ἐσχάτως (1958) Γαλλιστὶ ὑπὸ τοῦ κ. Σταματ. Καρατζᾶ (διδάσκει ἐν τῷ Πανεπιστημίῳ τοῦ Ἁμβούργου), ἀξιόλογον βιβλίον βραβευθὲν ἐν Παρισίοις, ὑπὸ τὸν τίτλον: L' origine des dialectes Néo-grecs de l' 'Italie méridionale, τὸ ὁποῖον ἔτυχε πολλῶν εὐνοϊκῶν κριτικῶν[1].

Συγχαίρομεν καὶ εὐγνωμονοῦμεν τοὺς Ἰταλοὺς λογίους Rossi Taibbi καὶ Caracausi καὶ τὸν γνωστὸν καὶ φίλον τῆς Ἑλλάδος καθηγητὴν Bruno Lavagnini διὰ τὴν πολύτιμον συμβολήν των εἰς μελέτην τῆς διαλέκτου ταύτης, ἥτις, ὡς ἐλέχθη, παρουσιάζει ὅλως διόλου πρωτότυπον ἀπὸ γλωσσικῆς ἀπόψεως ἐνδιαφέρον καὶ μεγάλην ὡς ἐκ τούτου γλωσσολογικὴν καὶ ἱστορικὴν σπουδαιότητα.

ΑΝΑΚΟΙΝΩΣΕΙΣ ΜΕΛΩΝ

ΑΣΤΡΟΝΟΜΙΑ.— **The sunspots areas and the Wolf Numbers. A study on the analytical relations given by J. Xanthakis and J. Mergentaler,** *by J. Xanthakis and G. Banos**.

INTRODUCTION.

It is known that different investigators tried to establish a satisfactory analytical relation connecting the mean values [A] of the daily sunspots areas for each year (umbra + penumbra) with the corresponding Wolf Numbers [R].

M. Waldmeier (1) gave the linear relation $[A] = 16{,}7\,[R]$ from which it results that the ratio $[q] = \frac{[A]}{[R]} = 16{,}7$ is constant. W. Gleissberg (2) and J. Xanthakis (3) have shown on the contrary that [q] varies from minimum to maximum of each sunspot cycle, its mean value being much more smaller than 16,7. Moreover the amplitude of variation of [q] is greater when it is studied as a function of [A] rather than as a function of [R]. This, in conclusion, means that the area corresponding to each sunspot is greater on the average during the maximum; in other words, the characteristic

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[1] Ὅπως τοῦ Καθηγητοῦ Rohlfs (B.Z., τόμ. 1959 σελ. 99-104), τοῦ Καθηγητοῦ Νικ. Τωμαδάκη (Ἀθηνᾶ, τόμ. 62) καὶ τοῦ Καθηγητοῦ Στυλ. Καψωμένου (Deutsche Literaturzeitung, Heft 10, Ὀκτώβριος 1960) Καὶ εἰς τὰς τρεῖς αὐτὰς βιβλιογραφίας εὑρίσκει ὁ ἐνδιαφερόμενος ἄφθονον βιβλιογραφικὸν ὑλικὸν σχετικῶς μὲ τὸ ἀνωτέρω ζήτημα

* ΙΩΑΝΝ. ΞΑΝΘΑΚΗ καὶ Γ. ΜΠΑΝΟΥ, Τὰ ἐμβαδὰ τῶν ἡλιακῶν κηλίδων καὶ οἱ ἀριθμοὶ Wolf.

of the maximum is not only the increase of the number of sunspots, but also the increase of their average area.

New analytical relations between the sunspots areas and the corresponding Wolf numbers have been given recently by J. Xanthakis and J. Mergentaler (4). In the first part of this paper a comparative study on these relations is given; in the second part an effort is made to explain the great differences arising in some years between the ratio [q] resulting from observational data and the relations given by J. Xanthakis.

COMPARISON OF THE RELATIONS GIVEN BY J. XANTHAKIS AND J. MERGENTALER

J. Xanthakis (2) expressed the ratio $[q]=\frac{[A]}{[R]}$ as a function of the time of rise with the help of the following relations:

(a) for the cycles Nr. 12 - 14 and 16 - 18 (Zürich numeration)

$$\left.\begin{aligned} [q] &= 12.11 + 5.31 \ \cos^2 K \frac{\pi}{2T_R} \quad \text{before maximum} \\ [q] &= 12.11 + 5.31 \ \cos^2 K \frac{\pi}{2(11-T_R)} \quad \text{after maximum} \end{aligned}\right\} \qquad (1)$$

(b) for the peculiar cycle Nr. 15

$$\left.\begin{aligned} [q] &= 17.4 - 3.5 \ \cos^2 K \frac{\pi}{2T_R} \quad \text{before maximum} \\ [q] &= 17.4 - 3.5 \ \cos^2 K \frac{\pi}{2(11-T_R)} \quad \text{after maximum} \end{aligned}\right\} \qquad (11)$$

where T_R is the time of rise for the corresponding cycle, $K=0$ for the year of maximum and $K=1, 2, 3, \ldots$ for the years first, second, third,... preceding or following the year of the maximum.

J. Mergentaler on the other hand gave the relation,

$$x = a + by + c \sin\theta$$

where $x = [A]$, $y = [R]$, $\theta = \frac{t - t_0}{T} \cdot 360°$,

t_0 is the beginning of the cycle, t a given time and T the period of the same cycle.

In some of the cycles J. Mergentaler substitutes $\sin\theta$ in the above relations with $\cos\theta$ or $\cos(2\theta)$.

The constants a, b and c for the sunspot cycles concerned are given in Table I.

TABLE I.

cycle	a	b	c
XII	− 73 ± 65	+ 17.3R ± 1.4	− 48 sinθ = A ± 39
XIII	− 52 ± 41	+ 17.0 ± 0.8	+ 27 sinθ = A ± 30
XIV	− 108 ± 88	+ 18.1 ± 2.0	− 19 sinθ = A ± 49
XV	+ 31 ± 41	+ 14.2 ± 0.7	− 49 sinθ = A ± 28
XVI	− 291 ± 151	+ 24.4 ± 3.6	+ 216 cosθ = A ± 134
XVII	− 48 ± 75	+ 17.7 ± 1.0	+ 126 cos (2θ) = A ± 49
XVIII	− 437 ± 202	+ 22.3 ± 2.9	+ 436 cosθ = A ± 221

At first sight the relations given by J. Xanthakis and J. Mergentaler show the following differences:

(a) J. Xanthakis uses in his relations two constants only, whereas J. Mergentaler's relation contains three constants.

(b) Xanthakis' relations (I) can be of a general application i.e. they are valid for any cycle, but the peculiar cycle Nr. 15, for which relations (II) must be applied. In Mergentaler's relation on the contrary the values of the constants a, b, c change from cycle to cycle.

(c) The observed values of [q] corresponding to the maxima of the cycles Nr. 12 - 13 and 16 - 18, considered here, are nearly the same. In this way Xanthakis by taking the maximum value of his periodic term at maximum can use the same amplitude of this term for all these cycles. Mergentaler on the contrary takes the fixed point of his periodic term at the minimum; in this way the minimum falls in each cycle in different phase and for this reason he cannot have the same amplitude of this term in all the cycles.

(d) Another basic difference is that Xanthakis uses different relations for the ascending and the descending branches of each cycle, so that the different slopes of these branches can be taken into account. Mergentaler on the contrary uses the same relation for both branches in each cycle, with the result that, in spite of the fact that he uses different constants, these constants cannot be determined accurately, the mean error exceeding in one case the value ±200%. This results also to the fact that Mergentaler's relation gives in some cases negative values for the ratio [q].

In order to compare the accuracy given by both relations Table II has been computed. In this table,

Column 1 shows the observing year
» 2 » » ratio $[q]_{obs} = [A]_{obs} / [R]_{obs}$
» 3 » » ratio $[q]_{cal}$ by Xanthakis
» 4 » » difference $[q]_{obs} - [q]_{cal}$
» 5 » » ratio $[q']_{cal}$ by Mergentaler
» 6 » » difference $[q]_{obs} - [q']_{cal}$

The standard deviation of $[q]_{obs} - [q]_{cal}$ was computed for the two cases and was found to be $\sigma = 2.01$ for the relations given by Xanthakis and $\sigma' = 2.72$ for the relations given by Mergentaler; in the Mergentaler's case, the negative values of [q'] have not been taken into consideration.

Fig. I gives the differences $[q]_{obs} - [q]_{cal}$ (Xanthakis) and $[q]_{obs} - [q']_{cal}$ (Mergentaler) for the year of maximum as well as for the years preceding and following the year of maximum for all the cycles considered here From this figure we see that, at maximum, the analytical relations established by Xanthakis allow a higher accuracy for the ratio [q] than those established by Mergentaler. For two or three years preceding or following the maximum, the analytical relations given by both authors allow almost the same accuracy for the ratio [q], while for the remaining years the accuracy of the Xanthakis' relations is by far superior.

The above results are clearly shown in Table III where the mean values of the differences $[q]_{obs} - [q]_{cal}$ for each year before and after the maximum of solar activity are given.

TABLE II

1	2	3	4	5	6
Year	$[q]_{obs}$	$[q]_{cal}$	$[q]_{obs} - [q]_{cal}$	$[q']_{cal}$	$[q]_{obs} - [q']_{cal}$
1880	13.7	14.3	− 0.6	13.6	+ 0.1
1	12.5	15.8	− 3.3	15.1	− 2.6
2	16.8	17.0	− 0.2	15.5	+ 1.3
3 Max	18.1	17.4	+ 0.7	16.1	+ 2.0
4	17.8	17.0	+ 0.8	16.5	+ 1.3
5	15.5	15.9	− 0.4	16.7	− 1.2
6	15.0	14.5	+ 0.5	16.3	− 1.3
7	13.7	13.1	+ 0.6	14.5	− 0.8
8	13.1	12.3	+ 0.8	8.3	+ 4.8
9 Min	12.4	12.2	+ 0.2	8.7	+ 3.7
1890	13.9	13.6	+ 0.3	11.5	+ 2.4
1	16.0	15.3	+ 0.7	16.2	− 0.2
2	16.6	16.8	− 0.2	16.6	0.0
3 Max	17.2	17.4	− 0.2	16.7	+ 0.5
4	16.4	17.1	− 0.7	16.5	− 0.1
5	15.2	16.2	− 1.0	16.2	− 1.0
6	13.0	15.0	− 2.0	15.5	− 2.5
7	19.6	13.7	+ 5.9	14.2	+ 5.4
8	14.1	12.7	+ 1.4	14.0	+ 0.1
9	9.2	12.2	− 3.0	10.7	− 1.5
1900	7.9	12.2	− 4.3	9.8	− 1.9
1 Min	10.7	12.3	− 1.6	− 21.9	
2	12.4	12.3	+ 0.1	− 5.4	
3	14.3	13.3	+ 1.0	13.0	+ 1.3
4	11.7	14.6	− 2.9	15.1	− 3.4
5	18.8	16.0	+ 2.8	16.1	+ 2.7
6	14.5	17.0	− 2.5	15.9	− 1.4
7 Max	17.5	17.4	+ 0.1	16.3	+ 1.2
8	14.4	17.0	− 2.6	16.1	− 1.7
9	15.8	15.7	+ 0.1	16.0	− 0.2
1910	14.2	14.1	+ 0.1	13.3	+ 0.9
1	11.4	12.8	− 1.4	2.1	+ 9.3
2	10.3	12.1	− 1.8	− 9.0	
3 Min	5.0	—	—	—	
4	15.8	16.8	− 1.0	14.4	+ 1.4
5	14.7	15.5	− 0.8	13.9	+ 0.8
6	12.7	14.4	− 1.7	13.9	− 1.2

1	2	3	4	5	6
Year	$[q]_{obs}$	$[q]_{cal}$	$[q]_{obs} - [q]_{cal}$	$[q']_{cal}$	$[q]_{obs} - [q']_{cal}$
1917 Max	14.8	13.9	+ 0.9	14.2	+ 0.6
8	13.9	14.1	— 0.2	14.6	— 0.7
9	16.5	14.6	+ 1.9	15.2	+ 1.3
1920	16.4	15.3	+ 1.1	16.3	+ 0.1
1	16.1	16.1	0.0	17.1	— 1.0
2	17.7	16.8	+ 0.9	18.0	— 0.3
3 Min	9.5	12.3	— 2.8	11.5	— 2.0
4	16.5	13.0	+ 3.5	17.7	— 1.2
5	18.7	14.0	+ 4.7	19.6	— 0.9
6	19.7	15.3	+ 4.4	19.1	+ 0.6
7	15.3	16.4	— 1.1	17.9	— 2.6
8 Max	17.9	17.4	+ 0.5	17.9	0.0
9	19.1	16.8	+ 2.3	16.9	+ 2.2
1930	14.5	14.9	— 0.4	13.2	+ 1.3
1	13.0	13.1	— 0.1	11.4	+ 1.6
2	14.7	12.0	+ 2.7	10.3	+ 4.4
3 Min,	15.5	12.6	+ 2.9	31.4	— 15.9
4	13.7	12.8	+ 0.9	17.7	— 4.0
5	17.3	14.7	+ 2.6	13.9	+ 3.4
6	14.2	16.6	— 2.4	15.7	— 1.5
7 Max	18.1	17.4	+ 0.7	17.3	+ 0.8
8	18.4	17.2	+ 1.2	17.4	+ 1.0
9	17.8	16.5	+ 1.3	18.2	— 0.4
1940	15.3	15.4	— 0.1	16.3	— 1.0
1	13.9	14.2	— 0.3	14.0	— 0.1
2	13.8	13.2	+ 0.6	14.4	— 0.6
3	18.1	12.4	+ 5.7	20.0	— 1.9
4 Min	13.1	12.1	+ 1.0	22.2	— 9.1
5	12.9	12.3	+ 0.6	19.7	— 6.8
6	19.6	16.2	+ 3.4	18.9	+ 0.7
7 Max	17.4	17.4	0.0	18.4	— 1.0
8	14.5	17.2	— 2.7	16.4	— 1.9
9	15.8	16.6	— 0.8	15.8	0.0
1950	14.6	15.7	— 1.1	13.2	+ 1.4
1	16.4	14.7	+ 1.7	14.8	+ 1.6
2	12.8	13.4	— 0.6	14.3	— 1.5
3	10.5	12.8	— 2.3	18.7	— 8.2
4 Min	8.0	12.3	— 4.3		

TABLE III.

	−5	−4	−3	−2	−1	MAX	+1	+2	+3	+4	+5	+6	+7	+8
MERGENTALER	2.0	3.1	3.0	2.4	1.2	0.9	1.3	0.8	1.3	3.2	1.5	3.5	5.5	
XANTHAKIS	1.5	1.9	1.6	2 2	1 6	0.4	1.5	0.8	0.7	1.8	1.3	2.8	3.2	1.6

In computing the above table, the great values of $|[q]_{obs} - [q']_{cal}|$ resulting from great negative values of [q'] in the Mergentaler's relations, have been again omitted.

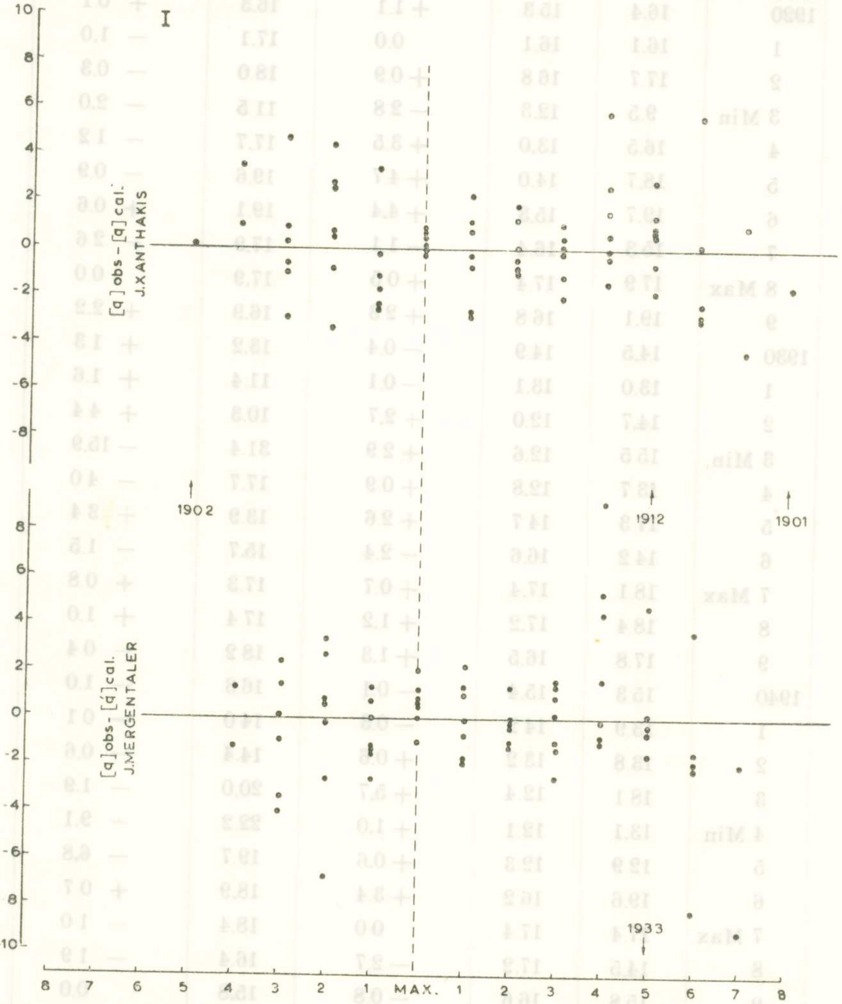

Fig. 1. Differences $[q]_{obs}$ - $[q]_{cal}$ for each year of the cycles Nr. 12-18 except cycles 15. Arrows show great values of $[q]_{obs}$ - $[q']_{cal}$ for the reported years.

It results from the above that the accuracy of Xanthakis' analytical relations is notably superior than that given by the Mergentaler's relations.

Table III shows that the mean deviations $|[q]_{obs} - [q]_{cal}$ increase from the maximum to the minimum of solar activity (this is roughly shown in the figure).

This increase is due to two reasons:

First: in case that [A] and [R] contain some error, the influence of such an error on the ratio [q] is much greater near minimum than at maximum. As a matter of fact, if we represent by d [A] and d [R] the error of observation on [A] and [R] respectively and by d [q] the error corresponding to the ratio [q], we obtain from the relation $[q] = \frac{[A]}{[R]}$

$$d\,[q] = \frac{1}{[R]} \left\{ d\,[A] - \frac{[A]}{[R]}\, d\,[R] \right\}$$

Thus, near maximum we have approximately average $[A] = 1500$ and $[R] = 90$. Supposing, therefore, that $d\,[A] = \pm 20$ and $d\,[R] = \pm 2$ we obtain $d\,[q] = \pm 0.59$. On the other hand we have near minimum average $[A] = 80$ and $[R] = 7$. Taking $d\,[A] = \pm 10$ and $d\,[R] = \pm 0.5$ (error values smaller than those of maximum) we obtain $d\,[q] = \pm 2.24$.

Consequently, an error ± 20 in the areas [A] and ± 2 in the Wolf Number [R] near maximum has no influence on the ratio [q], while smaller errors near minimum can change it by ± 2 units.

Second: near minimum, there are mainly small sunspot groups either of the A and B types, i.e. groups with small [A] with respect to [R], or groups of the J type, i.e. groups with great [A] with respect to [R]. Thus, the ratio $[q]_{obs}$ becomes very sensible.

INTERPRETATION OF SOME IRREGULARITIES IN THE XANTHAKIS' RELATIONS.

In the above mentioned Xanthakis' paper (3) as well as in Table II it is shown that for all cycles the ratio [q] for the year of maximum is greater than that for the remaining years, i.e. $[q] < [q]_{max}$ except for the cycle 15 (max. 1917) for which is valid for the years 1917 and 1918 only, while for the remaining years of the cycle it is $[q] > [q]_{max}$. This irregularity is exactly the peculiarity of the cycle and led to the formulation of the relations II for this cycle.

There is, nevertheless, disagreement in some years of the other cycles which are reported in the following Table IV,

TABLE IV.

Cycle	Year	[q]	$[q]_{max}$
13	1897	19.6	17.2
14	1905	18.8	17.5
16	1925	18.7	17.9
16	1926	19.7	17.9
18	1946	19.6	17.4

This is obviously due to the fact that during these years the areas of the sunspots are proportionly greater than the Wolf numbers; this is not the case with the corresponding years of maximum; in other words, in the ratio $[q] = \frac{[A]}{[R]}$, the term [A] is excessively increasing with respect to [R]. Observation during these years should have recorded a high percentage of sunspots groups with small number of spots per group and large areas. We tried to verify this point by checking the types of sun spots groups for the years concerned, according to the relative data given by the Federal Observatory - Zürich. This could be done only for the years 1926 on; data covering the types of groups prior to this period, are not available.

For securing the above verification it is necessary to have the groups classified with respect to their influence on the numerator [A] or the denominator [R] of the ratio

$$[q] = \frac{[A]}{[R]} = \frac{A}{10\,g + f}$$

We remark that in the case of groups of the A and B types and mainly of the A type, the factor g is greatly increasing and consequently [R] increases with respect to [A], their influence on f being negligible; it results from the above that with a strong percentage of such groups a small value of [q] should be expected and vice versa, a small value of [q] involves a strong percentage of such groups.

On the contrary, with groups of the J type, [A] is greatly increasing with respect to g and f and the result inverted.

Groups of the C, D, G and H types affect [A] more than [R] but in a minor scale than in the case of J type groups; this because in the last case [R] is considerably affected by the increased value of f.

Groups of the E and F types allow great values of [A]; but their great number f of spots involves equally great values of [R]. It can, therefore, be said that [q] is very slightly affected.

We are further studying the influence of the A and B types taken together as well as that of the C, D, G, H types taken together; the study of the influence of each individual type leads to the same results.

It results from the above that for the years 1926 and 1946 showing an important disagreement, we should expect a high percentage of mainly J type groups and a low percentage of mainly A as well as B types groups. As a matter of fact this is clearly shown by Table V, giving the percentage of the different types of groups. In the calculations have been taken in consideration the types the most prevalent during the evolution of the groups.

Table V shows that in 1926 was recorded the highest percentage of J type groups and one of the lowest percentages of the A + B types; in 1928, by maximum solar activity, the percentage of J type groups is reduced by 125 °/₀ approx. with respect to that of 1926, while for the A + B types it is increased by 12 °/₀ approx. A slight increase is also noted of the percentage of the C + D + G + H types.

On the contrary, with regard to the 1937 maximum which does not show any irregularity, we note a high percentage of J and C + D + G + H types in connection with neighbouring years, and a low percentage of A + B types.

THE DIFFERENCES $[q]_{obs} - [q]_{cal}$ AND THE TYPES OF GROUPS.

On the basis of the types of groups we may have an explanation of the differences $[q]_{obs} - [q]_{cal}$.

On this purpose we establish a function of distribution of the different types of groups as per following relation:

$$f = Q - a + 2b + C_1 \qquad \text{(III)}$$

where: $Q = C + D + G + H + J$

$a = A + B$

$b = E + F$

and $C_1 =$ a constant

and considering $Q + a + b = 100$

$f = 100 - 2a + b + C_1$ or by introducing $100 + C_1 = C_2$

$$f = C_2 - 2a + b$$

TABLE V.

1	2	3	4	5	6	7	8	9	10	11	12	13
Year	A	B	A+B	C	D	G	H	C+D+ +G+H	E	F	J	f
1926	28.32	21.86	50.18	17.92	10.75	—	4.30	32.97	7.53	0.72	8.60	+ 7.9
7	27.82	26.17	53.99	14.32	14.60	0.28	6.06	35.26	4.68	—	6.06	— 3.3
8	35.21	20.85	56.06	12.11	9.30	1.13	8.17	30.71	8.73	1.40	3.10	— 2.0
9	34.02	20.27	54.29	15.46	12.71	0.69	4.12	32.98	8.25	—	4.47	— 0.3
1930	35.93	22.51	58.44	16.02	9.09	0.43	2.60	28.14	5.19	0.86	7.36	— 10.8
1	35.76	27.01	57.77	14.60	10.22	1.46	2.19	28.47	3.65	—	5.11	— 11.9
2	28.40	39.77	68.17	11.36	1.14	—	5.68	18.18	6.81	—	6.81	— 4.5
3	27.27	24.24	51.51	15.15	15.15	3.03	3.03	36.36	6.06	—	6.06	+ 28.4
4	36.76	32.35	69.11	13.23	5.88	1.47	2.94	23.52	2.94	—	4.41	— 10.3
5	28.88	20.32	49.20	17.65	9.63	—	6.95	34.23	10.16	0.53	5.88	+ 12.3
6	33.79	26.16	59.95	12.47	12.47	0.24	0.49	25.67	5.62	0.73	7.82	— 13.5
7	31.35	23.76	55.11	15.35	12.21	—	2.81	30.37	6.60	0.66	7.26	— 3.0
8	36.29	20.08	56.37	9.85	8.49	3.86	6.76	28.96	6.18	1.93	6.56	— 4.6
9	35.41	16.31	51.72	9.44	7.73	2.58	7.73	27.48	9.87	2.36	8.58	+ 8.8
1940	38.44	13.87	52.31	7.80	13.58	2.31	4.62	28.31	10.11	1.16	8.09	+ 6.7
1	35.34	16.86	52.20	6.83	17.27	2.41	4.82	31.33	8.03	1.20	7.25	+ 4.8
2	36.84	14.04	50.88	7.60	16.96	3.51	5.85	33.86	8.19	2.34	4.68	+ 8.8
3	32.55	20.93	53.48	11.63	8.14	3.49	6.98	30.24	5.81	4.65	5.81	+ 3.5
4	39.24	22.78	62.02	11.39	12.66	1.27	5.06	30.38	3.80	1.27	2.53	+ 6.0
5	44.50	5.74	50.24	13.40	14.83	2.87	4.31	35.41	6.70	1.91	5.74	+ 8.1
6	43.04	5.22	48.26	12.39	17.83	2.61	5.43	38.26	5.43	1.52	6.52	+ 10.4
7	42.83	10.97	53.80	12.13	14.87	2.85	0.84	30.64	8.65	1.16	5.70	+ 2.2
8	38.15	12.72	50.87	13.79	19.28	2.68	1.07	36.82	5.89	1.87	4.55	+ 6.0
9	39.38	18.02	57.40	14.80	9.65	2.57	1.03	28.05	10.68	1.16	2.70	— 3.0
1950	46.90	13.17	60.07	14.37	8.78	0.60	1.40	25.15	8.58	1.00	5.19	— 10.6
1	49.72	14.72	64.44	12.78	7.50	1.67	1.11	23.76	7.78	0.56	6.94	+ 4.5
2	59.01	9.43	68.44	10.25	7.79	1.64	1.64	21.32	4.92	—	5.33	— 7.0
3	57.57	13.13	70.70	11.11	9.09	—	—	20.20	3.03	—	6.06	— 13.4
4	66.67	14.04	80.71	5.26	8.77	—	—	14.03	1.75	—	3.51	— 34.7
5	36.80	17.75	54.55	14.28	14.28	1.30	2.60	32.46	5.63	0.43	6.93	—

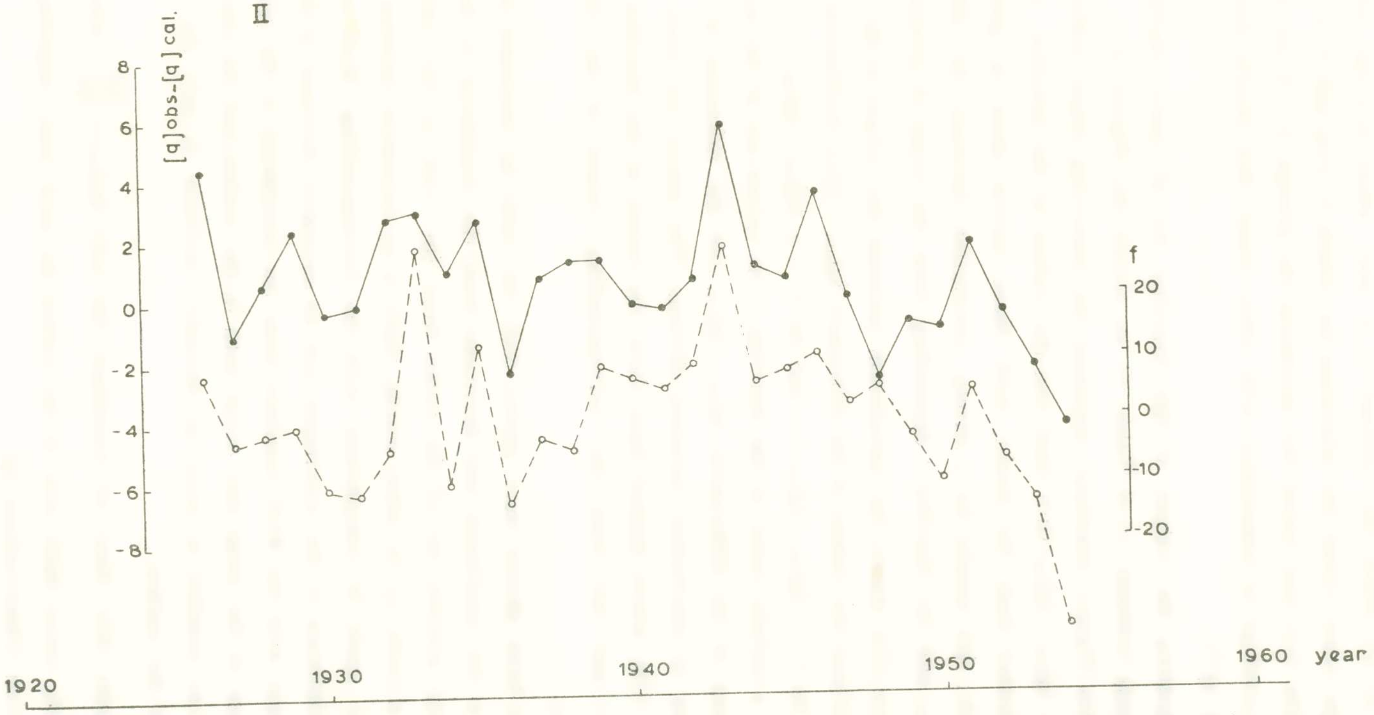

Fig. II.— March of the difference $[q]_{obs}$ - $[q]_{cal}$ (full line) and the function f (dotted line) depending from the types of groups. Abscissae show the years.

For all the years, the constant C_1 is zero, when $C_2=100$ with exception of the years round the minimum for which $C_1=25$ and $C_2=125$. This is due to the fact that round the minimum the groups $A+B$ are increased by 12,5% average in connection with other years; this results into increasing 2a by 25%.

Computing the values of this function for all years, starting from 1926 till 1955 (column 13 of Table V) we obtain the Figure II.

In this Figure, abscissae represent the observing years, ordinates the differences $[q]_{obs}-[q]_{cal}$ (full line) and the values of the function of distribution f (dotted line). No doubt, both these curves show in general the same march; this speaks for a strong correlation between the differences $[q]_{obs}-[q]_{cal}$ and the function f depending from the types of groups.

Figure IIIa shows the correlation between the values of the function f (abscissae) and the values of the difference $[q]_{obs}-[q]_{cal}$ (ordinates). We remark that for $f>7$, $[q]_{obs}-[q]_{cal}>0$ and for $f<-7$, $[q]_{obs}-[q]_{cal}<0$, i.e. above and below a certain value of the function f, its values are of the same sign as the values of the differences $[q]_{obs}-[q]_{cal}$ and the influence of the type of the spots, in conclusion, becomes obvious. The above, are more evident on Figure IIIb, where dashed lines show the values of the function f greater than 7 and full lines the corresponding values of the difference $[q]_{obs}-[q]_{cal}$.

It has been shown here above, that the ratio [q] increases from the minimum to the maximum and decreases from the maximum to the minimum of solar activity, for all the cycles from the 12th to the 18th, with exception of cycle 15. In other words, there is an excessive increase of the areas of the spots in comparison with the corresponding Wolf numbers from the minimum to the maximnm and an excessive decrease of the areas in comparison with the Wolf numbers from the maximum to the minimum. This increase of the areas may occur both in the umbra and the penumbra; it is, however, possible to occur an excessive increase in only the penumbra and not the umbra.

To make this clear, we examined the ratio $[q_u]_{obs}=\frac{[u]}{[R]}$ where [u] represents the mean daily area of the umbra for each year, resulting from the Greenwich Observations (5).

Figure IV shows the variation of the ratio $[q_u]_{obs}$ for each cycle from

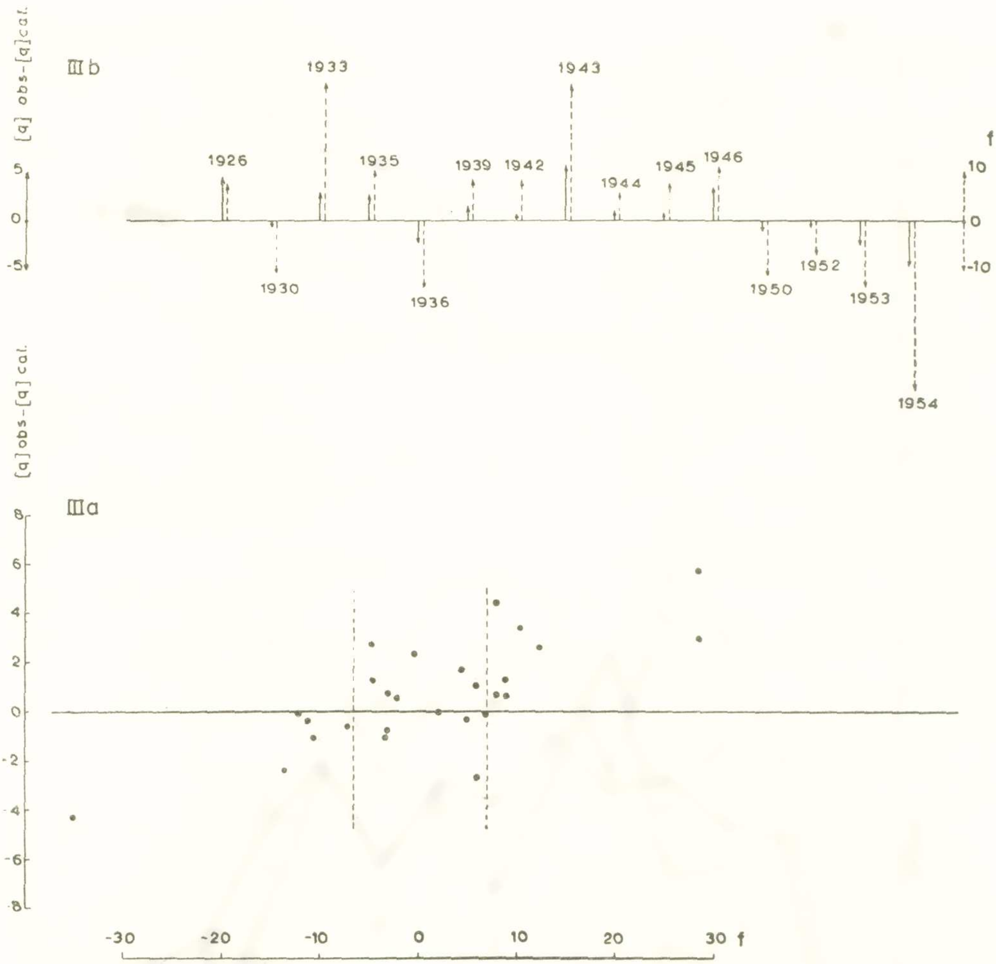

Fig. IIIa and IIIb.— Correlation between the values of the difference $[q]_{obs} - [q]_{cal}$ (ordinates) and the function f (abscissae) depending from the types of spots.

the 12th to the 18th (separately for the 15th) as well as the mean variation of same (full line); it results therefrom that the ratio $[q_u]_{obs}$ follows about the same march as the ratio $[q]_{obs}$.

CONCLUSION.

It results from the above the following:

a) The analytical relations established by Xanthakis, are considerably superior to those established by Mergentaler, as regards accuracy and simplicity.

IV

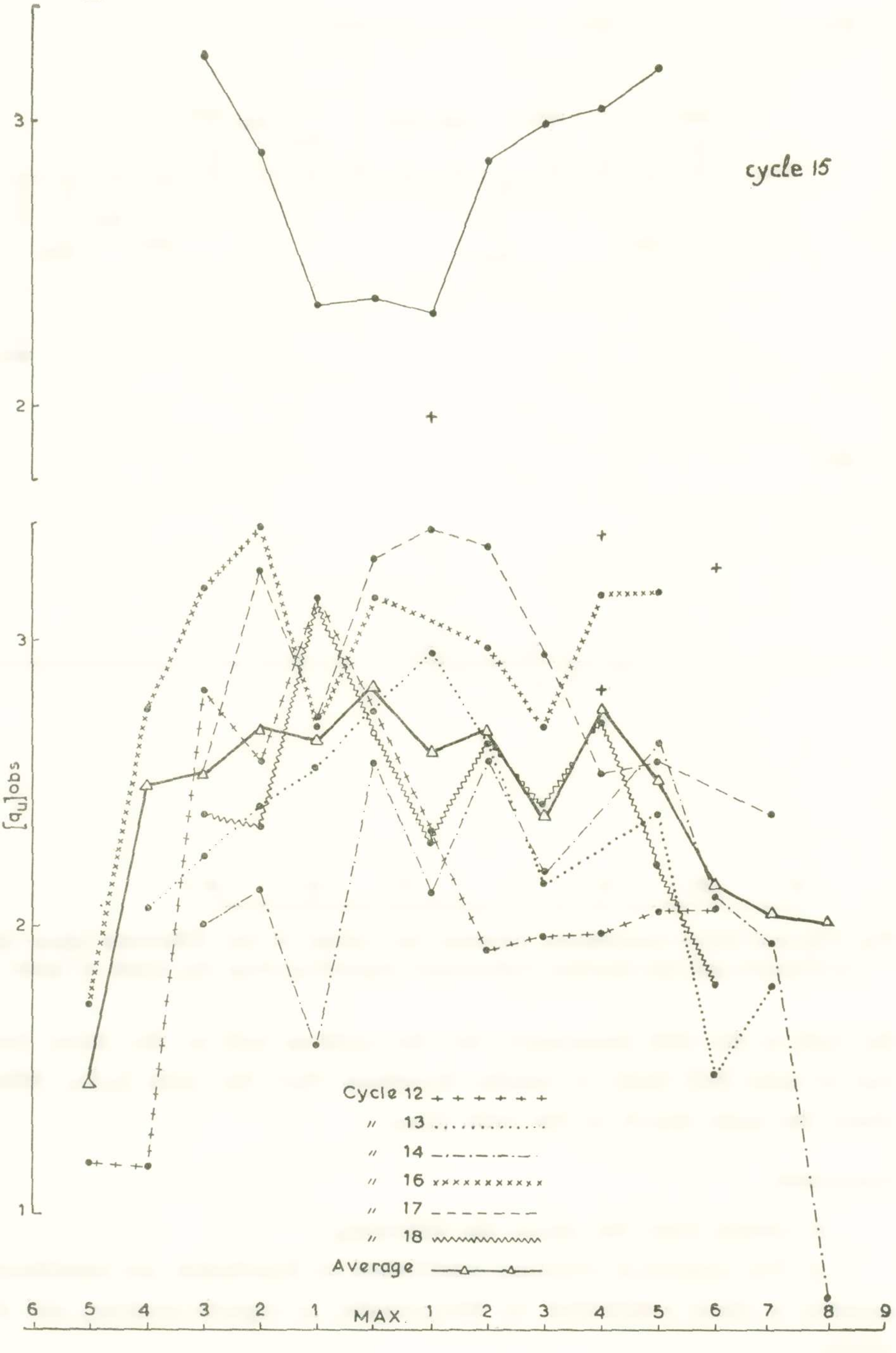

Fig. IV.— Variation of the ratio $[q_u]_{obs}$ for the years of the cycles 12-18. Full line represents the mean variation, while crosses represent irregular values of $[q_u]_{obs}$.

b) Some irregularities of the ratio $[q]$ can be explained if the types of groups are taken in consideration. The irregularity of cycle 15, could eventually be explained in the same way. Unfortunately, data covering the types of groups for this cyele, are missing.

c) There is a strong correlation between the differences $[q]_{obs}-[q]_{cal}$ and the function f established as above, depending from the types of the groups.

d) The ratios $[q]_{obs}$ and $[q_u] = \frac{[u]}{[R]}$, where $[u]$ denotes the mean daily area of the umbra for each year, increases from the minimum to the maximum and decreases from the maximum to the minimum for all sunspot cycles Nr. 12-18 but cycle Nr. 15 for which the opposite march is observed.

ACKNOWLEDGEMENT:

It is pleasure to acknowlege the assistance of Mr. D. P. Elias of the Nation. Observatory of Athens, who prepared for us the data covering the frequency of the types of sunspot groups for the period concerned.

ΠΕΡΙΛΗΨΙΣ

Εἰς τὸ πρῶτον μέρος τῆς παρούσης ἐργασίας μελετῶνται αἱ ἀναλυτικαὶ σχέσεις τῶν J. Mergentaler καὶ Ἰωάνν. Ξανθάκη αἱ ὁποῖαι συνδέουν τὰ ἐμβαδὰ τῶν ἡλιακῶν κηλίδων (ἐτήσιαι τιμαὶ) μετὰ τῶν ἀντιστοίχων ἀριθμῶν Wolf καὶ ἀποδεικνύεται ὅτι αἱ ἀναλυτικαὶ σχέσεις Ἰ. Ξανθάκη ὑπερτεροῦν σημαντικῶς τόσον ἀπὸ ἀπόψεως ἁπλότητος ὅσον καὶ ἀκριβείας.

Εἰς τὸ δεύτερον μέρος δεικνύεται ὅτι ὡρισμέναι αἰσθηταὶ διαφοραί, αἱ ὁποῖαι παρατηροῦνται εἴς τινας περιπτώσεις μεταξὺ τῶν τιμῶν τοῦ λόγου $[q]=\frac{[A]}{[R]}$ (ἔνθα $[A]$ εἶναι ἡ ἐτησία τιμὴ τοῦ ἐμβαδοῦ τῶν κηλίδων καὶ $[R]$ ὁ ἀντίστοιχος παρατηρηθεὶς ἀριθμὸς Wolf) τῶν διδομένων ἐκ τῶν ἀναλυτικῶν σχέσεων Ἰωάνν. Ξανθάκη καὶ τῆς παρατηρήσεως, εἶναι δυνατὸν νὰ ἑρμηνευθοῦν, ἐὰν ληφθοῦν ὑπ᾽ ὄψιν οἱ τύποι τῶν ὁμάδων τῶν κηλίδων. Ὁμοίως δεικνύεται ὅτι ὑφίσταται μία ἰσχυρὰ συσχέτισις μεταξὺ τῶν διαφορῶν τῶν τιμῶν ὑπολογισμοῦ καὶ παρατηρήσεως τοῦ λόγου $[q]$ καὶ μιᾶς συναρτήσεως f ἐξαρτωμένης ἐκ τοῦ ποσοστοῦ τῶν τύπων τῶν ὁμάδων. Τέλος εὑρίσκεται ὅτι ὁ λόγος $[q_u]=\frac{[u]}{[R]}$, ἔνθα $[u]$ εἶναι τὰ ἐμβαδὰ τῶν πυρήνων τῶν κηλίδων (ἐτήσιαι τιμαὶ) καὶ $[R]$ οἱ ἀντίστοιχοι ἀριθμοὶ Wolf, αὐξάνει ἐκ τοῦ ἐλαχίστου πρὸς τὸ μέγιστον καὶ ἐλαττοῦται ἐκ τοῦ μεγίστου πρὸς τὸ ἐλάχιστον.

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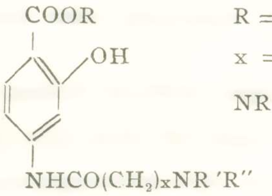
ΑΝΑΚΟΙΝΩΣΕΙΣ ΜΗ ΜΕΛΩΝ

ΦΑΡΜΑΚΕΥΤΙΚΗ ΧΗΜΕΙΑ. – Τοπικὰ ἀναισθητικά. Σύνθεσις π-(Ν-ἀλκυλαμινοακυλαμινο)-σαλικυλικῶν ἐστέρων. ΙΙ. Παράγωγα τῆς ὀξυκαΐνης[*], *ὑπὸ* ***Γ. Τσατσᾶ, Κ. Σάνδρη*** *καὶ* ***Δ. Κοντονάσιου***[**]. Ἀνεκοινώθη ὑπὸ τοῦ Ἀκαδημαϊκοῦ κ. Ἐμμ. Ἐμμανουήλ.

Εἰς προηγουμένην ἐργασίαν, ἥτις ἀποτελεῖ τὸ πρῶτον μέρος τῆς σειρᾶς αὐτῆς (1), ἀνεφέρθη ἡ σύνθεσις π-(Ν-ἀλκυλαμινοακυλαμινο)-σαλικυλικῶν ἐστέρων τοῦ γενικοῦ τύπου Α. Ἡ φαρμακολογικὴ ἐξέτασις, τῆς ὁποίας τὰ ἀποτελέσματα θὰ ἀνακοινωθοῦν προσεχῶς, ἔδειξεν ὅτι ὡρισμένοι ἐκ τῶν ἐστέρων τούτων παρουσιάζουν ἐν



A

$R = CH_3, C_2H_5$

$x = 1,2$

$NR'R'' = NMe_2, NEt_2, NHPr\text{-}i,$ πιπεριδινο, μορφολινο, $NHCH_2C_6H_5, NHC_6H_{11}$.

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[*] Μέρος τῆς παρούσης ἐργασίας ἀνεκοινώθη εἰς τὸ XXI Διεθνὲς Συνέδριον τῶν Φαρμακευτικῶν Ἐπιστημῶν εἰς Πίζαν κατὰ Σεπτέμβριον 1961.

[**] **G. TSATSAS, C. SANDRIS et D. KONTONASSIOS, Anesthésiques locaux Synthèse d'esters d'acides p-(N-alkylaminoacylamino)-salicyliques. II Dérivés de l'oxycaïne.**

('Εκ τοῦ Ἐργαστηρίου Φαρμακευτικῆς Χημείας τοῦ Πανεπιστημίου Ἀθηνῶν. Laboratoire de pharmacie chimique de l'Université d'Athènes).

Θεωροῦμεν εὐχάριστον καθῆκον, ὅπως ἐκφράσωμεν θερμὰς εὐχαριστίας πρὸς τὸ Βασιλικὸν Ἵδρυμα Ἐρευνῶν διὰ τὴν οἰκονομικὴν ἐνίσχυσιν τῆς ἐρεύνης ταύτης.