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FOR THE RECORD . . . .

The appearance of this journal some twenty months after the Society's inception marks the beginning of a new phase in its development. The past year has been devoted to gaining familiarity with the widely scattered and comparatively little known caves of this state, while the immediate future will, we hope, see this general knowledge extended with more detailed attention directed towards a few of our major systems. This means that the objectives of trips will be more clearly defined; that before leaving Sydney, leaders will know just what they hope to accomplish and will have a fair idea of their chances of success.

This change clearly brings with it new responsibilities for the leader. Formerly required to do little more than organise transport and similar luxuries and consequently often expendable, he will be responsible now for the following:

1. Planning:

The leader should plan the trip carefully before leaving Sydney, make full use of former reports and any other available information, and hold a pre-trip meeting of intending participants at which the objective and the means of its realisation are discussed.

An hour or two spent in deciding just what you want to do and how you are going to do it may mean that you do not leave vital equipment at home. It may mean that the time saved at the caves amounts to many times that period.

2. Report:

The leader should furnish a report as soon as possible after the trip and participants should assist him in this by recording observations on the spot.

For any work done to be of value, results must be carefully recorded and presented. In writing reports the question of accuracy of measurement is of great importance and order of accuracy should always be given, preferably with the means employed for measuring; for example, a distance might be guessed, paced, measured with tape, or with rangefinder.

Not only upon the leader, but also upon participants do new responsibilities devolve. We hope that all members will co-operate with leaders in any reasonable request.

For the Record..... Contd.

Attention was drawn above to the importance of presentation of results, and thus we are brought to the aims of the journal, which briefly and broadly stated, are:

(1) to serve as a vehicle for the interchange of ideas and opinions in items of speleological interest,

(2) to provide a medium for the publication of data from reports, and original observations on Australian caves.

We feel that it would be unwise in stating its aims to unnecessarily restrict the publication's scope, and consequently members are invited to interpret them as broadly as they wish, and to contribute to, and expect from the journal anything falling within the wide limits implied from the above paragraph.

Wherever definite results are obtained, the reports of trips will be summarised and the results stated, while all data collected will be published in detail.

The frequency of issue has not yet been decided upon, but for reasons well known, it may happen that only one issue will appear during third term. A sub-committee is to be elected to produce the journal and it will decide this question.

The journal then, is to serve as a record of results and data, but as words can only inadequately describe appearance, certain shortcomings are evident. In overcoming them, photography plays a leading role.

As a means of recording quickly and accurately formations, cave fauna, rope technique and many other subjects, the camera, especially if used in conjunction with colour film, is unrivalled; indeed the production of competant record photographs should be the aim of every caverneer who wishes to perpetuate his experiences or record his discoveries.

Record photographs, whether merely intended to give the observer as realistic and natural a representation as possible of the actual scene, or specially designed so that measurements may be made from it, are frequently of great value.

On the other hand there are interpretive shots in which the pictorial arrangement is the main consideration, and whose value lies more in the manner of taking than in the interest associated with the subject.

For the Record..... Contd.

It is our hope that in time the Society will acquire one of the best collections of cave photographs in existence, including work, in both monochrome and colour, from each of the three categories mentioned above, while most highly prized of all will be the print combining accuracy of presentation and agreeable arrangement of subject material.

In this introduction we have stressed the importance of recording results and have drawn attention to two means of doing that - the camera and the Journal.

Working in either of these media may afford considerable satisfaction. It is surely better that our accomplishments form stepping stones for ourselves and others rather than that we and they must start anew on every trip.

All of us may not have cameras, but all of us can write.

NOTES ON SUBTERRANEAN HYDROLOGY.

P. Fielding.

To those who busy themselves in investigating underground caverns, the question might occur, "How did these formations come about?". The answer is immediately obvious - "By water." The study of cave formation is embraced in the science of Subterranean Hydrology.

This science may be roughly divided into two sections:

(a) The practical importance and application of subterranean waters in everyday life.

(b) The "study of all the problems inherent in the origin development and destiny of subterranean caves."

The practical importance lies mainly in the utilization of the waters for hydro-electric power, irrigation and the supply of drinking water. Much research has been done on investigating underground waters used for drinking, with the result that water so obtained is sterilised, a procedure necessitated by the fact that during its passage through the limestone system it comes in contact with dangerous organic impurities. Allied to this is the identification of the correct source of a river which appears to come from a limestone system. The most outstanding piece of work in this connection is that of N.Casteret who proved, by underground exploration, that the source of the Garonne was the Rio Barranco which disappears in the Trou de Toro in the Maledetta massif of the Pyrenees.

Under section (b) come the main mechanisms of cave formation, namely action of subterranean waters, hydrostatic pressure and erosion (mechanical).

With regard to the first, all subterranean waters have for a common origin, surface water introduced by natural cracks. Rain water is the principal supply. These waters may be divided into two classes:

(a) Hot thermal waters heated by earth's heat, often containing dissolved minerals.

(b) Cold water near the surface.

The latter class only is of interest to us.

It is also necessary to have a knowledge of various rock types found in and around limestone. The two main types are (i) impermeable, and (ii) permeable.

The first type includes crystalline rocks such as granite, porphyries, gneisses etc., which owing to absence of fissures and compact nature, only permit water to run over the surface.

In rocks of the second class the ground waters sink down the fissures and re-combine as rivers, water tables, and reservoirs which afford wells and river sources.

There are three types of permeable rock:

Loosely packed:	i.e. not cemented together, e.g. gravels.
Porous rocks;	Permit water to filter moderately rapidly, e.g.certain chalks.
Fissured rocks:	Possess joint planes, stratification, and lithoclases. e.g. limestone.

Water may be taken in on porous beds or fissured rocks, sink down and encounters impermeable rocks. A layer of water will be formed and if the impervious rock cuts the surface the water emerges.

Otherwise the porous rock is very deep and the water lies in so called water tables.

All limestones are deeply fissured and usually rest on impermeable ground and no water can flow right down to the junction and lie there. Instead of forming a great lake the water dissolves the material in the joint planes and so forms a maze of galleries and canals. However the mode of formation of each gallery and their final joining to give a system has been subject to much speculation. E.A.Martel advanced this theory to explain the formation of these galleries.

In the limestone there exists small pockets that are joined by the joint planes of the limestone. They are often very near, but on account of their frequent parallelism are not united. The water accumulates in these pockets and the hydrostatic pressure so exerted enables the water to force its way through the joint to the next pocket. Thus, by continuation of this process the joint is enlarged, and so underground tunnels are formed.

The above theory has been given some backing by the discovery in the Joliet Limestone (U.S.A.) of several roofed cavities. The general description of one is as follows: A large open cavity was joined to an elongated lateral pocket, connection being made by a tube that was of the same width, but only half as high as the pocket. Another roofed cavity 25' long by 10' wide and 15' high lay close to and nearly parallel to a larger cavity, the only connection being a hole 2' by 2'. The shape of these cavities suggested that water had been present and that solution had taken place.

Frequently in limestone, wells are found, sometimes extending to great depths. These are formed by underground water courses corroding and undermining their canals, thus causing their roofs to collapse and this goes on until a well is formed.

The above remarks are intended to ibdicate the nature and extent of underground hydrology, its applications to everyday life, and its important role in cave formation. Not a great deal of work has been done on this subject as evinced by the lack of literature, and it is hoped that one day in the future, things might look a little brighter due to the efforts of some keen "trog".

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Cave Fauna.

J.C.Kelly

In this first article a brief review of the historical development of this aspect of bio-speleology and some general remarks on animal life in caves is being represented.

More detailed information on specific Australian types will follow in a later paper.

The first documentary evidence of true cave fauna comes from the prehistoric Magdalenion epoch. It is a sketch, scratched on a bison bone, of the insect, Troglophilus. The fragment of bone was found in the "Trois Freres" cave at Ariege in the Pyrenees. This insect has long disappeared from Western Europe, but is still found in Italy, and Asia Minor.

The next discovery of any importance was the discovery, about the middle of the sixteenthcentury, of the fresh water crustaceans - Niphargus.

The first really significant discovery, however, was made in 1768, in the Cave of Istria. The animal in question was the amphibious newt Proteus Anguinus which dwells in underground streams and lakes. This cave "salamander", since found also in Yugoslavia is blind, but is exceedingly sensitive to light and avoids it. It grows to about a foot in length and has four legs.

During the last century the number of cavernicolous animals has increased tremendously.

With such numbers of new species being discovered it is only natural that biospeleologists should concentrate on the zoology rather than the biology of the new discoveries. In this systematic study of their zoology, the cave fauna were classified into three groups:

<u>Trogloxeni:</u> Those which lose their power of reproduction in a cave environment.

<u>Troglophili:</u> Those which retain this power and could still live in daylight.

<u>Troglobi:</u> Those which are born, live to die in darkness and could not survive in daylight.

The first class arrive accidentally in caves and so do not concern us here.

The second class actively seek out and prefer the underground darkness.

The origin of the third class is an open question. Perhaps their ancestors were Troglophili, and we find that most cave animals come from groups habitually dwelling in damp, dim places, under stones or at the bottom of streams. An example of this is the blind white isopod Tithanethes. It is related to the British wood-louse, Porcellio which dwells under stones, or under the bark of trees. The Tithanethes, then, were pre-adapted to their cave environment when millions of years ago they entered it. Time, which takes care of more things, has so evolved them that now they cannot leave the caves and live.

Perhaps the initial colonisation of caves was accidental and the creatures so trapped managed to survive and reproduce. This is especially so for aquatic animals. Consider the minnor Paraphoxinus, found in European caves. It is really a surface fish, but perhaps in the slight reduction of its scales it is tending toward a characteristic common of cave fish. The blind white fish found in some Cuban caves may have had a similar origin, i.e. accidental entry into caves without any pre-adaption.

Undoubtedly, a combination of both the above methods has resulted in the cave population that we know today.

Before listing the general characteristics of cave animals let us consider the environment which gives rise to them.

A region of great importance is the "twilight" zone. This is the region near the cave entrance. At the outer end of this zone the surface climatic conditions are closely followed. The alternation of day and night, the seasonally variations which dominate the epigean (above ground) animals the changes in temperature and humidity are all present, but their variation diminishes as we proceed through the zone toward the inner caverns. The cave becomes darker, damper, quieter, and colder. The fauna found in the "twilight" zone show a tendency towards the characteristics listed below for the tru Troglobi. They are generally Troglophili.

We move into the dark zone and here are found the typical cavernicolous fauna. Theirs is a world of total darkness, low and constant temperature, high and constant humidity (commonly above 90%) still air, and unbroken silence.

The creatures found in this monotonous environment are very often blind, or have partly atrophied eyes, and are usually unpigmented. To compensate for their lack of sight, their organs of touch are very highly developed.

A not fully understood peculiarity of insects dwelling on cave walls is a tendency to develop long spindly legs. The cave grasshopper, Dolichopoda bolivari exhibits both this tendency and those mentioned above.

Another interesting example is the cave rat Neotoma, originally discovered in the Mammoth Cave, Kentucky, and since found in several American caves. It has very highly developed whiskers and hypertrophied eyes.

Phosphorescence among cave animals is rare, although two examples are known. They are a species of glow worm found in some New Zealand caves, and a similar species found in abundance in Marakoopa Cave, Tasmania.

Now that we know what a numerous and diverse population exists in caves, the question arises - what do they eat? All their food must come directly or indirectly from the surface world. Heaps of dead and rotten wood, leaves and other organic matter carried in by underground streams support springtails, millipedes, and some beetles These springtails, millipedes and beetles are themselves food for carnivorous beetles, spiders, phalangids, and pseudoscorpions.

The bodies of animals trapped in caves, moths and other creatures that wander about between entrance, "twilight"zone and dark zone all help the food supply.

Bat dung (guano) is a further important source of food. (The study of bats themselves is an interesting one but is too long to be dealt with adequately here). The guano piles support colonies of coprozoic (dung eating) insects and their predators. The true guano eaters show no specialisation at all. They are fully pigmented, have normal eyes, legs etc. even though they are born, live, and die in total darkness. Their predators, however, are often highly specialised to their cave environment. For those who would pursue the study of bats or coprozoic insects further, I shall close with a quotation from Prof. Jeannel's book, "Animal Life in Caves" :

> "When you enter a guano cave the first thing noticeable is an intolerably strong, bitter smell. It is due to a mixture of bat odour and the odour due to ammoniacal fermentation of the guano.
>
> "The atmosphere is warm and damp. The floor is black with guano, the roof is black with bats.
>
> "Thousands of insects,myriapods scatter as the intruder advances (perhaps knee-deep in guano), clouds of diptera flutter in the air, together with the disturbed bats; millions of ptnides writhe about in the guano......"

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SOME CURIOUS AUSTRALIAN CAVES.

Sci. Amer. Supp. P.22667. Feb.7, 1903.

John Plummer.

Among the numerous minor cave systems found in N.S.W., none are more remarkable than those situated at Oakey Ck, in the heart of a country rich in mineral wealth - gold, silver and tin being frequently found, also diamond and other gemstones....

The caves are situated about a couple of miles from Cudgegong, a small but thriving rural village, surrounded by well cultivated farms. .....

The entrance to the caves is situated in a sequestered nook, and might be unsuspectingly passed by anyone not aware of its real character. How it was discovered has never been explained, but the first explorer must have been possessed of considerable nerve, for the opening is very small, only large enough to enable a moderately-sized person to crawl through, and when the visitor has safely accomplished this feat, he finds himself encircled by Cimmerian darkness. But directly a candle is lighted a wonderful transformation takes place, and a most enchanting scene, formed by multitudes of dainty, f antastically-shaped stalactites and stalagmites become revealed to view. The floor is one vast deposit of carbonate of lime, and from the roofs and sides of the calcareous cavity the same mineral hangs pendant in strange conglomerate shapes, that are sometimes artistic and sometimes grotesque. The visitor, unless forewarned, has not time enough to take in the beauty of the natural curiosities before he experiences a revulsion of horror at which is likely to make his flesh creep and his hair stand on end with apprehension of peril. No sooner does the light dispel the darkness than he is made aware of the presence of scores of bats, whose whirring flight is likely to make the unsophisticated conjure up ideas of hob-goblins and other denizens of spirit land. Right at the entrance too, is a solid white block, which has been formed by the constant drip of the limestone, and which from its supernatural appearance and resemblance to the human form, has been christened the "Ghost". In this large cave there are four or five chambers, all similarly formed.

In the main eastern one a dwarf fissure communicates with the uppercrust or "terra firma", through which a tiny stream of light enters, which only serves to make the intense darkness a greater source of apprehension.

The large cave leads to another known as the "Blow Hole", the mysteries of which have never been penetrated. The entrance is by a crevice equal in size to the outer opening of the Caves, but on throwing a stone in, some seconds elapse before it is heard, strike bottom - a sufficient admonition to the most venturesome of the abyss within, to explore which would be literally walking into the jaws of death. Those most familiar to the Caves express an opinion that if the Blow Hole were properly explored, another series of subterranean passages would be discovered.