A NEW PROCESS OF MAKING TRICHROMATIC LANTERN SLIDES.

Mr. Fred E. Ives, president of the Camera Club in this city, recently explained his new method of making tricolored slides in a simple way, which would cause the picture on the screen to appear in the colors of nature. He stated that it was an improvement over the process he employed in 1891, in which gelatine-coated celluloid films were used, each colored and then combined to form one slide.

The new way was styled a compromise process, because it combined certain features of the half-tone process with pure photography.

In order to show that the same coloring as was obtained on celluloid could be obtained with prints made directly on glass by printing from half-tone process negatives, he threw on the screen a photomicrographic enlargement of a portion of a half-tone trichromatic print, and blended the colors into smooth tints by throwing it out of focus on the screen, stating that it would only be necessary to make the line and dot structure sufficiently fine, in order to obtain the optical effect of such continuous shading without throwing the image out of focus.

In the new process, the peacock blue print is made with smooth shading, in the manner originally proposed by him in 1889, described as "A New Principle in Heliochromy;" but the crimson and yellow prints are made from half-tone process negatives, in bichromated fish glue, by a very quick and simple process. Commencing with a trichromatic negative obtained by the use of his one-plate one-exposure cameras, he makes, by contact with the negative image produced through the red screen, a positive on a bichromated gelatine lantern slide plate, and tints it a peacock blue by immersion in a blue aniline dye solution.

From the negative images made through the green and blue screens are made half-tone process negatives, 200 lines to the inch, and from these are made prints in bichromated fish glue, by exposing a few seconds in sunlight and then washing in cold water, after which they are colored respectively by immersion in crimson and yellow dye solutions.

The yellow print is made directly upon the surface of the blue print, after the latter is dried and protected by a waterproof varnish, by coating it with a sensitized bichromated gelatine film and printing in the usual way, but the crimson print is made on the inner side of what forms the cover glass of the finished lantern slide, only the image is reversed as to position, in order to have it blend or register when placed in contact with the other two images.

The coating of bichromated fish glue is spread and dried in a "whirler," making a very thin and even film, and as the prints are developed from the face (unlike carbon prints), the development is completed in from ten to thirty seconds, so that the process is a very quick and reliable one.

As the films are all attached to glass, there is no danger of injury by the heat of the lantern, which is one of the objections to the celluloid film process. It is also not necessary to seal the films with balsam, as was formerly required.

Considering the effect of the half-tone screen structure on the quality of the slide, it was explained that it is much less in evidence than it would be if the blue image were made in that way, and that it was not likely to be noticed unless a person was very close to the lantern screen. Several slides made by the improved process were projected upon the screen, and their clearness and transparency were quite noticeable.

Since the process required the making of duplicate half-tone negatives, Mr. Ives thought it was not adapted for the amateur, but it would be useful in a commercial sense. The method was less expensive than hand coloring now in vogue.

He exhibited one colored slide of a farm scene, having much green foliage, brilliantly sunlit, the negative of which he said was made in one second with a new camera. The colors were very well rendered, and it was an interesting example of the improved sensitiveness to colors of the later trichromatic dry plates.

THE HEAVENS IN NOVEMBER.

BY HENRY NORRIS RUSSELL, PH.D.

One of the most interesting astronomical items of the last month has been the first bulletin of results from the Lick Observatory expedition to Chili. This enterprise owes its existence to the generosity of Mr. Mills, who, not contented with presenting to the observatory the spectrograph with which so many valuable observations of the northern stars have been made, has duplicated his gift, so that the work could be carried on simultaneously in both hemispheres. An observatory has been built on a hill near Santiago, and work has been going on for about a year, directed principally to measurement of the motions of stars in the line of sight.

The recent communication announces the discovery of a number of spectroscopic binaries, among which two are specially interesting, as they are also variable stars. But the observations of greatest immediate interest deal with a star whose name is familiar to all—Alpha Centauri—and advance our knowledge of its system to a point hardly reached in any other case.

Alpha Centauri is a remarkable object in many ways. It is one of the very brightest stars in the sky—coming next after Sirius and Canopus—and has a larger proper motion than any other bright star. It is also a fine double, whose components are at a greater apparent distance than those of any other known binary system; and, as is well known, it is nearer the sun than any other star yet investigated.

Summarizing what is known from observations of this system, we may say: The system of Alpha Centauri consists of two stars, of the first and second magnitudes, which revolve about one another or, strictly speaking, about their common center of gravity, in a decidedly elliptical orbit, highly inclined to the line of sight, with a period of 81 years, and at a mean distance of 17.7 seconds of arc, while the whole system has a rectilinear proper motion of 3.68 sec. per year.

From the relative distances of the two components from the center of gravity, it is found that they are very nearly equal in mass, though one is twice as bright as the other.

The careful determinations of this star's parallax made at the Cape Observatory enable us to translate these dimensions into miles, and compare them with corresponding ones in our own system.

Using the value 0.75 sec. for the parallax, resulting from all the Cape observations, we find that the distance of Alpha Centauri from the sun is 275,000 astronomical units (that is, 275,000 times the distance of the earth from the sun), a distance which it takes light four and one-third years to travel.

The mean distance of the two components is 23.6 astronomical units, so that their orbit is a little larger than that of Uranus. As it is highly eccentric, the distance of the two stars varies from 11 to 36 astronomical units, so that sometimes they are almost as near together as Saturn and the sun, and again a good deal farther apart than the sun and Neptune. The mass of the system comes out from these data as a little less than twice that of the sun. As the two stars are almost equally massive, either one of them singly is very nearly the sun's equal in mass. When it comes to brightness, we find that the brighter one gives just about as much light as the sun, and the fainter one less than half as much. As the spectrum of the brighter component is exactly like the sun's, it is not unreasonable to suppose that it is really almost a duplicate of our luminary. The fainter one shows differences which indicate either that it is cooler or that its atmosphere absorbs more of its light. Finally, from the observed proper motion, we know that the velocity of the system at right angles to the line of sight is 4.6 astronomical units a year, or about 13½ miles a second.

How fast the motion is *in* the line of sight was not known until the recent Lick observations were made. They show that both stars are approaching us, one at 11½ miles a second, and the other at 15.

It might seem at first sight that if they were moving at different rates, they must ultimately become widely separated; but the observed difference is due to their orbital motion about one another. In fact, it enables us to get a new determination of the star's distance; for we know how fast the stars are moving (relatively to one another) and how long they take to go round. Consequently, we can find the size of the orbit and, since we know how big it looks, how far off the system is.

This calculation has been made by one of the Lick astronomers, with the result 0.76 sec. for the parallax of the system. The agreement with the value 0.75 sec., found at the Cape in a wholly different way, is extremely satisfactory, and satisfies us that the distance of this system is now known within one or two per cent, and that the numbers given are approximately correct.

These observations also enable us to predict the future motion of the star. The system as a whole is approaching us at about 13½ miles a second, and also moving sidewise at nearly the same rate.

It follows that its actual motion relative to the sun takes place along a line making an angle of 45 deg. with the line at present joining the sun and star, at the rate of 19 miles a second, or 6¼ astronomical units a year. Calculation shows that the effects of the sun's attraction are small enough to neglect, so that we can assume as a good approximation that the star will keep on moving uniformly in this line indefinitely.

Now the nearest point in this line to the sun is about 200,000 astronomical units ahead of the present position of Alpha Centauri. Therefore the star will approach the sun for about 30,000 years more, when it will be at its least distance (about 200,000 astronomical units). If its brightness has not changed in the interval, it will then appear about twice as bright as it does now.

Following it back in the same way, we find that 100,000 years ago it was three times as far off as it is now, and only one-tenth as bright as at present.

The present pre-eminence of Alpha Centauri is therefore only a short-lived affair, if we count time by the lives of stars, and not of men. An average star probably keeps shining for many millions of years, and long before this time has passed. Alpha Centauri will have disappeared so far into the depths of space, that thousands of stars will then be nearer the solar system, and appear brighter, than it will.

Encke's comet—remarkable for its very short period of 3 1-3 years—is due to return this winter, and was "picked up" telescopically last month. It is now rapidly approaching the earth and sun, and will be brightest early in December, when it may be visible to the naked eye. On October 20 it was not far from Alpha Andromedæ, while early in December it will be near Altair. We hope to be able to give a more accurate account of its motion next month.

THE HEAVENS.

The familiar winter constellations are now returning to our evening skies. At 9 P. M. on November 15 Orion has just risen, and is almost due east. About it is Taurus, with the bright red star Aldebaran, and the Pleiades higher up. Gemini lies low on the horizon north of Orion, and Auriga is above it.

Following the Milky Way from this, we reach Perseus, then Cassiopeia, and, passing over the inconspicuous Cepheus, come to Cygnus, in the northwest. Aquila is below this on the left, and Lyra on the right.

The southern skies are less brilliant, except for Jupiter and Saturn. The former is in Pisces, almost due south and pretty high up, and the latter in Capricornus, low in the southwest.

Andromeda is directly overhead, and Pegasus southwest of it. The bright star low down in the S.S.W. is Fomalhaut. The southern and southeastern skies are occupied by Cetus and Eridanus, two of the dullest of the constellations. Ursa Major is low on the northern horizon, and Draco and Ursa Minor are below and to the left of the pole.

THE PLANETS.

Mercury is evening star in Libra and Scorpio. He can only be seen in the latter part of the month, when he sets about an hour after the sun. Even then he is so far south that he will be hard to see.

Venus is evening star in Scorpio and Sagittarius, and is visible in the southwest after dark. By the end of the month she sets more than two hours after sunset, and is a conspicuous object, though not nearly as much so as she will be in the spring.

Mars is morning star in Virgo, crossing the meridian at 4:15 A. M. on the 15th. On the 26th he passes very near the fourth-magnitude star η Virginis, the distance of the two objects being about one-fourth of the moon's apparent diameter.

Jupiter is in Pisces, and is conspicuous all the evening. He is due south about 10:45 P. M. on the 1st, and 8:40 on the 30th. His satellites are visible with the smallest telescope; in fact, a good field-glass will show them all when they are not too near the planet.

Saturn is evening star in Capricornus. On the 7th he is in quadrature with the sun, and is due south at 6 P. M.

Uranus is in Sagittarius, too near the sun to be seen. Neptune is in Gemini, and will be in opposition next month.

THE MOON.

New moon occurs at 10:28 A. M. on the 7th, first quarter at 7:27 P. M. on the 14th, full moon at 10:04 P. M. on the 22d, and last quarter at 2:30 A. M. on the 30th. The moon is nearest us on the 5th, and farthest away on the 17th. She is in conjunction with Mars on the 3d, Mercury on the 7th, Venus on the 9th, Uranus on the 10th, Saturn on the 14th, Jupiter on the 19th, and Neptune on the 25th, none of the conjunctions being notably close.

ROMANCE OF A SCIENTIFIC AGE.

Mr. Robert Bridges, in an article on "Is Poetry to Have a Chance?" in Collier's, says:

"To sail under the sea or through the air, to talk through space, to see through flesh and bone, to make light out of darkness, to harness Niagaras, to make wax speak and pictures move—these have been the deeds of the poets of our generation. The things that were dreamed of in the 'Arabian Nights' have become realities—and yet they say this is a prosaic age! It is seething with romance; young men talk the impossible on street corners and across little tables—and then make it come true. The spirit of achievement is the spirit of imagination and hope. These men delight to live, delight to plan, and dream, and hammer out results. Nothing staggers them—and failure or success is greeted with a smiling face."