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wouldest do, and he would have thee take thy ship Nimrod to the city of Cowes, and there abide for a space till he may come to thee.

¶ Straightway therefore, did Shackleton bestir himself, and with all haste betook his ship and his company to the city aforesaid.

And in due time, amid the clang of mock battle and the flaring of trumpets, came on board the Great King, and also did he bring with him the Queen, and the Royal Princes and Princesses his children.

And after that he had surveyed the ship, the King did bestow upon Shackleton a mark of honour, and the Queen did with her own hand graciously entrust unto him a banner of the country, and spake kind words to him and his company, so that their hearts did swell within them.

¶ Now it was even so that the ship Nimrod, although made so strong, did not possess great speed; Shackleton did therefore bid the captain whom he had chosen, to take the ship to that portion of the dominions of the Great King which is called New Zealand, and did also send in the ship two men who were to dwell with him in the strange land.

One of these was of the number of wise men, who did know all things about the fish that swim in

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the sea, and the beasts and creeping things which do abound therein;

And the other was also a healer of the sick and a mender of sundered bones.

And Shackleton and the rest of the company did abide yet a few days more with their own people, and then departed in large and swift ships to the land of New Zealand.

¶ Now it is well known of all men that many thousands of miles south of the rising of the sun, there lieth a vast continent which is also part of the dominions of the Great King, and is called Australia.

And it is also known that ships which go to the country of New Zealand, do often call at the ports of this land on their journey thither.

And it came to pass that the ship in which was Shackleton did stop at some of these ports and there abide a space.

And when the people of the country did learn he was there, even in their own cities, then were they rejoiced and made exceeding glad, for the knowledge of the work he would perform had spread unto every country.

¶ Then did the great men of the land and the wise men, gather together and commune amongst

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themselves, saying;

Behold! the task which Shackleton hath set himself to perform is great, and the good which shall come from it, will it not also be unto us, as unto the country of the Great King.

Let us therefore of our plenty, give unto him five thousand pieces of gold and thus give him a leg up, which being interpreted is to say, help him over the stile. And they all with one consent did exclaim,

Yea! let it be even so.

¶ Now amongst the wise men of the land was one whose fame was noised abroad over the whole earth, for he had travelled from his youth up in every country in pursuit of knowledge and the furtherance thereof, and whose name was called after that of one of the mightiest kings of old time, even David.

And though his years were not few and his hair was whitened unto the likeness of hoar frost, yet was his blood still full of fire and did flow swiftly through his veins;

And his body was lusty and strong as that of a young man, for could he not with one biff, which is to say, sallikatowzer, of his clenched hand, totally flummax, or in the modern tongue, put to sleep, a fullgrown and stalwart man.

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And he approached Shackleton, saying, Many things have I heard of this land to which thou art journeying, and fain would I see with my own eyes the mountains of fire which are reared up amidst the snow and ice, and all the wonders of this strange country.

Let me therefore bid farewell to my wife and to my children, and come with thee; and Shackleton bade him be of good cheer and come.

Also from this land of Australia took he two more; one of whom was a man learned in many arts and sciences, and who did bid fair to become known amongst the wise men; he was also of great length of limb and appetite.

The other was dark of hair, and short of stature, and had fought in the armies of the Great King; also was he a mighty hunter.

In the fulness of time came Shackleton and all his people to New Zealand, where his ship Nimrod did await him, and for the space of fourteen days did he abide there.

And the people of the country, both great and lowly, did make him welcome, and did give him and his people many blowouts, which is to say being interpreted, banquets.

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And so that they also might assist him in his labours, did they give unto him one thousand pieces of gold, and did lend unto him a great ship built of iron, to help his ship Nimrod through the water.

¶ And it came to pass that on the first day of the year, that all was in readiness, and Shackleton with all his people went into the ship;

And after the High Priest had blessed the ship and the company, they did sail away, and all the inhabitants of the country did come to bid them farewell;

Many thousands of them going on the sea in ships, to see that they went the right way, and had in very truth departed, and the noise of their shouting reached up to the heavens.

¶ Now on the second day there arose a mighty tempest of wind and sea, so that many of the people on the ship were sore afraid, and did yearn for the land.

And it came to pass that the storm did rage for seven days and seven nights without abating, and the waters did rush with great fury over the ship Nimrod and the ship that was with them.

And many of the timbers of the ship were broken by the strength of the waters, and the horses and the

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dogs which were on the ship were in sore distress.

But behold! on the eighth day there came a calm and the waters were stilled, and the winds did cease their raging.

And the wise men did again begin to take sustenance, which they had not done for many days, by reason of their interiors being disturbed by the tossing of the ship.

Yet were they not healed, for when the sun had set, another storm arose, so that many and oft were their journeyings from Oyster Alley where they did live, to that side of the ship which the sailors call the lee.

¶ Now after many days of sore travail and danger, for oft times the ship was threatened by mighty islands of floating ice;

They did come to that great high wall of ice which is there set up, and which is called the Great Ice Barrier.

And there did they diligently search for a certain haven in which to place the ship, and in which the ship Discovery had rested beforetime, but lo! it was not.

Then turned they the ship towards the rising of the sun, and would have gone to that land which has

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been called King Edward VII Land, in honour of the Great King;

But they could not, for their way was barred by mountains and plains of ice, which were broken up and scattered abroad over the whole face of the waters, in such quantity that no ship fashioned by the hand of man could force its way through, or withstand the pressure thereof.

Many of the great leviathans of the deep did they see, like unto the one which the traveller Jonah of old time did explore, and also vast numbers of the fierce beasts of the sea that do abound in this strange country.

¶ And it came to pass that after many more troublous and weary days, they came to that mountain of fire and smoke which is called Erebus.

And near unto the foot of this burning mountain did they build them a house, and for the space of nineteen days they did lustily labour until they had taken out of the ship sufficient food and raiment and all their goods and chattels, their horses and dogs, and everything that was needed;

Then did the ship Nimrod return to the land of sunshine, where women and men do dwell, leaving Shackleton and his people to sojourn and to labour

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in the land of darkness.

And the rest of the acts of Shackleton and his people, and the dangers and tribulations that did beset them, will ye find in the next book of these chronicles, which are not yet completed.

WAND ERER.



LIFE UNDER DIFFICULTIES.



LIFE UNDER DIFFICULTIES.



It is not intended in these notes, as the title might lead one to expect, to make any reference to the difficulties which we experience in camping during the long polar night in this latitude of somewhere between 77° and 78° south. Attention is invited rather to some of our very humble fellow-creatures, animals quite microscopic in size, which are able to live under conditions which seem to us extremely unfavourable.

Some of these deserve our interest as being, in the absence of Penguins and Skuas, the only land animals at present living in this region, perhaps the only living things besides ourselves on the whole Antarctic Continent.

The instances of Life under Difficulties are all selected from the class of the Rotifers. The animals of this class, though so small, are comparatively very highly organised and sensitive, yet they share with the simplest animals, (the Protozoa) the power of

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surviving all kinds of climatic rigours, heat, cold, drought, etc..

Larger animals may protect themselves from heat and cold in various ways, or they may migrate to avoid them. Emperor Penguins and other animals which winter in polar regions, keep up their heat by means of thick layers of fat and warm coats of fur or feathers. No such protection can serve our microscopic animals. A thin-skinned creature, measuring when contracted no more than one hundredth part of an inch in diameter, can hardly have a coating which will keep out cold and heat, and we can only suppose that they are able to live although they do become very hot and very cold when subjected to these conditions.

TOO SMALL TO HURT.

A heavy swell is rolling in from the Atlantic and breaking on the rocks of a rugged little western seaport. On the cement wall of the pier the waves are rushing and climbing high up, till they are thrown

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back shattered into clouds of spray. Amid all this turmoil what of the little fragile creatures which are known to swarm everywhere in the water of the sea? Do they retire to calmer depths? If not, how will they fare as the water which is their home is shattered into dust? Surely they must be crushed to death, and perish in multitudes! Let us see!

A net is repeatedly thrown into the foaming crests of the waves as they tumble back, and a large quantity of spray allowed to strain through it. When the contents of the net are transferred to a little clean sea-water, and a drop of this is examined under a microscope, a busy and interesting scene meets the eye.

The water is alive with beautiful little cone-shaped animals of crystal transparency, with a ruby red eye in the middle of the large head. They swim powerfully by means of rapidly vibrating cilia on two projections at the sides of the head.

The animals are Rotifers, *Synchaeta* by name, one of the comparatively few kinds which live in the sea. They dart about in every direction, pursuing some invisible prey: the scene is like a fair. But what of the numbers of maimed and dead which one would expect to find after their stormy experience of a few

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minutes ago? They do not exist. The water is pulsating with vigorous life, and the rotifers appear quite unconscious that anything unusual is toward.

These delicate animals must escape destruction by reason of their small size. When they have a drop of water to swim in they have a world. However small the drop of spray in which they may be enclosed, it will be covered by the elastic surface film, which will save the animals from jars. They are too small to hurt.

If, then, they cannot be hurt under these conditions, the conditions are not unfavourable, to *Synchæta*. They only seem so to us, since those breakers would kill us, and would destroy a strong ship. It is even so in all the other instances: conditions which would be quickly fatal to us do not really present any difficulty to animals which have become adapted to them.

ENDURANCE OF DROUGHT.

The leech-like creeping rotifers of the order *Bdelloida* supply the most remarkable instances of the

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capability to resist drought, as well as heat and cold. They are essentially aquatic animals, and can only remain active so long as they are surrounded by water. Yet many of them live in situations which are liable to become dry; streams and ponds go dry in summer, and moss, among which most of the kinds live, only receives occasional moisture from rain and dew and snow. If the rotifers could not cope with this difficulty they would perish in great numbers in dry weather, as rotifers of other orders do. If dried too quickly they are actually destroyed.

If dried more slowly, as when mixed up with grains of mud or sand, or when sheltered in the axils of moss leaves, they appear to have warning of the approaching crisis. They contract into little balls and the skin exudes a kind of varnish which dries and seems then to be quite impervious to air. In this condition they may remain for an indefinite time, and may be blown about as dust by the wind, and thus distributed to all regions of the earth.

Thus the sand of the desert, and the polar snows may receive these living dust particles, which may last have pursued an active existence in the woods or moors of temperate regions; and in either case, if they happen on moist places they may in a few hours

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resume their interrupted life.

It is a curious result of this faculty of resisting dessication that animals which would terminate their natural life, probably in a few hours, at the utmost in a few weeks or months, may live over a long period of years.

Whether an individual, after hibernating in this manner for many years, could again enter on a long hibernation, is not known, but groups of individuals have been revived again and again after shorter intervals, though in diminishing numbers, some dropping out after each resuscitation,

ENDURANCE OF HEAT.

The capacity to resist heat is intimately related to that of withstanding drought. In a state of nature, some Bdelloids when dessicated, must also suffer very severe scorching from the tropical sun; yet mosses from tropical regions are found to be as productive of Bdelloid Rotifers as any others, and they readily revive when conveyed to temperate regions and steeped in cold water.

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Artificially some of these Bdelloids have been raised to very high temperatures. The actual figures given by Davis and others are not here available, but the temperature to which they were raised was certainly higher than anything to which they would be subjected under natural conditions anywhere on the surface of the earth, and many were revived after this treatment.

ENDURANCE OF COLD.

The Rotifers which are able to endure cold should interest us especially in our present circumstances, as they are at the moment under observation in the lakes around us at Cape Royds, and we have some personal experience of the cold which they have to undergo.

Bdelloid Rotifers abound in the lakes of Cape Royds, and there are several species. The conditions to which they are submitted are extremely severe. They are frozen into the ice very early in the autumn, and must remain frozen solid for at least the greater part of the year. With the ice of the smaller lakes and the margins of the larger lakes they must take the

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lowest temperatures that occur in the district. We know by observation that they survive after experiencing a temperature of -30° Fahr.. They were found living in the Blue Lake under 15 feet of ice, there being some reason to believe that at this depth melting may only occur at intervals of years.

It has been generally assumed that animal life ceases at the temperature at which water freezes, and this is in the main true of animals which swim in water, but whether the death is due to cold or to mechanical causes is not known.

Those who have worked at the microscopic life of the Arctic Region know that it must survive extreme cold somehow. The Arctic Region has a genial summer climate of some months duration, with abundant water and a vegetation of higher plants. The winter might be passed by resting eggs, and a new generation produced each summer. Professor Richters revived Water Bears from Spitsbergen some years after they were collected, but it could not be known whether the adult animals would have survived the winter of their native land.

At Cape Royds there is no doubt that the adult animals survive through the winter. Some of the species lay eggs, but the eggs are not plentiful. One

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species (*Adineta Grandis*) produces living young, being an exception in this respect in the genus. The life both of parent and young may apparently be arrested at any stage. Animals bearing from one to seven young may be seen, some well developed, some at a very early stage. This species is further remarkable as living in water so saline as to be a sort of brine.

Whether the same species which endure great cold can also endure great heat, can only be settled by experiment. All the species found at Cape Royds have been brought quickly from -30° Fahr. to $+60^{\circ}$ Fahr., and have then been found actively feeding.

Some of the rotifers found at Cape Royds are supposed to be species widely distributed over the world. Others are peculiar, and unknown as yet anywhere else, and one is of a very peculiar form.

Portraits of some of these Cape Royds natives are shown on the plate, highly magnified.

From the instances given above of kinds which can resist heat and drought, it will appear that the *Bdelloid Rotifer* is one of the hardiest creatures in the world. It promises now to shed much light on the limits of temperature at which life is possible on the earth.

J. MURRAY.

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faint stirring seemed to be going on about, which gradually made itself felt on my yet somnolent senses. Rising time was evidently drawing nigh. The uncertainty shortly came to an end when, in harsh tones, the familiar call sounded; 'Lash up and stow, lash up and stow; 8-30 and time all hands were up.'

This announcement, coming as it did from a pair of lungs boasting of an early training in St. Paul's Cathedral, and matured in the Navy, was calculated to effectually wake the profoundest slumberer, but did not prevent me turning over for a final doze.

It hardly seemed any time, however, before we were exerting our best efforts dragging the sledges onwards towards the southern goal. The drudgery of the journey over the great 'sastrugi' ruffled plateau of Victoria Land had now become felt by all.

Everlastingly our eyes wandered over the horizon in search of new objects, but as yet nothing greeted

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our gaze more than had been the bane of our march these last 250 miles, since leaving Mt. Lister behind.

Why we had ever come to choose our present route to the South—S.S.W. over the Victoria Land Plateau—seemed impossible of explanation. It was generally believed, however, that the strength of the meteorological element had prevailed in this decision, as it was decidedly a chance to get abundance of high level data.

Some of the more outspoken, irritated by the monotony of the journey, now expressed themselves in no measured terms regarding the alteration of the original plans. More especially had discontent arisen because of the fact that this had entailed the substitution of man power to the extent of the combined strength of the expedition in place of the ponies.

Today the march proved more interesting, as scarcely had we got properly under way, before the Commander drew our attention to a peculiar appearance in the sky, somewhat to the west of our course. It was like nothing he had had experience of in this latitude during his previous exploration with Captain Scott along the Great Ice Barrier.

Resembling open water, it suggested possibilities we had never till now entertained. As the day wore

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on, the more real did this phenomenon appear, so that every one was fired with a new enthusiasm. The sledges no longer seemed to offer any resistance, so that we pressed onwards at a brisk pace for two days.

The S. W. middle current wind, so prevalent to the north, had now cut out, and the warmer south-seeking anti-trade came down to the plateau level, helping us onward. Some miles ahead a fog bank hanging low upon the land obscured the horizon.

On the morning of the third day, we felt a crisis was close at hand, as the sky in front contrasted strongly with the uniform ice blink we were now leaving behind. The temperatures perceptibly rose as we came up to the fog bank. The tiny particles of ice floating in the air and producing the fog, were now so much more abundant that it was impossible for us to see more than about 100 yards ahead. The increased temperature was due, evidently, to liberation of latent heat set free by separation of the fog particles.

Camp had been pitched and the 'hoosh' served, when the hungry Scotchman was interrupted in his occupation of devouring any remaining tit-bits, by a shout from without. Enquiring heads appeared from the tents, and amongst the turmoil that ensued could be heard cries of, -'The Bottomless Pit,' -'Gehenna.' -

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A moment later our astonished gaze was greedily devouring the situation. The mist had temporarily rolled back, revealing a steep slope commencing shortly in front of us. The gradient increased rapidly until lost to sight in the mist, a couple of thousand feet below.

We appeared to be standing on the ruin of a huge volcano of unprecedented proportions. The wall on which we stood extended far to the North and South. Even as we watched, the cloud bank rolled yet further back, and a more extended view unfolded to our rapt gaze. The steep gradient, already noted, ended below in a yet steeper slope, almost wall like, whilst dimly, in the depths below, snowless undulating plains were visible.

What a mighty wall guarded the secrets of the abyss. What grandeur beyond anything to be expected. Our very souls were elevated and burned with a desire to penetrate the depths before us: yet how impossible this seemed. How could mortal man scale such a wall as barred our progress.

Whilst our thoughts ran thus, a better view being obtained to the South, we descried a steeply dipping slope leading from the plateau down to the depths below. This was developed in the form of a semi-

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cone against the face of the wall and appeared to be of volcanic origin. This volcanic slope was certainly quite scaleable, and we unanimously decided to attempt a descent by it. Many hours afterwards, camp was pitched on the plateau hard by the cone, and all were oblivious of the sounds of revelry occasioned by the snorers.

The following day the fog again enveloped the landscape, and the time was spent making the necessary preparations for the continuance of our journey with packs in place of sledges. The depth of the abyss before us was very great, but difficult at the time for us to judge. Afterwards it proved to be about 30,000 feet, or some 22,000 below sea level.

When at last the mist rose and we were able to proceed, advance proved rapid for the first 12,000 feet as we could glissade for long stretches at a time; at this level, the temperature having steadily risen during the descent, the ice cap began to dwindle and a lobed front was met extending amongst great accumulations of morainic material stacked in the form of terraces along the mountain side. Thaw water, developed in pools investing the erratic boulders distributed over the ice, trickled away to unite and form crystal clear stream, soon lost in crevasses, whither

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they plunged to swell the muddy waters of sub-glacial channels.

Camp was pitched at this stage and we indulged in the usual hoosh. The air felt quite warm and moist, so much so that instead of immediately crawling into our sleeping-bags, some time was spent in surveying the new scene before us.

At intervals spouting streams leapt from the glacier faces, and ploughing deep furrows in the morainic terraces at our feet, continued their downward courses as mountain torrents, till, almost lost in the distance below, they appeared as silver streaks threading their way by winding courses across the undulating plains of Bathybia, as we had unanimously designated this region.

Loud booming sounds proceeded upwards periodically from the depths below, occasioned by the precipitation of small avalanches breaking away from the ice-cap above.

Our biologist was busy examining lichens which coloured the boulders bright hues. There was abundant evidence of low forms of plant and animal life though curiously restricted in range.

Affairs had assumed such an interesting pitch, that we lost no time in getting under way on the following day. Novelties appeared on every hand, until we were

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in a condition to accept unmoved any new discoveries however radical.

When at last the steep slopes had been negotiated and the undulating plain reached, a much fuller insight into the conditions prevailing in Bathybia had been gleaned. The summer temperature averaged about 70° Fahr., and was evenly toned by abundance of water vapour and carbon dioxide in the atmosphere. The air was distinctly oppressive on account of its density and moisture, but even this passed unheeded in the general excitement. The plant life had rapidly increased in abundance as lower altitudes were reached. These were chiefly algæ fungi, though representatives of the mosses, liverworts, and ferns were not wanting. On the plains, a dominant red colour pervaded the vegetation, owing to prolific growth of red algæ.

The existence of red coloured plants was of course to be expected, existing as they did in sunlight from which a large proportion of the blue end of the spectrum had been eliminated in its passage through so great a thickness of atmosphere. Finally, the vegetation had already become very rank, and the odours distinctive of some species were not at all pleasant.

However much the plant life interested us, it did not claim our attention so much as less pretentious

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examples of the animal kingdom. Small crawling spider-like beasts had been noted close below the glacier zone; since then larger forms had made their appearance, some of which looked distinctly formidable.

The biologist had an encounter with one of these large bodied, short-legged animals, and was generally regarded as lucky in securing the specimen without harm to himself. It measured a foot in length and was armed with vicious looking mandibles. Though not identical with anything we had ever seen before, it much resembled a giant Tick, and was pronounced as belonging to the mite family. The existence of these great ticks constituted a distinct element of danger, and precautions were taken to guard against possible injury from that quarter.

With this object in view, we were careful always in future to keep our ice axes within reach.

Our first camp on the plains was never to be forgotten: most of the time intended for sleep was spent in ridding ourselves of an almost microscopic species of mite, which infested our camping ground and invaded our persons. We learnt that a camp in comfort could be expected here only after taking the precaution to previously burn off the vegetation from the site. In this way obnoxious creatures were removed.

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Already our progress was much impeded by the luxuriance of the vegetation, and as this state of affairs did not show signs of improving, we decided to attempt navigation on a river which lay about three leagues to the north, and appeared to be the main drainage line of this portion of Bathybia.

Some time elapsed before this new method of procedure could be put to the test. Raft building was not without its troubles, as we were unacquainted with the materials available and consequently their floating qualities had to be determined. At length a structure was completed which rode lightly on the water, and was regarded by the sea-farers amongst us as distinctly promising. In its construction we employed the dead trunks of huge fungi of a variety capable of resisting water-log. Large sheets of fungus several inches in thickness, found growing over the ground in moist localities, furnished an excellent decking, whilst a spyrogyra like alga was found to answer splendidly as a cord for binding the structure.

Whilst these preparations were in progress, several incidents of special interest occurred. One of these came near proving fatal to one who had gained much in favour by rendering signal service as a mountaineer during our descent. Provisions had become alarmingly

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scarce, and a section of the company decided that members of the scientific staff were much more likely to excel as connoisseurs in the matter of food stuffs, than prove experts in ship-building. As the labour of examining the natural products at hand did not present an arduous aspect, the scientist above referred to came manfully forward, and offered his services in this domain.

Instructions were issued to the effect that explorations should not be conducted far from camp, and the route proposed to be taken should be clearly defined before setting out. The investigator had been absent on his quest for over two hours, and the commander becoming anxious set out in search of the wanderer.

The search party had gone hardly a couple of hundred yards into the jungle, when they stumbled upon the prone body of the missing man. A giant Tick was investigating the carcass and apparently just about to commence operations on its prize. The obnoxious creature was forthwith despatched, and the body of the martyr reverently taken back to camp.

He still breathed heavily, but no wounds could be found on the body. A dread feeling seized us for, though living things had no terror for us, yet the intangible found us weak.

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For long the doctor diligently attended, in the uncertainty of the stroke, administering small doses of alcohol from our limited medical store. At last, after twelve hours, success crowned his efforts and the patient regained consciousness. Even now his senses seemed to have lapsed, and in his delirious ramblings, amongst inarticulate expressions, could be heard, "Yon's the reight stuff, man, aye it is!" Later on he seemed to come to himself again as he weakly asked for tea. Indeed so frequent became his cravings for this beverage, that one of us was told off especially to keep up the supply. It was not till the evening of the second day that the matter was cleared up.

All but the night watch had retired, when the supposed invalid suddenly stepped briskly from his bed, and made towards the food bags with a determination boding ill for our now inconsiderable stores. On this occasion the night watchman proved the value of the institution by quickly alarming the sleepers and averting what might have been a serious catastrophe.

Explanations ensued, and we discovered that the miraculously healed patient had merely had the good fortune, as he described it, to discover a succulent alga giving abundance of intoxicating liquid. No further explanation was required, as his subsequent behaviour

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was obvious to everyone.

Whilst this drama was being enacted, more valuable discoveries were made by others. The senior geologist, in company with a body-guard, had studiously applied his tasting faculties over a wide range of vegetable products, narrowly averting serious consequences in the case of several apparently poisonous substances. As a result of his investigations, three varieties were finally selected as good for human sustenance. One of these was a mushroom type of fungus, the others sweet tasting algæ.

Some of the algæ contained abundance of oil and made perfect kindling. With this material, spluttering torches could be made on a moment's notice.

We now had abundance of carbohydrate food, but did not feel disposed to try the culinary qualities of the monster ticks.

Today, an unusual disturbance took place in the atmospheric conditions, so that instead of the general calmness which usually existed in this region, we experienced a succession of cold blasts descending the valley walls. This change reminded us again of the conditions under which we existed here in Bathybia; a land where the sun shone red in the morning, pink at noon, and red in the evening. Our eyes accomodated

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themselves surprisingly rapidly to these new circumstances; possibly owing to previous exercise in the dull pink illumination of modern drawing-rooms. In the jungle the light was exceedingly dim and our exploits had to be conducted with great caution. Although since the recent discoveries, the food supply presented no immediate difficulties, we were loth to remain a winter in these regions for, though the summer conditions were bearable, there was no guarantee of their remaining so during the long dark night of the winter. As soon therefore, as the raft was completed, we launched out on our down-stream voyage, intending to make the most of our time collecting facts concerning this wonderful land.

Oars of a kind had been fashioned, but were mostly serviceable in polling the craft off weed banks, the current being quite sufficient to take us along at about two miles per hour.

Many were the suggestions offered for cooking our new food, but finally the amateurs gave over in favour of the chef, who had the power of making the most tasteless dishes appetising by attaching names. The concoctions usually served up in Bathybia were purées which, being translated, simply meant freshly gathered this or that, immersed in pure river water,

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and brought to a temperature of 212° Fahr. for an hour or more.

Naturally more attention was now bestowed upon the denizens of the river, and indeed their abundance and variety surprised us. Minute organisms belonging to the rotifers and tardigrada abounded, whilst larger species occasionally came into view. We spent many an hour peering into the waters in search of new finds, and were abundantly rewarded by queer sights. For several days our progress continued thus without serious event. The jungle, however, became alarmingly denser so that it was now almost arched overhead and presented a gloomy outlook. Unaccountable noises and glimpses of strange forms came to us through the weak light, but fortunately nearer acquaintance had so far been avoided.

Matters did not improve, so that we were soon hastening along beneath a complete covering of dense matted vegetation so effective in blotting out the daylight that, but for the fact that here was the home of phosphorescent fungi, we should have been in utter darkness. This greenish-white luminescent forest seemed weird in the extreme after the red light to which we had become so much accustomed.

Presently our meditations were disturbed by a

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volley of strong expletives of a nautical character coming from the starboard bow. We were just in time to rescue our comrade from the clutch of a dangerous-looking spider-like monster, several feet in length, that had attempted to board us. Invasions of these monster water bears, as well as unavoidable affrays with giant species of rotifers were all too common during this extraordinary voyage.

However, in accordance with the adage which states that necessity is the mother of invention, we soon discovered that these beasts without exception retreated in the face of fire, with which they were entirely unaccustomed. A supply of torches was kept in readiness as weapons in the event of need. By the aid of these, also, a better knowledge of the conditions around us was obtained. The river was now to all intents and purposes a subterranean stream cutting through the accumulated remains of dead sunlight-seeking plants, which still lived only far above, within range of the daylight at the upper surface of this dense mass of dead and living vegetation. This lower zone through which we now passed, was not altogether composed of dead material, but supported abundance of saprophytic types, chiefly fungi and bacteria.

No human being could exist long under these

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trying conditions, so that it was with joy that, after two days, streaks of daylight began to penetrate the tangled mass above. In a comparatively short time, clear sky stood above us, and the walls of rank vegetation on either bank slowly dwindle as we proceeded. With the return of daylight our spirits rose. During the same day we witnessed a fight between a water bear and a rotifer, both of giant size. Each of these several feet in length and must have been immensely powerful. The water bear seized on the rotifer from behind, and had commenced sucking the life fluid of the victim when, with amazing alacrity, the captive swung round his free end and seized his adversary in a bunch of tentacles. A furious combat ensued in which the water bear though much mauled, proved victor. We judged, from the action of rotifer, that something of the nature of an anæsthetic had been injected by his enemy. Definite proof of this was shortly forthcoming in an unexpected manner.

One of us, who had been in the habit of daily treating himself to a wash, whether he required it or not, when we floated out into daylight again, hastened to make up for lost time ; whilst dangling his legs over the stern and, at the same time, conducting an animated conversation on the relative merits of deer stalking in

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the Highlands and in more populous centres. Somebody had just made an unusually fitting salley when, above the ripple of applause, there sounded a wild yell followed by an apprehensive exclamation, "He's got my ruddy toe!" Quick was the word and sharp was the action that followed, else we could never have saved the bather from the malicious grasp of a giant water bear. The beast had already punctured the toe referred to, but was driven off before serious damage was done. It had had time however to inject an anæsthetic, as our comrade passed into a comatose state after about one minute, and did not revive for over half an hour.

So accustomed had we now become to our new surroundings that we passed a few days not unpleasantly, drifting down stream.

The vegetation, though luxuriant of its kind, grew much less dense, and we came at length to more or less open country. There plant life was represented by mushroom-like fungi arranged in clumps over the plain. Our artist was in specially good spirits and, on our mooring alongside the bank, took the opportunity to scramble on to the top of a clump of giant toadstools hard by, intending to size up the sketching possibilities of the neighbourhood. A sharp report shortly after attracted our attention in time to see him executing

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evolutions in mid air about fifteen feet above the summit of the toadstools and some thirty feet from the ground. It happened that this particular toadstool was matured and required to burst it only the slight irritation supplied by our comrade in mounting; fortunately the bed was soft to fall back upon, or a serious accident must have resulted. Our ingenious engineer was much struck with this demonstration, and conducted a series of experiments among members of the genus fungi represented in the neighbourhood. As a result, he brought to camp some time afterwards a huge flat specimen which, he averred, would make a fine mattress. In kindness of heart the specimen was given to his companion of the afternoon's adventure. Judging by the remarks made by the recipient during his sleep, he must have passed an unusually pleasant night. Indeed the mattress appeared to be still exerting a magic influence close on to the breakfast hour, when several attempts failed to arouse the slumberer. Then up came the ingenious engineer who, with a prick of an ice-axe in the proper place, fired the mattress, and shot its burden from the depths of sleep into broad daylight *viâ* the tent roof.

From this point on the river water became increasingly more brackish, so that we were much exercised

EXECUTING EVOLUTIONS IN MID AIR.





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in our minds regarding the future source of our water supply. After traversing several shallow lakes, the matter became critical and we decided to moor up to the bank. The neighbouring country was almost deserted compared with the jungle left behind. The saline soil supported only stunted vegetation, except for occasional clumps of mushroom-like fungi standing on local elevations of the ground. We were some distance from camp, making a reconnaissance, when a heavy rain storm commenced. Perfect shelter was obtained beneath the umbrellas of the fungi. As time went on, however, and the downpour did not abate, we grew anxious for the safety of our commissariat. Shortly afterwards, we might have been seen marching back to camp each sheltered under one of these novel umbrellas. The adjacent country already showed signs of flooding; it was, therefore, deemed best to pack our gear and remove it to one of the elevations. The waters continued to rise even after the rain ceased, so that our position was again threatened. We were now thoroughly alarmed, and hastily transferred our possessions to a flotilla of queer craft, consisting of fifteen large mushroom shaped fungi set in the floating position, and lashed together with alpine rope. Hardly had these preparations been completed, than the lapping waters

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swept us off in the strong current; we were eventually carried into a great salt lake.

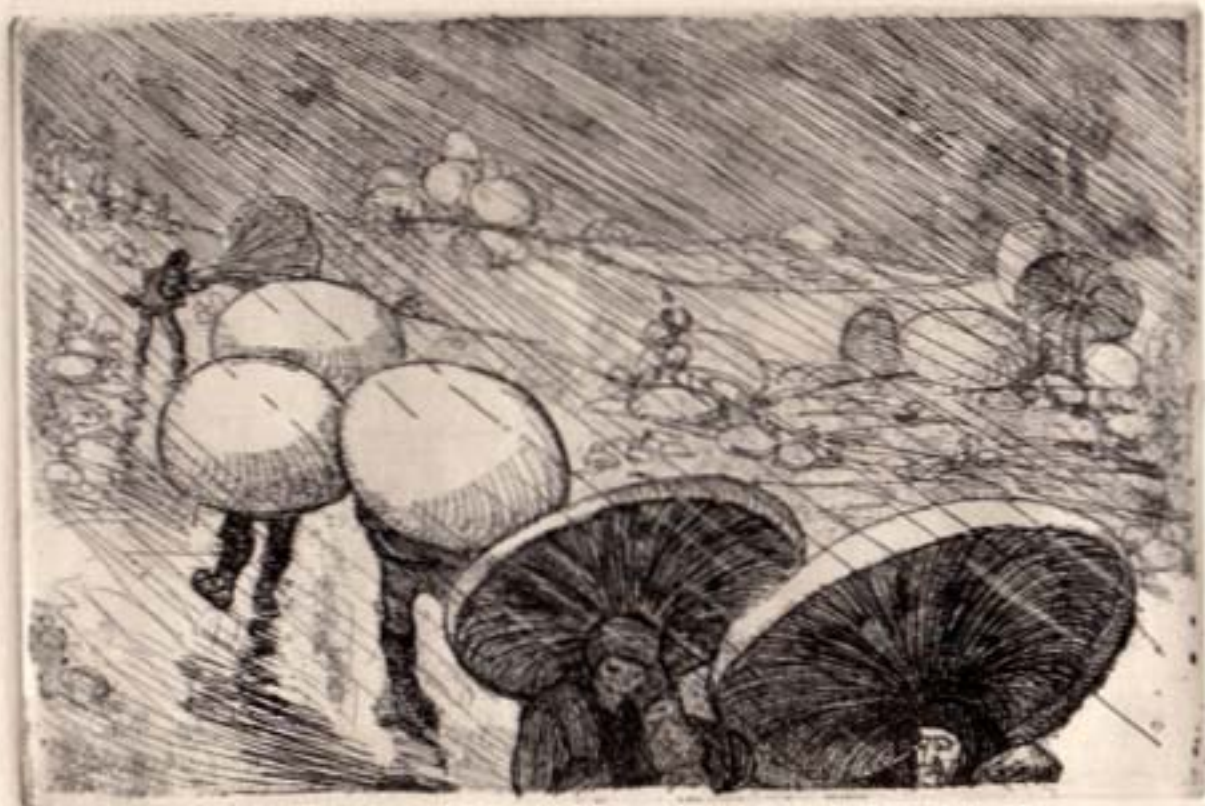
As the only fresh water available for drinking purposes consisted of that which chanced to have been caught in the bilges of our craft, great relief was felt when a steady wind set in driving us gently before it. Two days later we were fortunate enough to reach the further shore and, entering the debouchure of a large stream, succeeded in travelling some distance up it with a still favourable wind. Finally, on account of the opposing current we had to abandon the water and march on land.

One morning, just as most of us were rising, a scampering noise was heard without, accompanied by encouraging shouts of "Hi yah! hi yah! stick it, boy." Presently one of the equestrians, who had risen early to take his accustomed morning walk, came riding up, mounted on a new species of a monstrous mite. He pulled rein with a "How's this for a specimen, Mr. Biologist?" "Go to ——" was the answer, which meant that scientist was not having any.

This portion of our journey proved very wearying, as our daily marches were extended as long as possible. The direction in which we had been travelling, being across the main topographic features of Bathybia, was

EACH SHELTERED UNDER ONE OF THE NOVEL UMBRELLAS.





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calculated to yield a maximum of information in a minimum of time. Time, however, was now becoming a serious matter, though new information never failed. Since leaving the great salt basin of the central regions, our track had consistently risen. The total amount of this elevation now amounted to close on 6,000 feet. The jungle was fast becoming too dense to penetrate. Therefore, as a final coup before retracing our steps, we decided to ascend a high volcanic cone lying close by our course. From its summit, some 17,000 feet above, much information might be gained.

A summer snow cap descended for about 4,000 feet, whilst a perpetual wreath of smoke curled upwards from the summit.

It was noon three days later when we made our camp just below the snow line. The afternoon was spent by most of us in a visit to the summit.

Hydrocarbons were escaping from fissures in the ground near the summit, whilst continuous flames played about the crater, where the greater heat kept the escaping gases ignited. The rocks were very basic and heavy. Metallic iron occurred in many of the outcrops, and copper fibres were observed in not a few.

However interesting these observations were, they did not prevent us drinking in the distant panorama.

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Far behind was the great salt sea and saline borderlands. Ahead was a sea of jungle spread over gradually rising plains. Beyond, where frigid altitudes are reached, a great snowy plateau carried the picture beyond the horizon.

The whole party was overcome with the wild grandeur of the scene and, when it was time for return, we retraced our steps down the snowy slopes in silence. From this reverie we were suddenly awakened by a shout from the foremost, who had come upon the body of a huge animal, about four feet in length, partly buried in the ice. The biologist reported the beast to have affinities between the water bears and the mites, but distinct from anything we had so far noted in Bathybia. We got to work with our ice axes and soon had him out. The body being more or less cylindrical, we found no trouble rolling our prize to the camp near by. In the first instance our intention for so doing was merely to astonish our comrades. However, the biologist, seeing the specimen still intact, asked that it might be spared till further investigated. It was the peculiarity of our biologist to save his specimens for examination in the early morning hours.

After supper, it being the eve of our returning journey, a general discussion regarding the natural

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history and physical data so far experienced in Bathybia, was instituted. Summarising the various points brought forward as bearing on a scientific elucidation of the phenomena observed, the following are worthy of note.

Bathybia was a great depression some hundreds of miles across, bound on the East by a great fault face, but with more gently rising boundaries in other directions. In fact it might be likened to a portion, for example, of the basin of the Pacific Ocean from which the water had been removed.

It seemed to us almost certain, that the folding and faulting of the earth giving place to this configuration, must have taken place at a period corresponding to a maximum phase of a great ice age, when the Antarctic regions supported an ice cap of stupendous thickness. The ice must then have played the rôle of rock, when the great earth movement referred to occurred.

At a later date, as the ice age passed away, ablation, removing the ice strata, exposed the deep basin of Bathybia. The lower portions of this basin, situated below so great a thickness of atmosphere, was blanketed from the great cold of the upper regions.

To this end also, the humidity and increased abundance of carbon-dioxide in the atmosphere aided.

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Although in succeeding times, the highlands above were deeply buried under snow-fields, this deeply plateau locked basin could keep its floor for the most part unencumbered with water.

The atmospheric circulation, being distinct from that of the outer earth, presented special features. What was most to be remarked with respect to the atmosphere is that it contained a minimum of dust particles; so that, though the air was saturated with moisture, condensation seldom took place, except along the border lands, where fogs were very prevalent. The great rain storm, producing the flood we experienced, was probably due to an unusual disturbance of anti-cyclonic nature, whereby dust-laden air of the anti-trade belt above had descended, causing sudden condensation. The waters, continually draining into a central basin and there evaporating, led to the production of a residual salt sea.

A knowledge of the strata underlying the basin would have been of the greatest value, but of course exposures were not available. However, a great accumulation of coal producing matter was presented in the jungle zone.

Extinct volcanic activity had been noted along the fault scarp, and specially interesting was the active

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volcano on which we now stood. The great basicity of the lava, and the fact that it contained metallic elements, and probably also metallic carbides at a depth, as indicated by the exhalations of hydrocarbons, showed it to be typical of the deeper earth crust.

The abundance of both plant and animal life, and especially the curious restrictions governing their range seemed, at first acquaintance, inexplicable. The biologist now drew attention to the fact that all the species represented were but curiously developed forms of types already known to the scientific world. They had suffered but little variation, though many had increased enormously in size. Furthermore, it was known that such species could at one stage or another in their life-history be transferred for great distances by wind agency. Also many, even in adult state, after remaining frozen for long periods, maintained the power of re-animation when thawed out.

In the light of this information, it seemed most reasonable to suppose that the invasion of plant and animal life had come from warmer climates through the agency of the anti-trade winds.

It was just about two a.m., when a select few were in the act of brewing their tenth cup of tea since supper, that a movement in one of the sleeping bags

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attracted attention. An arm and then a head appeared followed quickly by the rest of the body. Silently the figure slipped on his boots and a moment later passed out of the tent with the intention of inspecting his specimen.

Almost immediately a wild commotion rent the air and, as we burst from the tent, a terrifying spectacle met our gaze. The beast we had left frozen a few hours ago had thawed out, and come to life as is the wont of the water bears when subjected once again to congenial conditions. In this case, however, the term of hybernation had been extended to centuries, so that no doubt in the interval this savage species had become practically extinct.

Our comrade was frantically struggling with his specimen, and into the *mêlée* we threw ourselves. The din grew louder and slowly but surely, out of the confusion rose a voice, which smote clear upon me. "Rise and shine you sleepers, 8-45, time for down table!"

There in the passage was the horrid figure of the night-watchman replacing our washing-up bowl, which had just served him as a breakfast gong.

As I sleepily drew on my clothes, regretful at sacrificing Bathybia for Cape Royds, I meditated how

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much can happen in dreamland during a short quarter hour.

DOUGLAS MAWSON.