May 23, 1511. The Pope went to Rome June 27. In July he succeeded in forming a secret league with England, Spain and Venice to attack France. On the 17th of August the Pope was taken seriously ill, became unconscious on the 21st, and recovered consciousness on the 22d. On the 1st of September the schismatic council of Pisa was organized. The Crema stones fell into the French territory September 4th. The league between Spain, Venice and the Pope was published October 5th, and in November England, and subsequently MAXIMILIAN, joined the League. For a time success was with the French. On the 11th of April, 1512, the battle of Ravenna was lost by the papal forces and the Roman territory was seriously threatened. But, in spite of such temporary success, the French were forced to withdraw in June altogether from Milan and northern Italy. What would be more natural to RAPHAEL, under such circumstances, than to unite, in the altarpiece that he was painting, the fireball with the rainbow, in order to symbolize at once Divine reconciliation and assistance?

So far as I know no specimens of the Crema aerolites have been preserved. The accounts say nothing about the direction of motion of the fireball. It seems more probable, however, that the motion was from the south or west than from the north or east. The earth's quit was then about S. 35° W., 15° or 20° high. I have elsewhere shown that aerolites in general follow the earth in its orbit, and this makes a motion of this stone from the S. or W. quite probable. If it was moving from the east of south it would be more strikingly visible in Rome, and its appearance in RAPHAEL'S painting may be due to a brilliant course across the Roman skies.

ON THE SIMILARITY OF CERTAIN ORBITS IN THE ZONE OF ASTEROIDS.

BY Professor DANIEL KIRKWOOD, LL. D.

[SECOND PAPER.]

In the *Publications* of the Astronomical Society of the Pacific, No. 7, March, 1890, the present writer named three pairs of minor planets whose orbits are characterized by remarkable similarity. Those given were selected from a larger number, so that only the most marked might first receive the attention of astronomers.

Further study has but strengthened the writer's opinion in regard to the origin of such relations in perturbative action, and the subject is now resumed in the table below:

Groups of Asteroids.

NOTE.—a represents the mean distance, e, the eccentricity, i, the inclination, π, the longitude of the perihelion, and Ω, the longitude of the ascending node.

GROUPS		a	e	i	π	Ω
				° ′	° ′	° ′
I	84 Clio.	2.3629	0.2360	9 22	339 20	327 28
	115 Thyra.	2.3791	0.1939	11 35	43 2	309 5
	249 Ilse	2.3793	0.2195	9 40	14 16	334 40
II	19 Fortuna	2.4415	0.1594	1 33	31 3	211 27
	79 Eurynome	2.4436	0.1945	4 37	44 22	206 44
III	134 Sophrosyne . . .	2.5647	0.1165	11 36	67 33	346 22
	193 Ambrosia	2.5758	0.2854	11 38	70 52	351 15
IV	37 Fides.	2.6440	0.1758	3 7	66 26	8 21
	66 Maia	2.6454	0.1750	3 6	48 8	8 17
V	218 Bianca	2.6653	0.1155	15 13	230 14	170 50
	204 Callisto	2.6732	0.1752	8 19	257 45	205 40
	246 Asporine	2.6947	0.1050	15 38	256 6	162 35
VI	3 Juno	2.6683	0.2579	13 1	54 50	170 53
	97 Clotho	2.6708	0.2550	11 46	65 32	160 37
VII	203 Pompeia	2.7376	0.0588	3 13	42 51	348 37
	200 Dynamene . . .	2.7379	0.1335	6 56	46 38	325 26
VIII	278 Pauline	2.7575	0.1331	7 50	199 52	62 28
	116 Sirona.	2.7669	0.1433	3 35	152 47	64 26
	1 Ceres	2.7673	0.0763	10 37	149 38	80 47
IX	245 Vera	3.0966	0.1975	5 11	27 48	62 12
	86 Semele	3.1015	0.2193	4 47	29 10	87 45
	106 Dione	3.1670	0.1788	4 38	25 57	63 14
X	121 Hermione	3.4535	0.1255	7 36	357 50	76 46
	87 Sylvia	3.4833	0.0922	10 55	333 48	75 49

Besides the similarity of orbits given in my former paper, I had, in 1887,* specified several others, and in the *Annuaire* for 1891, M. TISSERAND has independently pointed out three cases of decided correspondence. Twenty-four asteroids are included in the foregoing table, and the number will probably increase with future discoveries.

* The *Asteroids*, p. 48.

The explanation of these facts was referred by the writer to the sun's divellent force.† The disturbing influence of *Jupiter*, however, may alone have been sufficient. The mean density of the solar nebula when its radius was 300,000,000 miles was $\frac{1}{340,000,000}$ the present mean density of the sun being unity. The surface attraction of a primitive or nebulous asteriod was therefore almost *nil.* No exact calculations seem necessary to show that the separated masses might have been dismembered by the unequal attraction of *Jupiter* on the different parts. In other words, this influence was sufficient not only to detach the matter of asteroids from the central body, but also to subdivide the newly-formed nebulous planets until the fragments finally resulted in the existing asteroids. Evidence is not wanting of the actual occurrence of such division in the case of comets.‡ The study is not unworthy the careful attention of astronomers.

ASTRONOMICAL OBSERVATIONS.

Made by TORVALD KÖHL at Odder, Denmark, in the year 1890.

Although the following notes do not claim any importance in regard to the progress of Astronomy, I yet venture to publish these few contributions to our astronomical knowledge in the hope that they, perhaps, will be of some interest to the members of the A. S. P.

January 21, 10^h A. M. (Time of Copenhagen): A group of sunspots consisting of three larger and some smaller spots is situated near the western limb of the sun's disc.

February 9, $7-9^h$ P. M.: The *Zodiacal light* appears pretty plain.

Northern limb: $347^\circ + 3^\circ$, $357^\circ + 6^\circ$, $7^\circ + 9^\circ$, $14^\circ + 12^\circ$, $21^\circ + 14^\circ$, $28^\circ + 17^\circ$.

Southern limb: $7^\circ + 19^\circ$, $11^\circ + 9^\circ$, $13^\circ + 0^\circ$, $20^\circ + 6^\circ$, $32^\circ + 13^\circ$.

At 8^h the star β *Ceti* was seen in the southern limb. The summit of the Zodiacal light seems to reach the middle of *Aries*.

Corresponding observations had been projected between Dorset, England, and Odder, Denmark, but the cloudy weather did not favor the undertaking. Nevertheless the Rev. S. J. JOHNSON, M. A.,

* The *Asteroids*, p. 48.

† See the *Annuaire* for 1891, p. 301. Compare also the elements of the comets of 1668, 1843, 1880, and 1882.