

experiments of several other scientists. Some of these investigators have estimated the size of virus particles from the size of the holes in a filter that they pass through. Others have estimated the concentration of virus in infected plant juice. One found that one part of infected tobacco plant juice diluted in ten thousand parts of water still contains infective material.

The layman's interest in these impressive figures is largely a matter of curiosity and wonder over the size and concentration of the substances that can cause him so much personal harm or financial loss.

The scientist's interest is related to the

isolation of the infective principle of viruses. One as yet unsettled question about viruses is whether or not they actually are living organisms.

As Dr. Robbins explains it, if the tobacco mosaic virus, for example, is non-living, attempts now being made to isolate it as a definite chemical compound will eventually succeed, provided a sufficient number of infective particles are present in a cubic centimeter of juice.

Put in another way, if scientists can finally isolate a virus as a definite chemical compound, they will know that viruses are not living substances at all.

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ultraviolet astronomical front from 3,400 down to 2,300 Angstroms.

Now, at one stroke, astrophysicists can jump the gap caused by ozone absorption and reach still shorter wavelength regions of the solar spectrum. Another important contact with sunlight is thus established.

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ANIMAL HUSBANDRY

Sheep Reared Successfully On a Synthetic Diet

THE first two sheep ever reared upon synthetic diets have just been slaughtered in a Cornell University scientific experiment. They never tasted grass or grain but thrived on purified food elements. Scientists foresee the possibility of more rigorous nutrition experiments upon cows, goats, sheep, rabbits and other herbivorous animals as the result.

Reared by Dr. L. L. Madsen of Cornell's Animal Nutrition Laboratory, they were beautiful, mature animals although they never received a blade of grass nor a kernel of grain from the time they were weaned from their mothers. Each day for over a year they were fed a "synthetic" mixture of casein, cellulose, starch, vitamin concentrates and salts. They grew to maturity rapidly and were about a year and a half old at the time of slaughter.

This success in raising "synthetic" sheep ends seven years of trials to perfect a diet of purified foodstuffs for plant-eating, herbivorous, animals. Such

PHYSICS

New Band of Ultraviolet Found in Sun's Rays

A WHOLE new band of ultraviolet light rays in the radiation the earth receives from the sun has been detected by the Swiss scientists Edgar Meyer, M. Schein and B. Stoll. The discovery is believed to have an important bearing on future astronomical research.

In their report (*Nature, Oct. 6*), it is disclosed that sunlight is not completely cut off at about 2,800 Angstrom units of wavelength as previous research indicated.

An Angstrom is a unit of length equal to a bit less than four billionths of an inch. The ultraviolet region from 2,900 to 3,100 Angstroms consists of rays which have an actinic effect and cause sunburn.

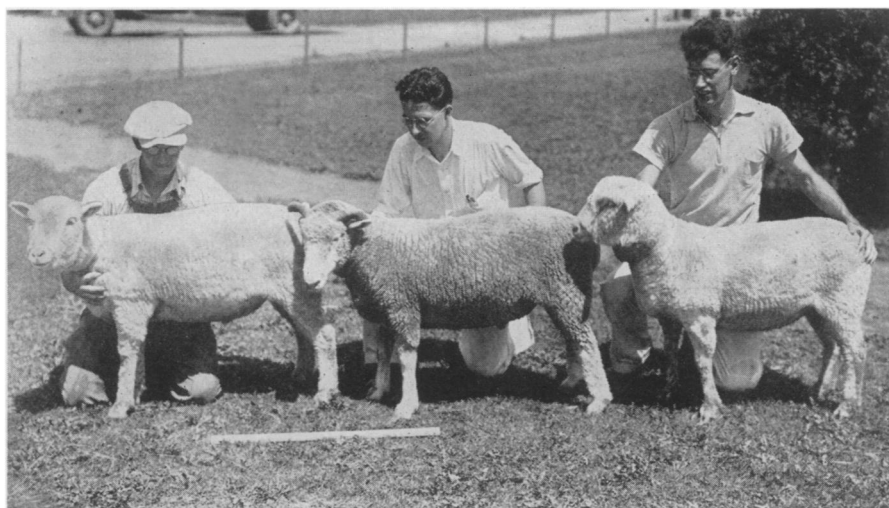
It had always been supposed, as far as proof was concerned, that the ozone in the earth's atmosphere absorbed sunlight of wavelength shorter than those of the 2,800 to 2,900 Angstrom region. Theory predicted otherwise but careful searches to find sunlight of shorter wavelength were unsuccessful in the past.

Using special apparatus which counts individual photons of light energy instead of employing a photographic plate, the Swiss scientists were able to jump the gap caused by ozone absorption from 2,800 to 2,400 Angstroms and detect the new ultraviolet peak having a maximum of 2,100 Angstroms. The new-found rays started to come through at 2,400 Angstroms. So deli-

cate was the method that the intensity was traced to nearly 1,900 Angstroms. The oxygen in the earth's atmosphere should cut off solar radiation less than 1,800 Angstroms of wavelength.

The research was carried out in a laboratory atop the Jungfrauoch in the Swiss Alps, at an altitude of 3460 meters—over two miles.

The new findings have important possibilities for high-altitude measurements of radiation from the sun and stars. Mirrors using aluminum instead of silver coatings have recently extended the



CAN YOU PICK THE "SYNTHETIC" SHEEP?

The two beautiful animals on the ends of the line have never tasted a blade of grass or a kernel of grain, but have thrived on purified food elements. A conventional grass-grain fed sheep is shown in the center for comparison.

diets are useful for studies with such animals as rabbits, guinea pigs, sheep and goats because one substance at a time can be added to or subtracted from such mixtures. The development of such diets for white rats about 20 years ago led to many of the modern discoveries in the science of nutrition concerning vitamins, minerals and proteins. With these new diets such studies will become possible with herbivorous species. These species include the foster mothers of the human race, the cow and the goat, as well as sheep. They also include the smaller animals such

as rabbits and guinea pigs which are widely used in laboratories for the study of disease.

The "synthetic" sheep proved to be in excellent condition and free from one of the most common of the parasites which are found in almost all the sheep of the region. From observations upon these animals it is thought that these new diets may afford novel methods of freeing sheep from the usual parasites that inhabit the digestive tracts of sheep.

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OCEANOGRAPHY

Amazing Landscape Lies Beneath the Pacific Ocean

If the Water Could be Drained from California Coast Scenic Marvels Would Be Revealed to Onlookers

By PROF. FRANCIS P. SHEPARD,
Of the University of Illinois

IF SOME force could remove the waters of the ocean to a depth of two miles, residents of Monterey peninsula, on the California coast, could look out onto one of the scenic marvels of the world.

Directly off Pacific Grove they could look down a canyon wall to a floor 7,000 feet beneath their level and they could see a 5,000-foot wall rising on the farther side. If they were standing at the end of the peninsula, they could see another impressive canyon coming out of the present Carmel Bay, receiving many tributaries along its course, to where it joined the main Monterey Bay canyon.

The fishermen who inhabit the sparsely settled coast around Cape Mendocino, in northern California, would see a series of canyons directly off their homes that would compare to the greatest valleys of the west slope of the Sierra Nevada.

The residents of La Jolla, near San Diego, would be given a surprise through the appearance of a deep chasm with almost vertical walls, which would be seen extending out from the present day sea cliffs north of the Scripps Institution of Oceanography. Gorges such as this would become the show places of the new California coast.

It is natural to be curious about the

origin of these remarkable gashes in the sea floor. There is no evidence that would allow us to believe that these great rock canyons could have been cut out of the sea bottom by the feeble currents of the deeps. Neither do they contain the basin depressions cut by unusual marine currents in such places as the Golden Gate, where the tide is accentuated by the narrowness of the entrance and the vast size of the bay. These canyons were more likely produced by some process now observable on land.

There are three main types of deep land valleys: those excavated by the ice, of which the Yosemite Valley is a classic example; those cut by rivers, of which the Yellowstone Canyon is typical; and finally those due to faulting of blocks of the earth's crust, of which Death Valley and Owen's Valley in California are splendid illustrations. Each of these types has definite characteristics, as you will know if you are familiar with the examples cited.

Of the three the river-cut canyons are the most distinctive as they have a rough V-shaped cross section in contrast to the U-shape of the glacial valleys and the trough shape of the fault valleys. Also most of the river valleys are much more winding in their courses than the others, and have tributary systems very much like the branches of a tree or the veins of a leaf.

When we compare these charac-

teristics of deep stream valleys with those of the submarine canyons we find decided agreement, and the new surveys seem to leave little doubt but that the great canyons of the sea floor were excavated by ancient rivers at a time when the land margins were greatly elevated.

The significance of these deeply submerged river canyons off the California coast is a cause of bewilderment. It has been generally assumed by geologists that the California coast is rising. It undoubtedly has risen, as anyone can see from the marine shells in the gravel deposits on the numerous beaches now well above sea level. Why then do we have on the one hand these submerged river valleys as evidence of a rising coast? The difficulty is removed by the assumption that there was first a large subsidence which drowned the canyons and later a more moderate uplift which raised the narrow wave-cut benches.

The straightening of the California coast and the cutting of wave terraces following the submergence of the canyons must have consumed a long period of time and therefore the submergence must have been very remote. There are reasons to believe it occurred more than a million years ago.

Comparisons between old and new marine surveys have to be made with care and used with reservations; but such comparisons off the California coast at least strongly suggest that there have been changes in depth during the last 50 years. Such changes were inferred in the submarine canyons off Redondo, off Newport, and off Carmel. In each case the new surveys give evidence of decided deepening. It seems probable that the canyons despite the usual slow filling with sediments are deepened from time to time by these mud flows.

The submarine canyons are of some practical importance to man. They allow navigators to determine definite positions at sea during a fog. They constitute good fishing grounds because of the rocky ledges on their sides. Where the heads of the canyons come in close to the coast the deep water has made a favorable situation for the building of piers. Filling at these piers has proved less troublesome than at the ends of most other piers off the California coast.

However, this location may be fraught with difficulties, since the canyon represents a funnel down which the bottom deposits may slide or be swept by storm waves.

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