

spectroscope will help to solve many perplexing questions of interest to the astronomer. From the length of the tail before passing through the sun it seems almost certain that Halley's comet will be such a magnificent spectacle that a quarter century hence we will tell our grandchildren about the great comet of 1910.

In the Saturday Evening Post of April 16th, there appears an article on "The Peril of the Comet" and while this may be somewhat overdrawn, nevertheless, it is interesting, viewed from the standpoint of possibilities. It says:

"Clearly a comet's tail must be some rare and delicate fabric. By means of a wonderful instrument called the spectroscope, an instrument which analyzes a distant star as readily as if it were a stone picked up in the road, it has been discovered that the comet's tail is composed of gases called hydrocarbons—combinations of hydrogen and carbon—and that it bears a decided chemical resemblance to the blue flame of a kitchen gas-stove. Street-gas is poisonous. If a comet's tail were dense enough it is, therefore, conceivable that every human being on this planet might be asphyxiated by breathing the toxic vapor as the earth plowed through it. There is also the possibility suggested by Flammarion, that the gases of a very dense tail—denser than any ever known—might so combine with the nitrogen, which constitutes nearly 80 per cent. of the air we breathe, that the atmosphere would be converted into the "laughing gas" employed by dentists. The world would die in a delirium of joy. At first a delightful serenity would settle upon mankind. Then there would follow a contagious gaiety, febrile exaltation, a paroxysm of delight and finally madness. Flammarion even conceived the world merrily dancing a joyous, hysterical saraband in which it perishes laughing.

The tail of a comet is fraught with still other remotely possible dangers. Our atmosphere contains a certain amount of hydrogen, a marvelously light gas to which airships owe their buoyancy. Besides its lightness, the gas is characterized by an extreme inflammability. The law of the diffusion of gases teaches us that part of this hydrogen in the air is mechanically mixed with other gases and that part of it probably floats in the upper air, far beyond the reach of any balloon. A comet may be regarded as a huge lighted celestial match which may be brought dangerously near that upper layer of highly inflammable hydrogen. If the gas should ever be touched off by this cometary match flame a planet would be ignited. The whole atmosphere would become a seething ocean of flame, in which forests and cities would burn like straw, in which oceans would boil away in vast clouds of steam, and in which all

animal life would be snuffed out of existence before it ever realized that the world was on fire. In a word, the globe would become a planetary funeral pyre. Since water results from burning hydrogen in oxygen, this same fierce and terrible flame would be speedily extinguished by a mighty deluge which would engulf the earth.

The spectroscope analysis of Halley's comet has revealed the presence of cyanogen gas in the tail. Cyanogen is a compound of nitrogen and carbon, one of the most poisonous combinations with which the chemist is familiar. Prussic acid, potassium cyanid and many other cyanids, all of them almost instantaneously fatal if taken into the human system, are compounds of cyanogen. If that gas were present in large enough quantities one flick of a comet's tail would end all human and animal existence.

Fortunately, these possible effects of breathing a lungful of comet's-tail, all of them studied by the imaginative Flammarion, are so far-stretched that no scientist of repute considers them at all seriously.

On the other hand, a collision of the earth with a comet would undoubtedly prove disastrous, how disastrous would depend largely on the size of the comet's head and on its speed. That a violent heat would be developed we have every reason to believe from our knowledge of meteors. The mere movement of a meteor through the thin upper layers of our atmosphere produces a dazzling trail and reduces the meteor itself to a molten, metallic mass. Arrest a body in swift motion and you must dissipate its energy in some way. As a rule the energy is converted into heat. A bullet discharged from a rifle is often melted when suddenly stopped by steel armour. A comet travels at a pace compared with which a projectile fired from the most powerful 12-inch gun seems only to crawl. What, then, must be the frightful effect if it should even strike the earth. A comet rushes through space, not at the bullet's rate of hundreds of miles an hour but of a million miles an hour. The bigger it is and the faster it moves the greater will be the heat developed by its stoppage. "At the first contact with the upper regions of the atmosphere," says Professor Simon Newcomb, "the whole heavens would be illuminated with a resplendence beyond that of a thousand suns, the sky radiating a light which would blind every eye that beheld it, and a heat which would melt the hardest rocks." The same conclusion was reached by Mr. Faye.

If there is ever danger of a collision with a comet of formidable size, the human race will be in the horrible predicament of knowing the exact hour and minute of its doom. The newspapers will print a despatch from some great observatory.

At first the discovery produces not even a ripple of excitement. Telescopic comets are discovered too frequently. Three days later the discoverer has worked out an ephemeris which gives the date



Halley's Comet as seen in 1682

when the body will pass around the sun and which indicates the comet's path. He finds that on a certain day and at a certain hour the earth and the comet must crash together. Again and again he repeats his calculations, hoping that he may have erred. The utmost permissible allowance for accelerations and retardations caused by the outer planets and the solar system fails to change the result. The earth and the comet must meet. With some hesitation he sends a telegram to a central observatory which acts as a distributor of astronomical news. At first his prediction is discredited and even laughed at. Another computation is made at the observatory. Again mathematics infallibly indicates the exact time and plane of the encounter, and the last lingering hope is dispelled. Telegrams are sent to astronomical societies, to the leading scientific periodicals and to the more conservative newspapers.

At first the prediction of the earth's doom is received with popular incredulity, engendered by years of newspaper misrepresentation. The world's end has been too frequently and too frightfully foretold on flamboyant double-page Sunday editions. When the truth is at last accepted, after days of insistent repe-

tition of the original announcement, a wave of terror runs through the world. There is no escape. International committees of astronomers meet daily to mark the motion of the comet. Bulletins are published announcing the steadily dwindling distance between the world and the huge projectile in the sky. The great tail, arching the heavens as the comet approaches, seems like a mighty fiery sword held in an unseen Titanic hand and relentlessly sweeping down.

As the comet draws nearer and nearer night changes into an awful nocturnal day. Even at noon the comet outshines the sun. There is no twilight. The sun sets, but the comet glows in the sky, another more brilliant luminary, marvelously, yet fearfully, arrayed in a fiery plume that overspreads the sky. The moon is completely lost and the stars are drowned out in this dazzling glare. Warned by the astronomers, mankind takes refuge in subterranean retreats to await its fate. Long before the actual collision, long before the earth is reduced to a maelstrom of lava, gas, steam and planetary debris, mankind is annihilated with merciful swiftness by heat and suffocation. A candle flame blown out by a gust of wind is no more quickly extinguished.

When the comet encounters the upper layers of the atmosphere there is a blinding flash, due to the friction between the air and the comet. A few seconds later the crash comes. From the earth molten rock and flame, pent up for geologic ages, burst forth geyser-like. The globe is converted into a gigantic volcano, in the eruption of which oceans are spilled and continents are torn asunder to vanish like wax in a furnace. When it is all over, the earth swims through space, a blackened planetary cinder, desolate and dead.

The manufacture of paper coated with aluminum as a substitute for tin-foil has begun to assume industrial importance. Within a year the Wickel process has been successfully applied in France to the metallizing, with aluminum, of paper of all thicknesses, from that of cigarette paper up to that of the sheets from which postal cards are made. Aluminum paper has the advantage over tin-foil that it contains no lead. It is suitable for enveloping all kinds of confectionery, for making paper boxes, and even for wall hangings. When used as wall-paper it possesses the admirable quality of being cleanable with a wet cloth or sponge.

In Oux valley horseshoes made of the antlers of the mountain deer, fastened with horn pins, are employed. Horses in the Soudan wear socks of camel's skin.

