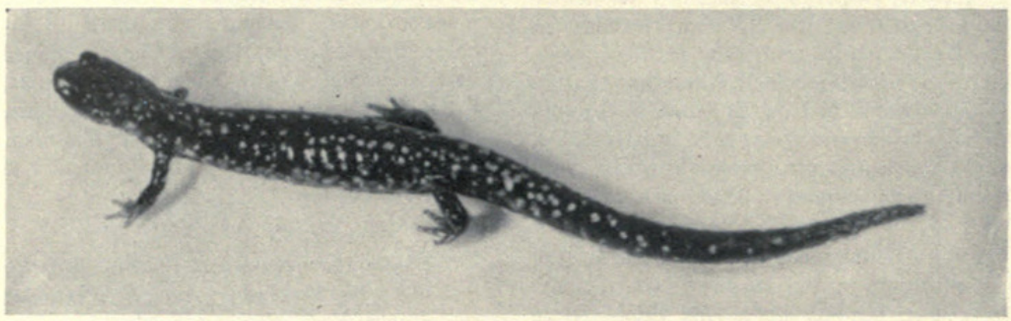
HUNTING FOR SALAMANDERS IN THE APPALACHIANS

By CLIFFORD H. POPE
CURATOR OF AMPHIBIANS AND REPTILES

Zoologists working in large museums are in a dilemma: Only a big city can support such a museum and nowhere is animal life less abundant than in a large city and its environs. The "expedition" is the usual answer, but another way of resolving the dilemma lies in periodic visits to a biological station. At such a place one combines the facilities of the laboratory with the animal and plant life of the open country.



THE SLIMY SALAMANDER—IT STICKS LIKE FLYPAPER

The slimy salamander is frequently found in the Appalachian region. When caught, it "sweats" a mucus so sticky that dirt adheres to the captor's hands and can scarcely be scrubbed off. A glance at the collector often reveals whether this species is in his catch. Individual shown is 5.75 inches long. Photo by A. M. Winchester.

The University of Virginia maintains Mountain Lake Biological Station in the Appalachian Mountains west of Roanoke, Virginia. Situated near a beautiful lake at an altitude of nearly 4,000 feet, this station has an unsurpassed setting. The deep lake of clear water is the only one of its kind in the southeastern states. It was not formed by glacial action but through the natural damming of a valley by great blocks of clinch.

Still greater in interest are the unspoiled mountains surrounding the station, some of which are covered with virgin forests. Every summer about fourscore graduate students and professional biologists forgather at Mountain Lake Biological Station, many with their families. The students receive formal instruction while the biologists teach and carry on research, with seminars and lectures scheduled every week.

RICHEST SALAMANDER FAUNA

The southern Appalachian forests harbor the richest salamander fauna known, a fact that led me to spend much of the summer of 1948 at Mountain Lake.

At meetings in Chicago of the American Association for the Advancement of Science, I had met Dean Ivey F. Lewis of the University of Virginia, the former director of the Mountain Lake Biological Station. Dr. Lewis suggested that I plan to work at Mountain Lake. Thereupon, I wrote to Director Bruce D. Reynolds and it was through his courtesy that the arrangements were made.

Since I had never before worked at such a station, it was a pleasant surprise to find that one of its chief virtues is the almost infinite possibility of co-operative endeavor and exchange of information. For example, when I needed minute animals with which to feed hatchling salamanders only an inch in length, I was shown by fellow researchers two sources of food. Miss Lucile Walton, of George Washington High School, Danville, Virginia, explained how, at that season, aphids of various sizes could be found in the galls on witch-hazel leaves. Dr. Lillian C. Thomsen, of Mary Baldwin College, Staunton, Virginia, provided me with great numbers of fly larvae that she had found in muck at the base of an oak tree. The information and material supplied by these specialists were merely incidental to their own problems. This shows how knowledge unimportant to one zoologist may be of great value to a colleague.

Dr. A. M. Winchester, of John B. Stetson University, De Land, Florida, proved to be extremely expert at taking photographs of small animals of all kinds and even succeeded in getting a remarkable picture of a rattlesnake in the act of striking. This had to be done with an exposure of only one five-thousandths of a second. Miss Catherine M. Russell, of New York Medical School, made cultures from the mouths and venom of the rattlesnakes in an effort to determine the role bacteria play in snake poisoning. There is considerable difference of opinion among "authorities," some believing that infection invariably follows bites of venomous snakes, others that such infections are merely incidental and occasional.

HAPPY DAYS!—MANY RATTLERS

All this work with rattlesnakes was possible because the summer of 1948 proved to be an unusually good one for dangerous snakes. Two rattlesnakes and a copperhead were found at the station and many additional rattlers in its immediate vicinity. In fact, Salt Pond Mountain on which the station is located has long been notorious for its rattlesnake population, and the original inhabitants were surprised that the biologists would live in such a dangerous place.

Co-operation outside of the laboratory was just as profitable. Years of collecting in the Mountain Lake area enabled Dr. Paul R. Burch, of the State Teachers College at Radford, Virginia, to lead us to a rattlesnake den as well as to a dam under which the giant salamanders known as hellbenders could be found. In this country these grotesque creatures grow to be more than two feet long; the only other kind lives in eastern Asia and is much larger. Colonel Robert P. Carroll, of the Virginia Military Institute, did not hesitate to tell us where many rare and even undescribed species of salamander had been found by him and demonstrated the advantages in learning the complete fauna and flora of one area such as western Virginia. His approach is in sharp contrast to that of the specialist in the large museum who attempts to learn the world fauna of one group of animals and may yet be ignorant of the floral and faunal setting in which the animals live.

CELLINI AND THE SALAMANDER

As already mentioned, field studies of salamanders had led me to Mountain Lake. Because of a lizard-like shape, salamanders are constantly confused with lizards. Actually, these animals are amphibians and lack scales, whereas a lizard is a reptile and has scales. Like other amphibians, salamanders have a moist skin and live in damp places. Strangely enough, salamanders have always been known to folklore as creatures that live in fire. In his famous autobiography, Benvenuto Cellini, the Italian metal artist of the 16th century, tells how a salamander was forcibly impressed on his mind. His father saw one crawling on the family hearth and forthwith gave young Benvenuto a sharp slap on the cheek, not by way of punishment but simply to make him remember forever the strange, fire-loving creature. The poor salamander certainly had been driven by the heat of the flames from its retreat in one of the logs piled on the hearth.

In the southern Appalachians these "spring lizards" are so abundant that they frequently get into water pipes and turn up in basins and tubs. Occasionally someone who drinks directly from a pipe gets a salamander in his mouth. It is commonly believed that the aquatic kinds keep springs and wells clean and therefore should not be killed. Although this belief is groundless, some of the species are confined to cold, clear mountain water, which of course is always relatively clean.

Having studied the distribution and life histories of the various species found in western North Carolina and neighboring parts of South Carolina and Georgia, I was anxious to make similar investigations of

the kinds found in western Virginia. Although twenty years ago salamandering was more or less of a hit-or-miss proposition, it has today become scientific. Instead of going to the wildest place one can hear about, one now pores over physiographic and topographic maps for hours in an effort to work out the probabilities of distribution based on physiography, geography, and faunal and climatic conditions.

The rarer salamanders of the woodland group live in dark, damp forests at high elevation. Experience has shown that a few kinds are found in every such forest. A thorough knowledge of the distributions as far as known is a prerequisite to a study of the various types of maps, chiefly topographic ones. This perusal of the maps invariably brings to light many fascinating gaps in our knowledge of this or that species. Here is an area of the preferred type of forest from which no salamander has been recorded. Will this particular forest prove to be inhabited by a salamander known to occur somewhat farther north, or will it be in partial or total possession of one common to the south? Or perhaps its heavily blanketed floor conceals an entirely new species. It is, of course, the principles of animal ecology and geography involved that make the work valuable from a scientific point of view.

The kind of salamander investigation described here can no longer be carried on with specimens preserved in a museum. This is why the worker himself must go out and find the animals. As a matter of fact, some herpetologists still attempt to draw conclusions from "pickled" salamanders, but the cleverest student is apt to go astray. One of the chief reasons for this is the instability of color in salamanders. The markings may so completely disappear that identification becomes excessively difficult. A scaly animal like a snake or lizard that has lost its color is more easily named than a scaleless creature like an amphibian.

One of the most striking of the southeastern woodland salamanders was first found in 1902 by Dr. Franklin P. Sherman, who was then State Entomologist for North Carolina. He sent two specimens to Dr. C. S. Brimley, who forwarded them to the United States National Museum where they were stored as specimens of the common slimy salamander. Not until 1916 were they recognized by Dr. Emmett R. Dunn as belonging to an entirely new species, which was named *Plethodon yonahlossee* after the region in which it lives. Dr. Sherman had made a note to the effect that the two specimens when he found them had had red backs but the National Museum herpetologist, unconvinced, took no action; their backs had turned black long before he saw them. This case shows not only how unstable are salamander colors but also how hard it may be for a small animal to get a big name.

WYOMING QUARRIES YIELD SEAFARING NOTHOSAURS

By RAINER ZANGERL
CURATOR OF FOSSIL REPTILES

During middle Triassic time, some 187 million years ago, the geography of Western Europe was very different from what it is today. There were sea basins in which large quantities of limestone and shale became deposited. The shorelines of these sea basins were populated with a variety of animals, among them many invertebrates, several kinds of sharks, and a considerable variety of fishes with ganoid type scales, as in the living gar pikes. There were also many different kinds of reptiles, of which the most conspicuous and typical group were the nothosaurs.

Nothosaurs were seafaring creatures well adapted for swimming and feeding in the water. Most likely they never went ashore, or if they did, it was only for the purpose of laying their eggs or basking in the sun.

Until 1935, nothosaurs had been known from Central Europe only; not even a fragment had been identified from any deposits in the New World. During the summer of 1935, Don Allsen, a student at the University of Wyoming, discovered some bones embedded in pieces of hard limestone on a quarry dump near Goose Egg, Wyoming. The rock had been quarried for road gravel and was derived from a relatively thin band of hard, partially dolomitic limestone, the so-called Alcova limestone of Central Wyoming. This limestone bank belongs to a formation 1,200 feet thick that consists mostly of sand and siltstone, the so-called Chugwater Formation. The Alcova limestone is only about 20 feet thick, but it is very conspicuous wherever it crops out because it forms vertical cliffs that can be seen from great distances. Since all of the Chugwater Formation has furnished very scanty fossil materials, and some parts of it none whatever, the value of the discovery of a partial skeleton of a nothosaur from the Alcova limestone is very great indeed, both from the geological and the biological standpoint.

The first specimen was described by Dr. E. C. Case of the University of Michigan in 1936 as *Corosaurus alcovensis*. The specimen comprised the skull, a large part of the vertebral column, the shoulder girdle, and the front limb. The pelvic girdle and the rear limbs are missing.

It seemed desirable for several reasons to plan an expedition with the specific purpose of obtaining more materials from this formation. Such an expedition was organized by Chicago Natural History Museum last summer, with the result that about a dozen additional specimens, presumably of the same species, were obtained, besides a large number of isolated bones and a specimen of another reptile whose systematic position cannot be determined until it is prepared.

Securing specimens from a hard bank of limestone belongs to the more difficult paleontological field operations. In this case, it involved the peeling off of coarse-surfaced slabs, each of several inches' thickness, over areas up to 400 square feet, and from the surface of the formation to a depth of up to six feet. Removing this mass of hard rock by hand, that is, with no tools heavier than tool steel chisels, sledge hammers, and crow bars, requires a great amount of exceedingly hard physical labor. The skeletons are buried either inside the rock, in which case they cannot be detected except on the break surfaces of the slabs, or they lie on the bedding planes of the formation and thus are visible when the slab covering them is being removed.

The preparation for study of this material will require patience, time, and great skill on the part of the preparator, because the bones are much softer than the surrounding rock.

The members of the party were Mr. William D. Turnbull, preparator in the Museum, Mr. George Snyder, geology student at Dartmouth College, and the writer. Mr. Allan Jaeger, Mr. Ben Moss, and Mr. Stefan Kraszewsky each spent a month with the expedition.

DIGGING SEA BOTTOM—IN WYOMING!

A paleontologist's life is not an easy one. Dr. Rainer Zangerl (left), Curator of Fossil Reptiles, and his expedition assistant, Mr. George Snyder, geology student from Dartmouth, really toil and sweat as they pry into the rocks for specimens of ancient marine creatures whose fossils indicate that nearly 200 million years ago an ocean covered the state now famous for cowboys and rodeos.