law of completion in weeks. His very pulse keeps time to the seven day period. Dr. Stratton states (as the result of several series of observations) that in health, the human pulse is more frequent in the morning than in the evening, for six days out of seven; and that on the seventh day it is slower. *

And man's life as a whole is a week, a week of decades. "The days of our years are threescore years and ten" and that by Divine appointment. Combining the testimony of all these facts, we are bound to admit that *there prevails in organic nature a law of septiform periodicity, a law of completion in weeks*. We turn now to consider, the prevalence of the same law in Scripture.

* *Edinburgh Med, and Surgical Journal*, Jan. 1843.

Continued in Part IV. Section II. The Law of Completion In Weeks. Chapter II. The Week In Scripture.