000° C., the value assigned by Professor Schaeberle; but neither is it demonstrable that the temperatures assigned by Stefan's law are correct; and nothing but the existence of certain coincidences in values given by different methods, coincidences which are possibly fallacious, can be said to favor the supposition that the effective temperature is as low as 7,000°.

Since about nineteen twentieths of photospheric radiations of wave-length 0.3 μ are absorbed by the sun's atmosphere, and of rays of wave-length 0.4 μ barely a fifth get through, the form of the spectral energy-curve is so much changed near the maximum that the position of this important point in the curve of photospheric radiation, restored by application of corrections for the absorption by the atmospheres of sun and earth, becomes uncertain; but the photosphere can not have a temperature as great as 60,000°, nor even one of 10,000°, without requiring serious changes in the constants of radiation in the formulæ accepted to-day, or in the assumptions tacitly made as to the emissive power of the solar substances. The latter may very likely be in error, and it would be interesting to have measures of the relative emissive powers at very high temperatures of all substances which can give continuous spectra at those temperatures.

FRANK W. VERY

WESTWOOD, MASS.

THE FAUNA OF RUSSIAN RIVER, CALIFORNIA, AND ITS RELATION TO THAT OF THE SACRAMENTO

FOLLOWING an article in a recent number of SCIENCE[1] on certain "Physiographic Changes bearing on the Faunal Relationships of the Russian and Sacramento Rivers, California," a note on the fish faunas of these basins may be of interest. The writer of the present paper has seen no account of the fishes of the Russian River, and therefore must rely entirely on his own observations for the following statements.

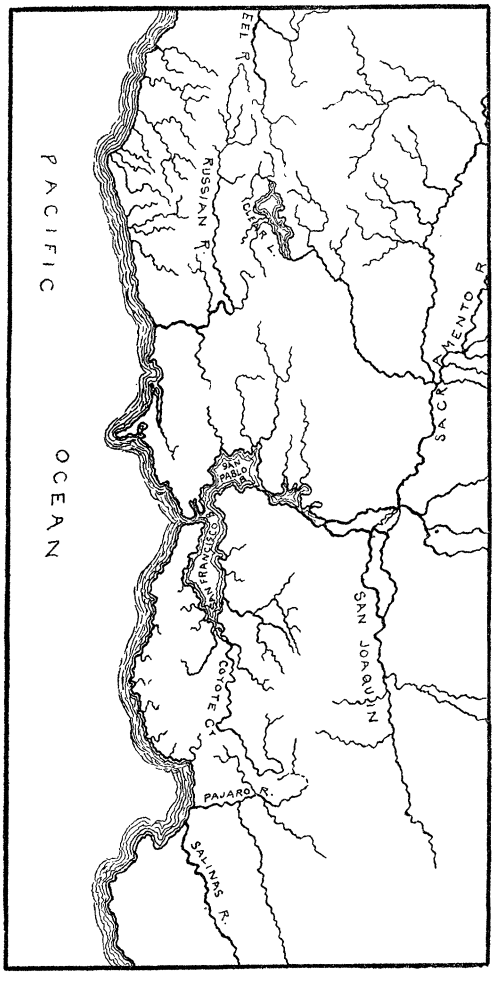
The Russian River has, so far as known, twelve species of indigenous fishes. They are: *Entosphenus tridentatus, Catostomus occidentalis, Mylopharodon conocephalus, Ptychocheilus grandis, Rutilus symmetricus, Oncorhynchus tschawytscha, Salmo irideus, Gasterosteus cataphractus, Cottus asper, Cottus gulosus, Cottus aleuticus* and *Hysterocarpus traski.* Of these, *E. tridentatus, O. tschawytscha* and *S. irideus* are anadromous forms, while *G. cataphractus, C. asper, C. gulosus* and *C. aleuticus* are able to withstand salt water and are consequently to be ignored in a study of the faunal relationships of rivers. The other species are strictly fluvial. The above-named species also occur in the Sacramento River. A large series of specimens from each basin, examined some years ago by the writer, presented no structural differences whatever. They were as near alike as fishes collected from the same stream.

It may here be noted, for those not familiar with the geography of the region, that the Russian River occupies a basin lying mostly in the mountainous region to the westward of the great valley drained by the Sacramento. Its general course is southward until it reaches a point about 35 miles to the north of San Pablo Bay, when it turns abruptly west and, flowing through a deep canyon, reaches the ocean. It is therefore completely isolated from the Sacramento. The headwaters of numerous small tributaries of both rivers rise in close proximity in the high mountains which divide their basins. It is in this mountainous divide that Holway has found evidence of a transfer of a part of a tributary from the Russian River to the Sacramento, which probably carried along with it a representation of the Russian River fauna.

That such a movement as Holway records could have any effect on the faunal relationships of the two basins seems highly improbable, as the Sacramento, a vastly larger and probably older system, not only contains all the fluvial species known from the Russian River, but also others not there represented. The zoological evidence, such as it is, indicates that the Russian River fauna was derived from the Sacramento, and not that any portion of the fauna of the latter was obtained from the Russian River.

[1] Holway, Ruliff S., SCIENCE, September 20, 1907.

Since the two systems are widely isolated, one can explain the identity of their faunas in so far as it exists, only by the assumption that an intermingling of their waters occurred at some past time. Several years ago attention was directed to a probable connection between



Map of the Russian River basin and parts of the Sacramento and neighboring rivers.

these basins, no reference being made at the time to their faunas. Lawson[2] in 1894 made a statement to the effect that at one time the Russian River, instead of turning abruptly westward to the ocean, continued its southward course through an uninterrupted valley to the region now occupied by San Pablo Bay. It would thus have established a main channel connection with the Sacramento, the union being perfect in case of a slight elevation of the coast which probably prevailed at that time.[3] In this connection it should be emphasized that whatever may have been the agency for bringing about a passage between the two systems, it was apparently not able to transfer a complete representation of the Sacramento fauna to the Russian River. There are among the Sacramento fishes a considerable number of species not known in the Russian River, of which may be mentioned *Orthodon microlepidotus, Lavinea exilicauda, Pogonichthys macrolepidotus* and *Leuciscus crassicauda,* all strictly fluvial. Concerning these species two facts should be noted as having a possible bearing on the method by which the Russian River received its fish fauna: (1) they are indigenous to certain small streams which flow into San Francisco Bay[3] and they have also found their way from thence southward[4] into certain small coastal streams, where they are now abundantly able to maintain themselves; (2) they are such forms as inhabit the lower courses of the rivers, seemingly preferring the warmer, deeper and more quiet waters of the main channel. Now, if the Russian River received its fauna from the Sacramento through a main channel connection, as may be inferred from Lawson's statement, we should expect to find among its species the same channel fishes as inhabit the Sacramento and the smaller streams flowing into San Francisco Bay. They are absent, however. That they were once introduced and have since become extinct seems scarcely probable, since they are now living in the small streams referred to, under conditions apparently similar to those prevailing in the Rus-

[2] Lawson, Andrew C., "The Geomorphogeny of the Coast of Northern California," *Bull. Dept. Geol. Univ. of Cal.*, I., p. 269.

[3] Snyder, J. O., "Notes on the Fishes of the Streams flowing into San Francisco Bay, California," Rept. Com. Fish., Dept. Com. and Labor, 1904, p. 327.

[4] Branner, J. C., "A Drainage Peculiarity of the Santa Clara Valley Affecting Fresh-water Faunas," *Jour. Geol.*, XV., No. 1.

sian River. Should a part of the upper course of a tributary have been transferred from one system to the other, it would have carried with it only such forms as it harbored, thus introducing to the recipient basin a comparatively limited fauna. This condition is apparently what we find in the Russian River system. Its fauna is like that of the upper courses of the streams tributary to the Sacramento which flow from the western side of the great valley, the channel forms common to the main river being absent.

It is fair to conclude that the fish fauna of the Russian River was probably derived from the Sacramento system, and a study of the species offers the suggestion that the intermingling of their waters, by which the species were introduced, was not affected by a main-channel connection, but rather by a process of stream-robbing something like that described by Holway, only that the transfer was in the opposite direction. J. O. SNYDER

THE MOTH-PROOFING OF WOOLENS

WHEN living in Swatow, China, my house, like all dwellings within the tropics, was infested with various kinds of insects. In experimenting with diverse substances with a view to self-protection against insect pests, I found that alum was a perfect preventive of the ravages of moths among woolens.

It is well known that the female clothes-moth deposits her eggs in woolen goods, and that the worm-like larvæ hatched from these eggs subsist upon the wool until they attain the general form of the adult moth. The Chinese, who are the great practical economists of the world, do not ordinarily wear woolen garments. They are well protected from cold by an interlayer of raw cotton between the lining and the surface fabric of their winter apparel, which is often made from very light-weight silk or linen. Nevertheless, the clothes-moth is ubiquitous in China, and undisturbed woolens are soon riddled by its developing progeny.

I gave the alum a severe test by immersing picture-cords made wholly of wool, in a saturated solution for several hours, and afterward using the cords to suspend framed pictures. These cords, numbering a score or more, sustained heavy pictures for over three years, without showing sign of weakness.

A basket of soft worsteds, that I had used in testing the Chinese for color-blindness by the Seebeck and Holmgren method, were likewise treated with alum, and left uncovered and undisturbed for more than a year without attack from moths. The colors of these worsteds, although diverse and delicate, were not altered by the soaking in alum water.

Woolen shawls and other articles were fortified against moths in the same way, and remained intact for several years.

The alum does not evaporate, and is therefore permanently effective in unwashed fabrics.

There is apparently no reason why wools used in manufacturing cloth, rugs and carpets should not be so treated with alum as to become moth-proof. Crude alum is inexpensive and probably one pound of it in four quarts of water would make a solution of sufficient strength for the practical result aimed at. The commercial value of woolen goods would be enhanced by this process, and "the house beautiful" would be more easily kept.

Holland, writing of these troublesome immigrants from the old world, says ("Moths," p. 426) that the depredations of clothes-moths cost the citizens of the United States annually a sum of money which is enough in amount at the present time to pay the interest on the national debt. ADELE M. FIELDE

SEATTLE, WASH.,
November 22, 1907

PINK KATYDIDS.

TO THE EDITOR OF SCIENCE: Referring to your page 639 (Vol. XXVI.), I have captured pink katydids at East Hampton, L. I., probably on four to six different occasions in the last twenty years. One year—I should say in the seventies—I had three at one time. No one there had ever seen any—although no professional entomologist was in town. I also found one at South Lyme, Conn., in the summer of 1906. All that I have ever found were a bright shell pink. I did not note the sex of any of my specimens, which were all