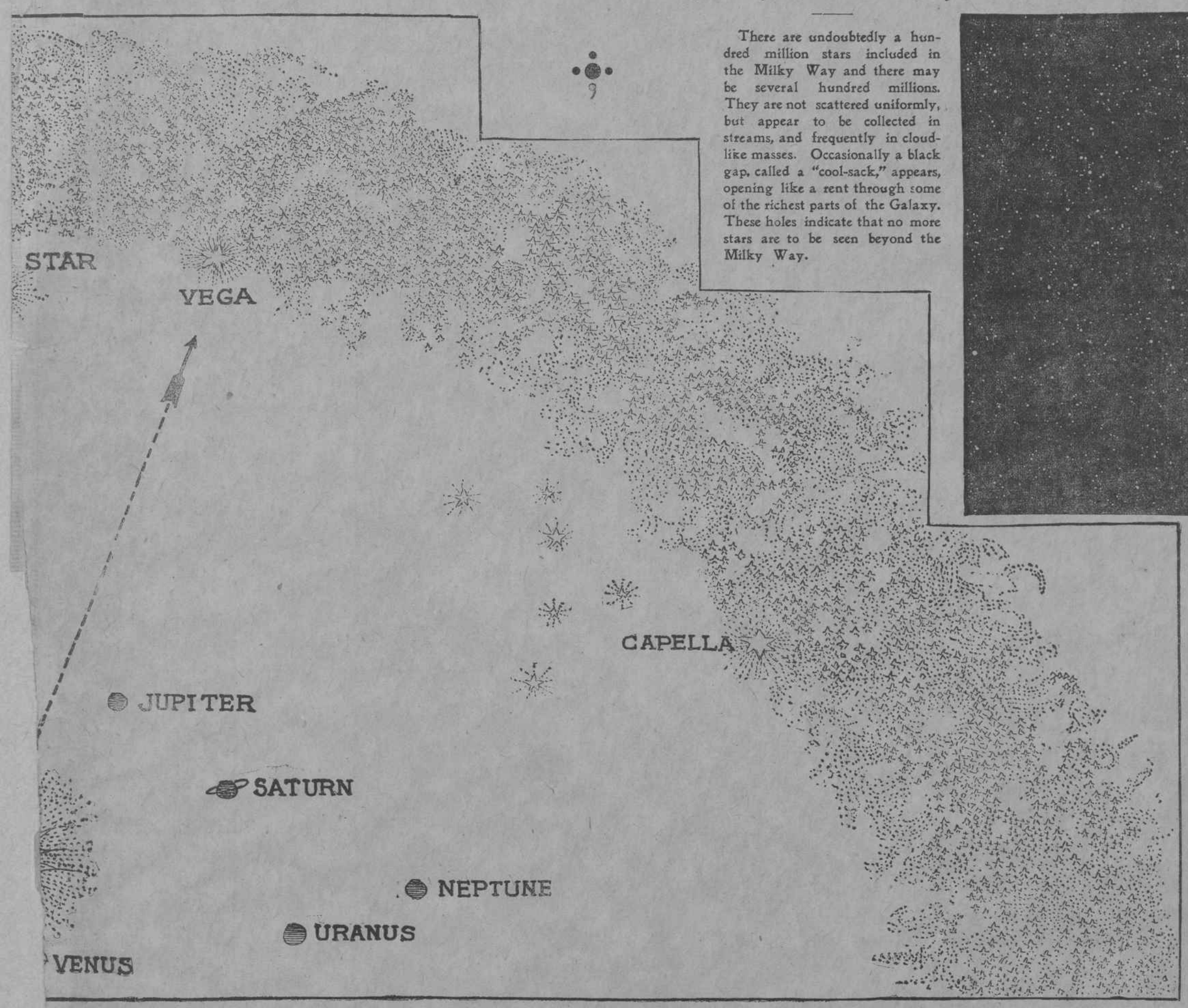
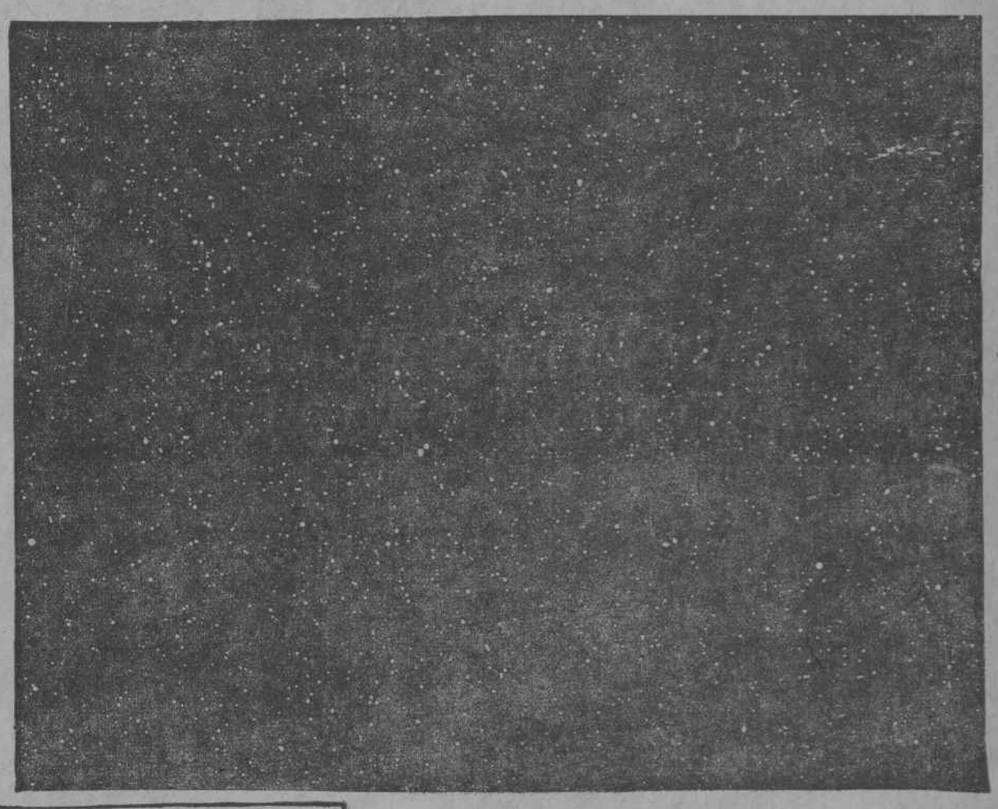
ENCE, THROUGH THE EYES OF THE NEW GREAT TELESCOPES, NOW SEES THAT . EARTH IS FLYING TOWARD 100,000,000 SUNS, EACH BIGGER THAN OUR OWN.



There are undoubtedly a hundred million stars included in the Milky Way and there may be several hundred millions. They are not scattered uniformly, but appear to be collected in streams, and frequently in cloud-like masses. Occasionally a black gap, called a "cool-sack," appears, opening like a rent through some of the richest parts of the Galaxy. These holes indicate that no more stars are to be seen beyond the Milky Way.



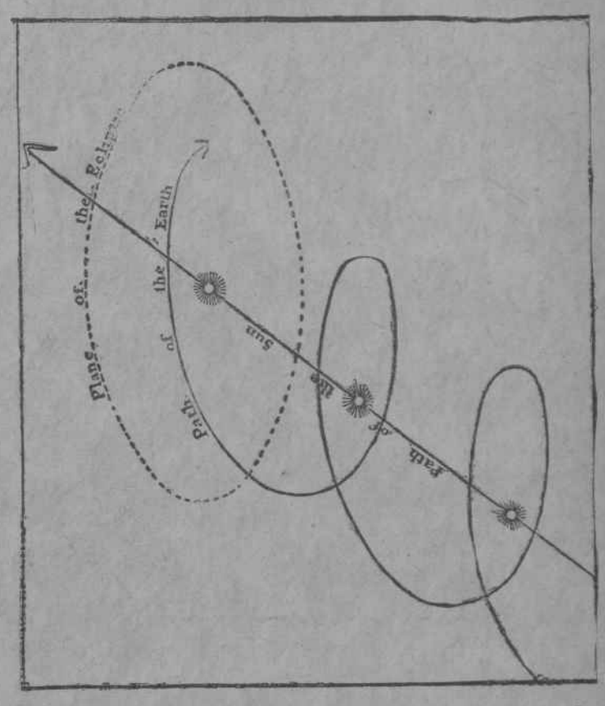
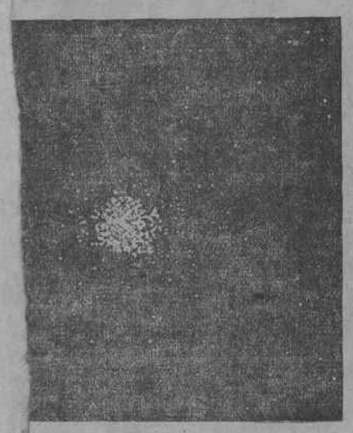
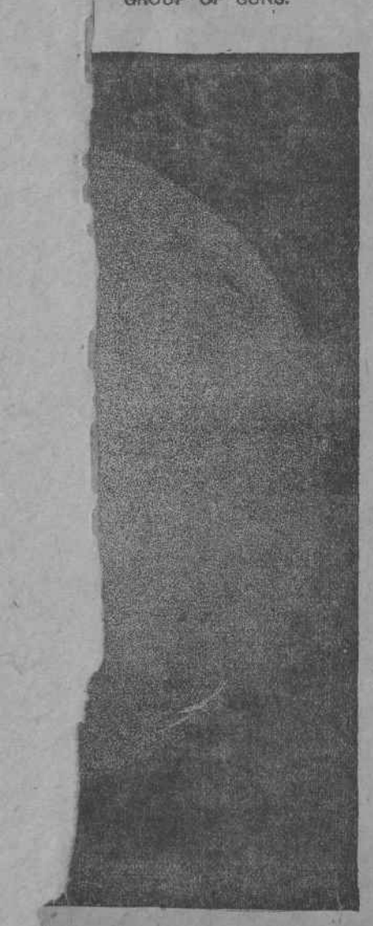


Diagram showing spiral path of Earth around the Sun while the Sun itself is rushing through space.

System Is Travelling North Toward the Myriad Stars of the "Milky Way."



GROUP OF SUNS.



RED WITH THE SUN.

eyes because the luminiferous ether, which conveys the waves of light does not extend beyond the borders of our own starry system. Suppose the sun when it has arrived with its worlds at the further verge of the ring of the Milky Way should keep on? It might in the course of ages cross the gulf of invisibility and become a member of some far mightier system beyond. Certainly there are stars within our ken moving as the sun moves, but with far greater velocity, which Professor Newcomb himself has shown cannot be arrested by the gravitation of the whole known universe. They may take the plunge if the sun does not.

One other question, in some respects the most important of all, is called up by the phenomenon of the solar motion. Here is a living, peopled earth flying after an unresting sun through limitless leagues of space. Around it, far distant, yet yielding some of their secrets to telescope and spectroscope, are millions of similar suns. Have they no such attendants also? Are there not planets among the stars and have not some, at least, of these planets living and thinking inhabitants, as the earth has? As we journey from rim to rim of the Galaxy, are we simply going from one glittering desert to another? Have the laws of life failed to operate through all the universe except on this careering speck of rock where we dwell? The very greatness of our powers of thought contrasted with the littleness of our dwelling place furnishes an answer to all of these questions. We are citizens of a universe, not of a mere ball. We are insignificant parts in a sublime whole, whose limits are not less than those of the stars.

"Future Worlds Only Hot Whirling Rings."

It may readily be conceded that every sun does not at the present time nourish inhabited worlds with its beams, and that every world is not simultaneously the theatre of life. The spectroscope proves that there are suns which have as yet scarcely passed beyond the formative stage, and others which have become decrepit and are perishing. In such systems life, on the one hand, is reserved for the future, and, on the other hand, has become only a memory of the past. The mighty sun Vega, toward which we are speeding, gives evidence to the spectroscope that, notwithstanding its giant stature, it has hardly yet passed out of its teens. It is aflame with hydrogen; the more familiar features of our sun have not yet appeared in it; it has still to attain its solar majority. Vega's family of future worlds may now be only hot, whirling rings, just breaking up preparatory to shaping themselves into globes and to become, ages hence, the home of marvellous forms of life.

On the other hand, there are found such suns as the wonderful star Mira, which appears to be actually dying the death of a wounded soldier on an abandoned battle field. It is a fearful struggle that the astronomer looks upon when he watches Mira. Now it flames out with astonishing vigor, as if the death-stricken giant had risen to his feet in a wild determination not to perish alone and unaided. Then the night closes around it again, its fires flicker and die down until only a red eye, like an ember, glares bloodily into the telescope of the watcher. Mira may have its system of planets, once splendid with a thousand forms of life, but now, when their sun is in its death throes, those planets and their inhabitants cannot survive.

But, numbered by hundreds of thousands, there are other suns, which are neither too young, like Vega, nor too aged, like Mira, to maintain living planets in their rays. The spectroscope assures us that they consist of substances the same as those that make up the sun and the earth. There are carbon and nitrogen, and hydrogen and oxygen, just as in the solar system. The conditions of life evidently exist there practically the same as here. The chemical elements whose combination in certain proportions, as our experience proves, ignites the vital spark and sets the chain of life in motion, blaze in the lights of myriads of suns around us. Can any reasonable person believe that sudden inertness has seized them there, that a strange atrophy prevails among these life-giving elements everywhere except upon our little earth?

"Arcturus, the King of Suns."

But it is not even necessary to assume that no life can exist where the conditions are different from those amid which we flourish. A certain amount of oxygen and nitrogen, mingled in the proportion of one to four and drawn into our lungs, keeps our vital machinery in motion; a certain quantity of hydrogen and oxygen, combined in the ratio of two to one and taken into our stomachs, preserves us from being burned to death by the heat of our own vital processes; a certain amount of protein, fat and carbo-hydrates, shaped into good beefsteak, keeps the whole enginery of our bodies in motion and fires alike the brain of a Shakespeare composing "Hamlet" and the heart of a soldier battling in Philippine marshes or on South African veldts.

Very good; but is the human body the only conceivable shape that intelligent life can assume? Does not even terrestrial experience teach us that what is food for one form of living creature is frequently poison for another form? We are far too complacently satisfied with ourselves when we jump to the conclusion that the human body is divine and superior to every other possible shape of mortality. It is only the soul within that is divine, and even the furnace of a sun could not shrivel that into nothingness. It is a modest estimate to say that in the glitter of the Milky Way, across whose broad circle the solar motion is sweeping us, there shine a million suns, every one of which is now in condition to support its family of inhabited worlds. And in all those million planetary systems there may not be two where intelligence is clothed in precisely the same bodily garments. Oxygen, nitrogen, carbon, hydrogen are everywhere, but their combinations under varying circumstances are infinite. What kind of air do they breathe in the system of Arcturus, the king of suns? Does water, or some yet more delicious combination of liquid elements, quench the thirst of the dwellers in the light of Aldebaran?

"Sun in Its Death Throes."

There was not so much sheer nonsense, after all, in the vision of that man who dreamed he had found a world where the bodies of the inhabitants were built up of atoms of gold, and they shone in the sunbeams like precious statues endowed with the power of life and movement; and another world where all creatures were formed of iron and were as fierce, hard and merciless as the nature of the metal that beat in their hearts and composed their terrible limbs.

Let us get a little closer to this question by considering the state of affairs in the flying solar system itself. Of the eight chief planets composing it there is only one, the earth, which we can be perfectly certain contains inhabitants. Jupiter and Saturn are apparently too young and still too hot and chaotic to support life. Mercury seems to be, like the moon, too old. It has, to all appearance, perished and become a desert. Venus, though most promising at first sight, has a strange peculiarity in her rotation on her axis, which deprives her of that succession of day and night, that recurrent relief from the blaze of sunshine and the chill of darkness, which is so agreeable upon the earth. Mars looks like a partly dried-up planet, cold and cheerless and far off from the invigorating sun. Uranus and Neptune, the remaining pair which make up the eight, are so distant that we can form almost no opinion about them.

But take the case of Mars. Its cold, dry continents may contain life suited to their conditions, though different from terrestrial life. The great white expanses that spread and recede and form and disappear and then form again as the seasons change around the poles of Mars may not, after all, be what they look like, snow. There are difficulties, arising from the composition of Mars's atmosphere, which seem to forbid the conclusion that there is any real snow upon that planet. What, then, are the white expanses? "Frozen carbonic acid," says one savant.

"Farewell, then, to life on Mars!" you exclaim.

Not so, not in the least. We could not live in an atmosphere surcharged with carbonic acid, that is true. But plants live and flourish in it. There was an age in the history of the earth, as the record of the rocks proves, when our atmosphere was poisoned in just that manner. Yet life survived. It was the great age of plant life, the wonderful carboniferous epoch. On our globe the line of highest development has followed the animal. But is it necessarily so on other planets?

"Frozen Carbonic Acid."

Suppose that at the remote beginning of things, when vitality first manifested its presence on the earth and when (as we see exemplified yet to-day) animal and vegetable forms were so similar that no eye and no skill could have told which was which—suppose that then the order of evolution had taken a different course from the one it really followed and had introduced the impulse of sprouting intelligence into the vegetable instead of into the animal form? The fact that plants are fixed to the soil and to rocks is no objection. Some of the lower forms of animals are equally fixed and immovable. The seas in early ages were filled with "crinoids," which, though actually animals, were nevertheless fastened by plant-like roots and stems to the bottoms where they grew. The earliest animals inhabiting the earth dwelt in the waters and only gradually acquired the ability to move freely about. At the start they were hardly as highly developed as their vegetable contemporaries.

But the line of higher evolution lay their way. Animals outstripped plants in the race. Higher and higher forms appeared. From shapeless, gelatinous creatures at length the order of life rose to the back-boned races, the vertebrates, and these pursued the upward course until, out of the mammalian species, came man. If, at the beginning, the course had lain the other way, if vegetable instead of animal life had received the stimulus, might not the ultimate result have been as fine and as wonderful? Suppose plants instead of animals had first cut loose from their retaining roots and acquired the power of locomotion, and suppose that in some golden moment they had felt the spark of divine intelligence—then Adam would not have been a brother to the beasts of the field, but would have acknowledged his relationship to the trees of Paradise, and all the world would have been different.

Now, if this hypothetical, yet apparently possible, order of evolution has prevailed on Mars, then the presence on that planet of carbonic acid snow and of atmospheric gases deleterious to us need be no bar to the existence of the noblest forms of intelligent life there. All that the immortal soul, temporarily confined to the surface of a planet, demands for its mortal shell could be supplied as well by the evolution of a plant as by the evolution of an animal. Let us please ourselves then with the thought that Mars may be the very counterpart and opposite of our world, and yet just as wonderfully suited and agreeable to its inhabitants as the earth is to us. They do not require our pity, and we need waste no commiseration upon them because they have only frozen carbonic acid instead of snow. It suits their constitutions.

"Our Sun Is One Among Hundreds of Millions."

But if somebody insists that this is going too far into the realms of the merely possible and prefers the more sedate level where the wings of fancy are kept closely clipped, yet the case, in its general features, is not thereby altered. Our earth may be the only planet among the eight which the sun governs that possesses intellectual inhabitants, but what of that? Our sun, as we have seen, is but one among hundreds of millions. In all that innumerable host of suns there are surely multitudes attended, like our own, by planetary systems, and if only a single planet in each of these systems possesses inhabitants, yet the living races thus brought to our contemplation surpass the power of man to enumerate them. No thoughtful person can resist the conclusion that it is not a dead but a living universe through which our flight is carrying us, and that amid the infinite variety in units that the heavens display there may well exist animate forms which as far exceed in beauty and complexity the life of this earth as the great star Vega, now the beacon of our age-long voyage, excels the sun in radiant splendor.

GARRETT P. SERVISS.

WHY TEA IS TRANSPORTED IN CARAVANS INSTEAD OF SHIPS.

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RUSSIAN tea traders have received news that the great caravans will shortly start on their long journey across Siberia. Within recent years much of the tea consumed in Russia has made the sea voyage from Chinese ports to Odessa on the Black Sea, but Russians say that tea transported by sea loses much in flavor and quality. In consequence of this the largest tea merchants continue to receive the bulk of their stock by the overland route.

Early in January the caravans arrive in Tomsk. Between the 1st and the 20th of the month 19,000 sledges full of tea are expected, each sledge containing five packages of about 130 pounds each. The tea is not packed in cases, but in stiffened ox hides. Five sledges are tied together and drawn by one horse. The last sledge of each group contains hay and barley, which the horse of the next group quietly munches as he travels. In consequence of this arrangement the caravans lose no time. The first horse only, who does not feed as he walks, is changed from time to time. The horses are changed in the villages along the road, but as villages are rarely met it often happens that the horses collapse from over-fatigue.