APPARENT POINTS OF CONTACT BETWEEN THE DAILY COURSE OF THE MAGNETIC COMPONENTS OF THE EARTH TOGETHER WITH CERTAIN SOLAR ELEMENTS, AND THE DIASTOLIC PRESSURE OF HUMAN BEINGS AND THE TOTAL COUNT OF THEIR LEUCOCYTES.*

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When comparing the daily trend of the curves for the year 1932 relative to the course of the various magnetic components of the earth and that of certain solar elements, with the results obtained from the study of 4,560 readings of diastolic pressure and 808 total counts of leucocytes gathered during this period, there is at a first glance such similarity in the form, extension and duration, that we are led to believe there is an element of origin common to all of them.

The elements which form an integral part of this study in comparison are the following: First, the three magnetic components of the earth, which are: the daily and monthly march of the component of declination, the dip, and the horizontal intensity; second, the daily and monthly frequency of the sun spots; third, the calcium sun clouds; fourth, the flocculi of hydrogen in the sun, both the brilliant and the dull; fifth, the ultraviolet rays as registered at Mt. Wilson between the margins of 0.320 ultraviolet and 0.500 green; sixth, certain readings of blood pressure and its diastolic averages—readings obtained from 4,560 daily examinations of 43 individuals during the period of one year; seventh, the average obtained from 808 total leucocyte counts, verified during the same time in 15 individuals.

In order to understand this study better; let us bring to mind certain facts which are strictly essential to keep before us.

The values of terrestial magnetism, which are of special interest to us at this moment, are those obtained from the

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* Received for publication November 19th, 1934.

study of the magnetic declination, the dip and the horizontal intensity. In other words, the deviation of the magnetic needle during the day, the year, and through the centuries, counted in degrees and minutes, will give us the component of declination; again, the vertical inclination of the needle, or dip, gives us the vertical component; lastly, the representative values of both forces of declination and inclination in time and space give us the horizontal and vertical components in gamma units. Thus we have declination in degrees and minutes—that is, in distance—whilst the vertical and horizontal components in intensity are recorded in gamma units.

Graph I * shows a day's graph of these magnetic components at the Guaynabo, Puerto Rico, Station, and gives us the values for a completely normal day, June 14, 1932. The geographical position of the Guaynabo Observatory, where the data were obtained, is 18°23′ N. and 66°7′ W. Greenwich. In this chart the letters D–D represent the amplitude of declination for that day; the lower line is a fixed reference line; the one above marks the daily register of variation. In like manner the lines H–H show the horizontal component (the line below is fixed); the one above marks the oscillating value of the day. Lines Z–Z mark the vertical component; in this case the reference line is above, while the lower line shows the variations in intensity for the day. Furthermore, there is an additional line marked T, which represents the temperature of the room containing the instruments. The lower lines corresponding to the letters Z–H are crossed by smaller ones, perpendicular to them, indicating the hours of the day.

In order to establish a comparison between an average day of normal magnetic value and a stormy day, we have inserted Graph II, which shows all lines highly altered, both in extension and in intensity. This graph shows the changes during a stormy period which occurred from noon of the 29th to noon of the 30th of May, 1932—the maximum of change falling on the 29th, as can be seen at a glance.

Terrestial magnetism is receiving a great deal of attention at this time. There are forty-one observatories scattered throughout the world, all of which send their daily records to De Bilt in Holland, established as the seat of highest authority, where an international commission gathers together

* Graphs will be found in Spanish original article preceding this.

all of the data and computes average values for the whole earth, these averages being universally recognized. The disturbances represented in Graph II were the same the world over, with differences of intensity only, the same variations occurring in Australia, Alaska and Norway. The differences would be due to the meridian in which the observatory is located. The oscillations are more sharply defined in those places nearer the magnetic pole than in those farther away or nearer the equator. Consequently, since these values have such a universally recognized character, they can be taken as the basis for our observations in everything relative to time and form, with adjustments when dealing with intensity and oscillation.

The preceding statement serves as a point of departure for the comparison of the data of terrestial magnetism and of the blood examinations of the 43 individuals, covering the same period of time. We shall have to explain also certain data and other principles related to the solar factors which must be kept in mind in order to understand the second part of this study.

Let us look at Graph III which shows the average daily values of the following elements:

(*a*) The diastolic pressure.
(*b-c-d-e-f*) The various magnetic components of the earth.
(*g*) The sun spots—those scattered over the whole solar disc and the central zone mentioned above.
(*h-i*) The calcium sun clouds on both the solar disc and the central zone mentioned above.
(*j-k*) The brilliant flocculi of hydrogen in both solar zones.
(*l-m*) The dull flocculi of hydrogen found over the whole solar disc and in the central zone.

The data here have been copied from the tri-monthly reports of the International Commission of Astronomy, establish at Zürich. The values represented correspond to the month of January, 1932, and are based on daily averages. We should warn the reader at this point that, in order to weigh these values, he must take into consideration a series of details which will cause certain variations in the numerical readings of the results obtained—such as position, intensity, and synchronism, which are attributes of these solar phenomena. One must also take into account changes due to topography and atmospheric variations. For example, today there may appear a larger number of sun spots than yesterday; nevertheless, the effect which this large number of sun spots has on terrestial magnetism may be lessened because of their meridional position, or because of the solar parallel in which they may have been located on that day. These same sun spots would manifest their effect, perhaps with greater intensity, if the solar meridian in which they were located happened to coincide with that of the earth. On the other hand, we have been able to take account of the changes of a local nature, such as topography and atmospheric variations, which may modify the course of the diastolic readings in the persons examined. Lastly, and merely as a reminder, we wish to state that the sun takes twenty-seven days and a fraction to revolve around its axis. Hence, a sun spot, whose meridian may be in line today with one on earth, will require the above number of days to return to the same position; however, this new position will not exactly coincide with its terrestial parallel as it did before, due to the obliquity of the terrestial ecliptic.

Let us examine Graph III, where we may immediately observe a most astonishing similarity of form, intensity and extension for the month of January, 1932. In other words, one can see a certain synchronism in time and space between the components *a* of this figure, which indicates the daily counts of the diastolic pressure, when compared with others *b-n*, representing the magnetic and solar components. Their trends show a certain synchronism for both the numerical and linear counts. Let us examine the graphs closely (see Graph III). The average daily counts of the diastolic pressure *a* descend and continue low during the 4th, 5th, and 6th day. There is another group which decreases during the 18th, 19th, 20th, 21st and 22nd day—the lowest of all—and lastly the same trend is seen, though not so marked, during the 29th, 30th and 31st days. These three sudden descents in the average daily readings of the diastolic pressure are accompanied by those in an even more pronounced manner, in the magnetic components *b-e*. The same thing occurs in the group of the solar elements, especially in *g*, and also happens, though not so well defined and pronounced, in *h-k*, there being certain transitory discrepancies of little importance in these last when compared with the former. It is to be noted that the course of the curves of the components shown in this graph, especially of those marked with the letters *f-l-m,* one of which, *f,* corresponds to the terrestial magnetism, and *l* and *m* to the dull flocculi of hydrogen in the sun, runs inversely to the other, but in similarity of form, almost perfectly.

Graph IV represents the mean daily average of the readings of the diastolic pressure, *a,* and that of the magnetic components *b* and *c.* Graph IV is shown so that the perfect similarity which occurs during the month of January can be seen to follow, more or less, throughout the month of July. This will indicate that, with but small variations, the same occurs during all the other months of the year. Therefore, the course of the readings of the diastolic pressure followed the same course as that of the magnetic components of the earth and of certain other solar elements in the matter of form, extension and intensity, during the year 1932.

The averages of the various elements which form the total for our comparisons (see Table I in original) reveal important information.

Let us study Graph V which presents the graphs of what we show in Table I, and examine the course of the average monthly readings of the diastolic pressure as shown by *a,* and compare them with the corresponding readings of the terrestial magnetism, *b-f.* At first glance there is a notable similarity in the direction of *a-e,* and inversely of *f;* hence, we see that the curves, *a-e,* are high, and remain so during the months of January, February and March; in April the descent of all these begins, with the exception of *d,* which shows a slight rise. This general descent continues until August. In September it rises again, descending again very rapidly in November, to rise for the last time in December. The inverse course which the curve corresponding to *f* shows is as follows: Instead of ascending as the others, it descends in March; it rises in June and July, to begin descending again in August when the others are rising, remaining at a low point during the months of September and October, rising again in November and going down in December, contrary to the course of the other curves. Let us forget for one moment the magnetic components and compare the curve *a* with the curves representing the calcium clouds in the solar disc and in the central zone, *h* and *i*. We shall see how those two marked descents of April and of August, *a*, correspond to those of *h* and *i*, and how, furthermore, they coincide during the rest of the year, going up in January, February and March, descending in April, ascending in May, going down until August, rising again in September and October, descending in November and rising for a last time in December. We note that the greatest similarity is found between the curves of *a* and *h*.

For comparison of these phenomena, we should take as a basis the curve which represents the sun spots, since this is the most fundamental and important solar phenomenon. This curve is represented by *g*, and gives us the average monthly readings of the spots, scattered over the entire solar disc. The spots appear thus distributed, but the astronomers study them in two groups: those which appear over the whole disc, as in *g*, and those that are located within that hypothetical central zone, *h*, whose diameter has been arbitrarily fixed by the International Commission of Astronomy in Munich.

It is an established fact that, in most cases, the appearance and course of the sun spots are forerunners of certain terrestial phenomena. In June of 1932 there appeared on the sun (whole disc) some 22.2 spots, as an average for that month (see Graph V). In the same month there were days when some 40 were counted on the whole disc, as can be seen by the reading for the 25th; for the 21st there were some 30. The average for June was the highest for the whole year. During that month one can note the abrupt rise of the curves *g* and *p*; next to them one can see the sharp descent of the curves of the magnetic components of the earth, *b-e*, and inversely, the abrupt rise of those corresponding to *f*. On the contrary, there is only a slight rise in the readings of the diastolic pressure *a* for the month of June. There can also be seen a tendency to rise and remain high in the averages of *h-k*, especially *j*, which represents the brilliant flocculi of hydrogen for the whole solar disc. The salient facts which can be observed from the comparison of these curves, are as follows:

1. An almost complete synchronism between *a* and *h* and *i* (Diastolic pressure and solar calcium clouds.)

2. Equality (in a general sense) between *a-b-c-d-e* and *h-i-j-k* when studied together.
3. The marked descent in April in *a-k* and *m-o*.
4. A considerable low in the summer, as may be seen in *a-e* and *g-n* and *p*.
5. A general and persistent rise during October in the curves *a-e* and *g-n* and *p*.
6. An almost universal low, reached the month before, seen in the curves *a-e* and *g-n* and *p*.
7. Universal ascent in *b-c* and *e* and *g-n* and *p*.

The corresponding similarity between the course of the curves for the year 1932 and that of the readings of the diastolic pressure gathered daily from 43 individuals during that period of twelve months, shows undoubtedly certain synchronisms in distribution, extension and oscillation, which open a new field of investigation for the future. The parallels thus shown in these graphs are the expression of that harmony which exists between the astro-physical and the human world, and which, if observed through various years and carefully studied, would lead us to understand many physiological phenomena which appear today as isolated occurrences. The correlation data would show us how the former completely control the destiny of the latter. These observations are, of course, not final. For them to be so, we would have to obtain further necessary information, to appreciate fully the influence exerted by astro-physical phenomena upon human physiology.

In these studies there are still lacking such values as those relating to the annual trends for the following coefficients:

1. Electrical potential.
2. Special status of the various Kennelly strata.
3. Ionization.
4. Daily coefficient of dispersion of the emanations of the cosmic rays, gammas and infra-reds.
5. Teluric currents.

On the other hand we need further data referring to those coefficients of local origin, such as the atmospheric conditions of the day; and lastly, a more complete knowledge of those biochemical and mechanical factors which control the functions of the human heart as well as its electric reactions which generate electric energy and act as a galvanometer.

The leucocyte counts are observed to have the same variations, more or less, as those occurring in the course of the various magnetic components of the earth. The character of the curve during the summer months and its tendency to drop, especially during the month of October, may perhaps be due to the fact that the leucocyte counts were taken during the morning hours, when blood pressure lows are so frequent during these months, instead of in the afternoon. Naturally, the curve for these counts is not so noticeable as that of the diastolic pressure readings.

RÉSUMÉ

These observations have been made merely for the purpose of awakening interest in others towards gathering further data. A longer and more intensive period of observation might reveal the same similarity and parallelism as obtained through only one year's work, and one might discover whether these would prevail year after year, or whether my observations have been a mere coincidence chanced upon in my range of study.

Yet there is no doubt in my mind that such correlation exists between the physiological world and astro-physical phenomena. But there must be determined the numberless collateral observations necessary to prove a perfect parallelism which will have the same cause and effect. One must determine first whether there is an individual similarity between all the phenomena; second, whether there is dissimilarity between some; third, one must determine what influence changing values of some exert upon the rest; and lastly, one must point out whether one or more are the causes, and if they are working together, and to show whether the physiological phenomenon called life is an incomplete phenomenon of transition, not yet definitely established in the chemistry of the universe.