

HISTORY HALLEY'S COMET FROM B. C. 240 TO PRESENT

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How Comets Are Tracked; This One Captured by Neptune; When and Where to Look for It.

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It is one of the many triumphs of modern astronomy, that it can track a comet, when out of sight, almost as well as when "blazing its way" among the stars before our very eyes. A comet is always found following one of the three kinds of orbits, and three observations, on as many nights, are all that are usually needed to determine, in the astronomer's mind, which orbit it is pursuing.

It is supposed that all comets come from a distance and were originally visitors. Where they came from and how they came to be no one knows. Counting through space, a comet comes within the sphere of our sun's attraction, turns out of its course to salute the sovereign of the solar system, swings about that body and flies back into space. Commonly its path is found to be either an hyperbola or a parabola, each an open curve, the two sides, in the case of the former, constantly diverging; in the case of the latter constantly approaching parallel lines, but in neither case completing the curve. Such a comet will never return.

But a comet, entering the solar system on such a curve, may "stop lively" or have its curve altered, if, at the earth's distance of 93,000,000 miles from the sun, the comet be coursing more swiftly than 26 miles a second, it will be in its hyperbola or parabola, and never return. But, if it drop below that speed, under the influence of the new forces encountered in our solar system it will be tied up in an ellipse. This latter path may be described as a compressed or elongated circle.

Prisoners of Our Planets.

It is in this way that comets are actually made prisoners by our planets, and made to conform to the unending treadmill of the ecliptic. Instead of roaming the universe in the broad liberty of the hyperbola or parabola. Drawn in by the attracting power of the sun, they are frequently made to "start lively" or more of the planets on route. The attraction of the planet then slows down the comet's speed below the fatal mark of 26 miles a second at the earth's distance, and henceforth the comet is ours. The closed path of the ellipse will bring it back periodically whether, like Encke's comet, it be in 3 1/2 years; like the present visitor, Halley's comet, in 75 years, or, like Donati's comet of 1858, in 2000 years. Neptune, our most distant planet, is believed thus to have captured Halley's and five others, Uranus three, Saturn two and Jupiter about 30, because of its great size and power and the greater nearness of the comets' orbits to its own.

But there is every probability that a comet will lay its orbit in a plane different from that of our earth. So it is with Halley's comet, whose orbit is inclined 18 degrees to the ecliptic. Only as it draws near the earth and the sun does it cut our plane. Backward in space the paths constantly diverge, until, where the comet may be said to be passing Neptune, it is no less than 700,000,000 miles from that planet—so far that it would feel its attraction less than that of Mars and the earth in passing them. On this account it is with difficulty that we believe that Neptune captured it, unless its path has been subsequently altered. It is on this theory, however, that so great an authority as M. Flammarion, the French astronomer, bases his argument for another planet beyond Neptune, inasmuch as the course of the comet of 1862 seems to demand such a planet to account for its presence in the solar system as a periodical comet.

Could we ride the comet, then, approaching the sun nearer than Venus, the orb of day would appear four times its size as seen in the earth's sky; but, retreating to a distance 200,000,000 miles farther than that of the most remote planet of our system, it would appear only as an inconspicuous star, whose light would require five hours to travel the intervening space, instead of the 8 1/2 minutes required to reach the earth. With sunrise, then, at 5 A. M., we should not enjoy its light till 11 in the morning; but with sunset at 5 P. M. we should still see the sun-star shining on till 11 at night. An electric message between the comet and the earth would at the same time require about as many hours for its transmission, regardless of the usual delays in office and delivery.

Nearer Than the Stars.

When the comet is sighted it is seen in the direction of certain stars, and appears to be actually among them. It is, however, countless millions of miles nearer than they. Thus the comet's light now comes in only about half an hour because of its proximity; but Sirius, brightest of all the stars, seen in that same quarter of the heavens, requires 8 1/2 years for its light to travel to the earth. At present, at about 11 in the morning, and each month about two hours earlier, rises in the east the brilliant Winter constellation Orion. Ready to compete for brilliancy with its two first magnitude stars, Rigel and Betelgeuse, and the adjacent orbs of like glory, Sirius, Alde-

bar and Procyon, there is the comet. In the northern part of the constellation, about two degrees west of the star Nu Orionis, there it is. Note the row of three conspicuous stars in Orion's belt. From the middle of these draw a line northerly to the bright red star Betelgeuse; then continue it about as far again, and you have found, if not the comet, at least the spot where the comet



Halley's Comet as it will soon appear.

Its course will be westward, through that great letter V laid on its side and marked by bright red Aldebaran; that is the Hyades group of the constellation Taurus. It will then pass along the south part of Arles and thence into Places.

The camera and telescope have already found it; in December every good eye will make it out, and in May it will be sweeping its broad tail nightly across the heavens, grand and awe-inspiring. Halley's comet spends a very small fraction of its time within human view. If it be one of the triumphs of modern astronomy that it has accurately traced its course throughout its complete round of 75 years, it is little less of an achievement to follow it back through the centuries to the times before the Christian era.

It must not be thought, from the name that it bears, that Sir Edmund Halley was the first ever to see this stupendous object, much less that it came into being or first visited this part of the universe in his day. Halley saw the comet in 1682, and he died in 1742, 60 years later, and 16 years before the comet's next appearance. But the comet was an old affair when he looked upon it; and when he successfully solved the problem of its identity with a number of historical comets, and the periodical character of its returns to our sky, it had been making its round of space for ages.

Probably Captured by Neptune.

That the comet originally entered our solar system from distant regions of the universe is practically certain. Once within our confines it was captured, as is supposed, by Neptune, our most distant known planet, and its speed became so reduced that it was compelled to adopt the elliptical form of orbit which it now travels. Now, when this happened no one can know or guess. It may have been within the history of mankind, or ages before. All we know is that the comet, like the moon, is here, and that it has been here for a long time.

Some of the greatest discoveries have grown out of what are called "lucky guesses." Halley had a strong suspicion that the great comet of 1682 was no stranger. He was familiar with the fact that remarkable comets had been seen in 1531 and 1697; and here were two intervals of so nearly 75 years each that he wondered whether these three were not one and the same comet returning with a certain regularity. His suspicion was converted to conviction, when he examined the courses of these three and found them to fit into each other so nicely that it was impossible any longer to believe that they were three; they were really one and the same.

It is strange that he did not go back still further to 140, whose comet so shook Europe with terror and dismay, for here was the same interval, and he could not be ignorant of that visitation. He might

also easily have included the famous comet of 1066 in his survey; but it seems that he did not. But in the three dates of 1531, 1697 and 1682 he felt that he had sufficient data to warrant a prediction. And this he now ventured upon—namely, that in the year 1758 there would be a fresh visit of a comet already seen at least three times; and so interested was he in the result of his prophecy, and so

strange than the return of new moon each month or of the planet Mars at approximately every two years. The popular mind was already in a ferment. The Turks had taken Constantinople and everything seemed ripe for destruction, when the comet put in an appearance, confirming all fears, and seemingly depriving men of what little wit they had left. It was then that, according to tradition, Pope Calixtus issued his famous bull against the Turk, the devil and the comet. He at least ordered special prayers to be said and the church bells to be rung at noon, which practice continues to this day. Terrified by the nightly apparition which endured for months, the people poured their wealth at the feet of the church, imploring petitions that heaven might save the world from its doom.

In 1821 the comet, almost forgotten, was again on exhibition. Following that it was seen in the years 1807, 1822, when Halley viewed it; 1758, when it returned according to Halley's prediction, and 1835, when it was last seen, and by some few who survive and are about straining their old eyes to see it again. Now, in this year 1909, it has just been freshly sighted, and before the year expires we shall all hope to see it with the naked eye. But the months of its glory and splendor will be in the year 1910, now close at hand.

Such is the history of this famous comet. We may say that it will next appear about 1983, and some few children who see it now will again see it in that year. So far as we know, at intervals of about 75 years, Halley's comet will continue to be the wonder of earthly spectators till time shall be no more.

FRERIC CAMPBELL.

SUPERSTITIONS ABOUT COMET

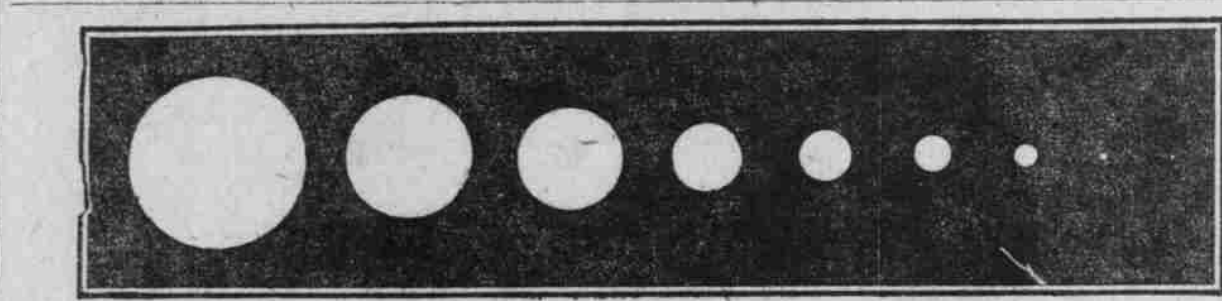
Belief That It Caused Plagues, Famines and Inundations.

In his lecture before the British Astronomical Association in 1907, Mr. A. C. D. Crommelin, F. R. A. S., the eminent astronomer said: "It is not strange that they (comets) should be looked upon

confident that he could not live to witness it, that he frankly expressed a hope that the world would recognize that it was an Englishman who made the prediction.

Fixing the Date.

Halley had been resting in his grave for 16 years, and astronomers all over Europe were watching for the return of the comet, when a Saxony farmer, George Fallich by name, having a love of the stars and a small telescope, be-



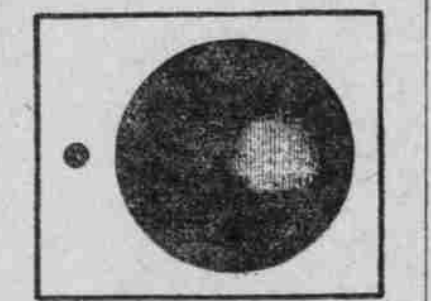
The Sun, as it would appear from Halley's Comet, first on the left, at Perihelion or nearest approach; then at distances of Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune; finally, on right, at Aphelion or Greatest Distance. Drawn by author.

came the Dr. Cook to steal the prize from the tolling Peary of his day, and sighted the monster on its return trip. It was on Christmas night of the year 1758, and henceforth this was Halley's comet; for he had made himself and the visitant famous by a first successful prediction of the return of a periodical comet.

We have mentioned the fact that Halley strangely overlooked other dates that he might have included in his series, and that the comet has been traced back to the times before Christ. The gaps are not all filled in the earlier dates; but this is doubtless due to the want of records in an unscientific age. Beginning, however, with A. D. 1066, not a date is missing, although, owing to the disturbing influences of the planets passed by the comet in coming and going, the intervals differ from 74 1/2 to 79 years.

The earliest date which we possess is B. C. 240. Our next date is 600 years later, namely, A. D. 41. Then comes 750. Now we come to an unbroken series, beginning with 1066, the date of the Norman invasion of England under William the Conqueror, when the comet was supposed to be the symbol of his all-conquering sword, and people stood aghast at the celestial spectacle. The comet repeated its visits in 1145, 1222, 1301, 1378 and 1467.

It probably never produced such consternation as in the latter year. No one imagined that this was merely the return of an old visitor, absolutely no more



Comparative Magnitudes of the Earth and Jupiter.

(Jupiter is credited with capturing more comets than all the other planets put together.)

as bringing us evil, and considered to be associated with plague, pestilence, and all sorts of horrors."

Milton wrote: "Like a comet burn'd, That fires the length of Ophiucus huge, In the arctic sky, and from his horrid hair Shakes pestilence and plague." In the London Times of October 12, 1832, John Herapath's letter appeared, from which the following two paragraphs are extracted:

"On this point—namely, the influence of comets to affect the temperature—M. Arago has made some researches, the result of which is, that comets have no effect in altering the mean annual temperature of the earth. Granting to M. Arago the full benefit of his inference, it by no means follows that they may not have a powerful influence on the season, separately considered, although they may have none on the temperature of the year. For example, let us suppose that one was by any means rendered either uncommonly clear or uncommonly cloudy, for a whole year, what would be the consequences? Would not the Summer temperature in the former case be considerably elevated, and the Winter as much depressed, and the contrary in the latter case; yet the mean temperature in both instances might be the same?"

"History furnishes us with numberless instances of the great atmospheric changes which have accompanied or succeeded the apparition of large and notorious comets; and unless we reject altogether its often iterated testimonies, I do not see how we can refuse our assent to influences so manifest, and yet so simple and perfectly philosophical."

Commenting on this valuable letter, Zadkiel, L. in his Almanac for 1832, wrote: "This gentleman declares that 'our best philosophers admit that comets may produce very sensible effects in the way alluded to.' It is to be hoped, after such an assertion by one of the first astronomers in Europe, we shall see less of positive assertion to the contrary in future. Mr. Herapath's letter has demolished the arguments, while destroying the theory of M. Arago, the celebrated French astronomer."

Zadkiel's Almanac then proceeded to place on record the following sketch of

the history of Halley's comet during the past six centuries:

"1231.—Halley's comet was in perihelion on January 30. The whole period of its being in our system, about four years, was remarkable. Dr. Forster says that 'devastating pestilence broke out in Italy, Denmark and France at once, and continued nearly the whole three years, from

approached our system epidemics began to prevail, and at length the plague succeeded and visited parts of Germany. In 1381 Aetna was on fire; and in 1382 a dead calm prevailed all the year.'"

"1495.—It passed the sun the 8th of June. The same year a tremendous earthquake in Italy destroyed 60,000 persons. "1521.—At Cabagua the sea rose four fathoms above its ordinary height, on September 1, 1520. It was preceded by spotted fever all over Europe at once, and followed by plague. Etna on fire again. Diox inundations about Basil, 1629, Rome in 1590, Antwerp in 1532. "1697.—This year there were great atmospheric commotions and a swell of the oceans and rivers—a Winter of uncommon severity over the whole world. In 1690, an earthquake at Lima, an eruption of Aetna, and the plague. In 1665, January 10, a vast inundation in Somersetshire, in some places 20 miles in length. Many earthquakes recorded, 1660, April 2, near Teratils, in the East Indies, a rock burning in the sea, always smoking," said Purchas, biographer of Captain Cook.

"1682.—Dr. Forster says that 'the plague was actually sporadic in Europe.' August 15, the Loyal Mercury stated that deaths were 200 daily at Halle, of plague, which also raged in Algiers and Spain. On March 22 the tides at London bridge flowed three in 12 hours. In 1683 a frost for 13 weeks. "1759.—It's period being 75 1/2 years, it

1230 to 1232. There was a famine in England, and 30,000 persons are recorded to have been starved! The Summer and Autumn of 1230 were intensely hot; inundations in Rome followed, and pestilence raged the whole time; while a severe frost eventually succeeded in the last Winter, and the plagues ceased."

"1759.—From 1757, influenza in America,

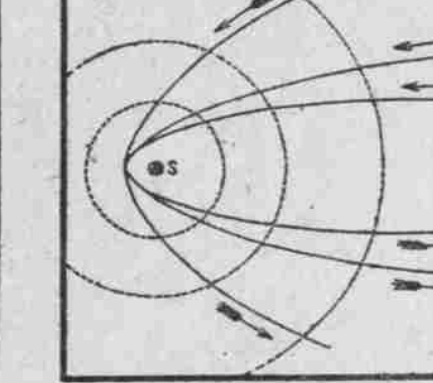
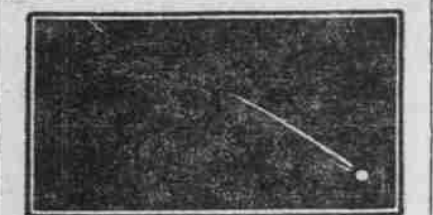


Diagram showing paths of planets about the sun, and three possible curves taken by comet, namely, outer, Hyperbola; middle, Parabola; inner, Ellipse; the latter alone closed, resulting in periodical return of a Comet.

should have appeared at the end of this year; but we have no account of it. But in 1312 a comet is mentioned, and an eruption of Hecla, famine in Bohemia and Poland. In England it prevailed in 1214. I suspect this date is wrongly given, as Dr. Good mentions a comet in 1307.

"1381.—Dr. Forster says again: 'As it



Great Comet of 1680, Two Years Before Halley's.

pestilence in Europe and plague in Asia are recorded until 1562, the year of the great frost, which lasted 94 days. Earthquakes were very prevalent, particularly at the Azores Isles, where 10,000 persons were buried in the ruins, and the island divided into two, July 9, 1557. At Tripoli, in Syria, an earthquake which extended 600 miles, when Damascus lost 6000 inhabitants; and several other cities were destroyed between October and December, 1578. Truxillo, in Peru, was swallowed up in November of the same year, and Syria suffered again October 20, 1290.

"Those who think that comets derange our system are of opinion that this great body will again be attended with some very serious effects at its approaching return. I have paid some attention to their history, and my opinion is that their effects are never very considerable

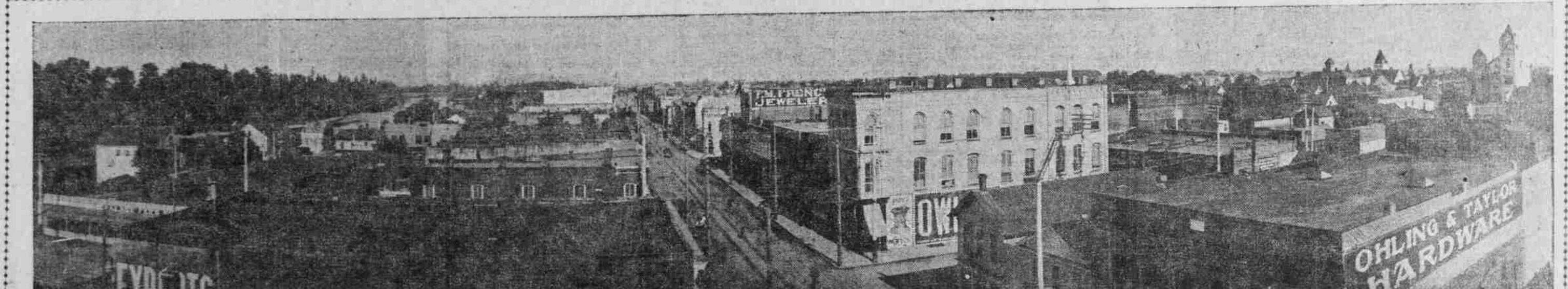
unless they are accompanied by conjunctions or oppositions of the large planets. And as it fortunately happens that 1824, 1853 and 1858 are free from such phenomena, I do not apprehend any very great evil of a physical nature from the return of Halley's comet. I believe that these bodies excite the electric fluid on their first appearance, and that this causes heat and destroys all cold diseases; and I conceive that after a time, if they remain long, a reaction takes place in the system, and severe frosts ensue, as in 1752 and at other times. I do not know of any great frost commencing at the first appearance of a great comet, but frosts often follow."

"The book is written by the late Governor John A. Johnson to a young man living in Northern Minnesota in response to an inquiry as to what books had influenced the Governor's career, was made public at the State Capitol recently. It is thoroughly characteristic of the man who began life as a druggist and ended it as Governor of Minnesota. It follows in full:

"Dear Sir: I have your letter and as I am just leaving for another tour I will try to answer it, although the answer must of necessity be brief. As to books which influenced my life—when a boy I started to do some reading—the only books generally come to boys of the age I was. A benefactor friend started me on a course of reading, introducing as the first work Prescott's 'Conquest of Mexico,' a book in itself influenced me only to the extent of encouraging me along the line of better literature. This was followed by 'Ivanhoe' and all of Scott's books, both poetry and prose. This was followed by Dickens, Thackeray and other masters in the realm of fiction. "Then came Shakespeare. I read all of his plays, re-reading many. I presume the great dramatist exerted a better influence than any other one writer, because of the delineation of so many-sided characters. Out of him came the inspiration to read more. His historical dramas directed me to the history of England, and Home and Macaulay naturally followed. Then I went to France to study her romantic history; from there to Germany, back to Rome, Greece and the Egyptian and Aryan regions. It would be impossible to say whether any one single book has been prominent in its influence. "The tendency of the above and kindred books interested me in the literature and history of my own country, and the growth of the appetite for this food for thought doubtless created a general desire to know more of the institutions of government here and abroad. All of my work in this direction must have been done to time fitted me with ambition and exalted my spirit of patriotic duty. In other words, my increased knowledge of the world and the men who made his history and affairs fitted me in some measure for the duties of life. I do not know that any one book or set of books could be chosen which would mean for more opportunity or greater success. It is the collection of books which make for more general knowledge, and for this one must simply cultivate the reading habit and confine reading to the best books written. "The books which I read beneath the volumes which have survived the decades and centuries, and it would be well to spend as little time as possible on the current literature, but confine yourself to that which has stood the test of years, when the wheat was winnowed from the chaff. I would not discourage light reading or denounce all literature because it was new, because you must know about the things of which men are thinking and doing today. "Cultivate the reading habit, and cultivate the art of communicating what you know to others. With the genius of hard work, directness of purpose, success will come. Very truly, "JOHN A. JOHNSON."

Hail to the Winter Underwear!

Chunute (Kan.) Tribune. Hail to the Winter underwear, most blessed of life's real pleasures and most satisfying of life's real necessities. The high standing of this humble existence is not fully realized until this time of year rolls around, and then there are none so skeptical who will refuse to pay due homage. You wake up some morning after months of balmy days and gauze covering your shapely limbs and teeth chattering and shanks blue with cold because of the frost's north wind pouring in your window, out of which you have hung your perspiring head during weeks of steaming aights, and it is then that your thoughts turn to this jewel of the dressing room, this endless delight of lisle tules, and peace and content give warmth to your anxious soul. There are, of course, some variations moments before your blissful feelings come, and some domestic appetites are likely to echo through the household atmosphere, for shelve's and drawers and old moth-bait scented trunks must be overhauled before your thin-blooded frame can be safely housed within the protecting recesses of this Winter friend. But after the haste of your agonizing nightgown search through the frosty air, and your thin blood begins to back in the genial warmth of the modest, reding garment, then the world takes on a rosy hue, and joy supreme fills the universe for you. Hail to Winter underwear, man's closest and dearest friend.



PANORAMIC VIEW OF ALBANY, OREGON, "THE HUB OF THE WILLAMETTE VALLEY."

A glance at the map of the Willamette Valley will show why the term "The Hub of the Willamette Valley" has been applied to Albany. Albany is situated in the geographical center of the Willamette Valley. It is at the "cross roads" of the valley. Railroads radiate from six different directions, and it owes its pre-eminence as a railroad center both to the fact of the very large production of the surrounding country, and to the very important fact that a water grade can be secured into all these rich tributary valleys from Albany. The city has a present population of about 7000. It has grown rapidly during the past few years, and has, since its beginning, kept pace with the growth of the valley, as it must always do. A conservative estimate makes the Willamette Valley capable of supporting 2,000,000 people (some say 5,000,000). Whenever the valley contains such a population as this, the City of Albany, which must grow as the valley grows, will be very large, its citizens think second only to Portland. The valleys which are tributary to Albany are of great extent and of wonderful richness. Trade in this state, as in all others, follows the water levels. It is not a coincidence that there are in the world, with few exceptions, no cities of importance not located upon navigable water.