Repeated sterility tests indicate the complete absence of bacteria and show that this species is capable of growth under such conditions. The zoochlorella which the ciliate ordinarily harbors has been cultured independently on agar slants. Further studies on the symbiotic relationship of these forms are in progress.

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THE SCARRITT EXPEDITIONS OF THE AMERICAN MUSEUM OF NATURAL HISTORY, 1930–34

THE Scarritt Expeditions have now completed their fourth year of continuous work, and a preliminary account of progress made is here presented. Sponsored by Mr. H. S. Scarritt, of New York, the purpose of the expeditions has been to collect and to study early Tertiary fossil mammals, especially those of South America. This work continues the program of early Tertiary exploration initiated at the American Museum by Professor H. F. Osborn more than forty years ago, continuously and vigorously pursued in many parts of the world by Wortman, Granger, Matthew, Andrews, and many others. Such exploration had not previously been done by this institution in South America, and the first aim of the Scarritt Expeditions was to fill this gap in our exhibition and study series, and to cast needed light on the most neglected part of the world problem of early mammalian evolution.

The American personnel has consisted of G. G. Simpson, leader, and C. S. Williams, assistant, throughout the period now completed. In the field in Patagonia a number of local assistants have been employed at various times. Of these Justino Hernández is worthy of special mention.

The first Patagonian Expedition, 1930–31, left New York on August 8, 1930, and sailed direct to Buenos Aires by the east coast of South America. Negotiations for permits to explore were delayed by the Argentine revolution of September 6, 1930, but the expedition arrived at its principal base, Comodoro Rivadavia in southern Chubut (central Patagonia) on September 28. Until December 2 we worked in the general region south of Lake Colhué Huapí, then after a reconnaissance west of the Sierra San Bernardo spent eight days north of the lake. On December 18 a base camp was established in Cañadón Vaca, north of the Río Chico, which forms the drainage from Lakes Musters and Colhué-Huapí into the Chubut River. Here a remarkably rich deposit of the oldest of Ameghino's faunas, the so-called *Notostylops* fauna, was discovered and worked with great success for two months. From February 18 to March 22 work was continued in Cañadón Hondo, opposite Cañadón Vaca south of the Rio Chico. Thereafter work was principally stratigraphic and geological reconnaissance, with no attempt at intensive collecting. Our route took us to Cabeza Blanca, made famous by the Amherst Expedition under Loomis, then to the northern coast of the great Gulf of San Jorge at Bustamante, and southward along the whole coast-line to Puerto Deseado. On April 23 we returned to Comodoro on our way north, and after shipping most of the collections by sea to Buenos Aires drove overland to that city, which was reached on May 12.

The collection was cleared for export and Williams returned with it to New York, sailing on June 6, and there began the unpacking and preparation which occupied him for most of the following two years. Simpson remained in the Argentine until October 10, 1931, studying the great Ameghino Collection in the Museo Argentino de Ciencias Naturales[1] in Buenos Aires and the Roth Collection in the Museo de La Plata.

The end of 1931, all of 1932 and the first half of 1933 were occupied by the preparation, illustration and study of the collections of the first expedition.

The Scarritt Expedition of 1933–34 was also directed to Patagonia, with the purpose of completing the collections of the first expedition and particularly of investigating rumors of a rich fossil field in central Chubut, north of the area of most intensive previous work. Simpson and Williams sailed from New York on September 9, 1933, through the Panama Canal, and down the west coast of South America to Valparaiso, thence by rail to Santiago de Chile and by air to Buenos Aires. Preliminary negotiations occupied two weeks, and the party left Buenos Aires by motor truck on October 17. The route followed was westward through Buenos Aires Province into the Territory of La Pampa, thence south across the Río Colorado at Balsa la Japonesa, a brief visit to the Cretaceous strata of eastern Neuquén, a week working on the Cretaceous-Tertiary contact opposite (south of) Roca, and then cross-country to Trelew on the Río Chubut. Here Justino Hernández joined the party and junction was effected with Sr. Alejandro Bordas, working on behalf of the Argentine Museum of Buenos Aires, with whom we collaborated here and also later in the Colhué-Huapí region. After seventeen days near Trelew and Gaiman, the Scarritt Expedition went up the Chubut Valley to Paso de los Indios, a traverse

[1] Its present name. At that time still called the Museo Nacional de Historia Natural.

in which reports by Roth and others of mammal beds proved to be incorrect, and then southward into unmapped central Chubut. After much searching, the richest strike of the expedition was made here on December 5, 1933, in a large amphitheater known locally as the Rinconada de los Lopez. Work on this discovery continued until February 4, 1934, and after a period spent in carting and packing fossils and repairing damage done to the car by the extremely difficult traveling conditions, a short time was spent rechecking and adding to observations made by the first expedition south of Lake Colhué-Huapí. The field season was closed and the party moved to Comodoro Rivadavia on February 27. The collection was shipped by government tanker, and we proceeded to Buenos Aires by land, picking up the Trelew collection at that town and following the same route as in 1931.

After lengthy negotiations and with some difficulties which need not be detailed at this time, the second collection was also cleared and is now in New York.

In the course of the two Patagonian expeditions, the party traveled over 12,000 miles in the field and made a reconnaissance, from the view-point of its special aims, of an area of over 30,000 square miles. Detailed studies were made at twenty-five different localities. Fifty-four detailed geologic sections were measured, and many others sketched or estimated. Almost every known exposure of the early Tertiary in Patagonia was examined, including several hitherto unknown, and detailed observations on their stratigraphy and structural geology made. These stratigraphic results will considerably alter the present conception of the Cretaceous-Tertiary transition in South America. Aside from a series of rock samples from all the principal exposures and horizons and a few small miscellaneous collections, the Scarritt Collection consists of fossil vertebrates. Many fish, frogs, birds, crocodiles, turtles and snakes are included, giving a remarkably complete picture of the early Tertiary life of the region. Some of the members of these hitherto neglected or undiscovered groups prove to be of extraordinary interest and value. Mammals, the principal aim of the expeditions, are still better represented, with fine typical collections from all the known pre-Patagonian (*i.e.*, Paleocene through Oligocene) mammal-bearing formations, including the oldest, the Río Chico Formation, first recognized and defined by us, as well as the Casamayor, Musters, Deseado and Colhué-Huapí, from which, respectively, came the *Notostylus, Astraponotus, Pyrotherium* and *Colpodon* faunas of Ameghino. A number of new forms are included, but it is considered still more important that many relatively complete specimens were discovered of animals previously named on the basis of scraps and single teeth and hitherto more confusing than helpful.

Work on this great collection of data and specimens will not be completed for several years, but is being pushed as rapidly as possible. Twenty-one preliminary papers have been published, and several others are in preparation. A book, "Attending Marvels: a Patagonian Journal," gives a popular narrative of the first expedition. An extensive memoir on the stratigraphy and faunas of the Cretaceous-Tertiary transition and the Río Chico, Casamayor and Musters Formations is about one third completed. A shorter résumé and revision of the Roth Collection is completed and will be published by the Museo de La Plata. A detailed descriptive catalogue of the *Notostylops* and *Astraponotus* faunas in the Ameghino Collection is nearly completed and will be published by the Museo Argentino de Ciencias Naturales.

Aside from the completion of this research, future plans for the Scarritt Expedition include the extension of its collecting activities into other fields, and negotiations toward this end have already been started, but an announcement of definite plans would now be premature.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE OBSERVATION OF MITOSIS IN THE LIVING CELL IN AMOEBA PROTEUS

DURING the past few years *A. proteus* has been used in this laboratory as material for the study of cell division. It has proven excellent material, except that, due to the great number of granules, food vacuoles, etc., in the cell and the transparency of the nucleus at mitosis, direct observation of nuclear fission was impracticable. Recently the following method has been devised which permits mitosis to be quite readily followed in the living cell:

Two or three drops of hot .65 per cent. agar agar made up in saline[1] are placed on a thin microscope slide and allowed to set. Then a dividing amoeba, selected according to the criteria given by Chalkley and Daniel,[2] is placed on the agar in a small drop of culture fluid and immediatly covered with a cover glass. Fifteen mm square No. 1 is satisfactory. The cell is thus flattened but is not damaged, as the

[1] H. W. Chalkley, SCIENCE, 71: 442, 1930.
[2] H. W. Chalkley and George E. Daniel, *Physiol. Zool.*, 6: 592–619, 1933.