



Campbell 2 of 2
6(1-24)

Cockburn Hood

Geology



John F. Campbell Esq
of Islay
Widdry Lodge
Kensington
W



Junior Carlton Club.

17 April 1879

Mr Cockburn-Hood presents his
compliments to Mr Campbell of
Islay, to whom he has sent an
extract from the transactions of the N.Z.
Institute, containing part of a
paper read by him there -

He does so because since
returning a few months ago
to England by way of tropical
Australia, Java, Ceylon & India
he finds he has been following
Mr Campbell's footsteps, and

Calcutta & Japan, Sicily

has had the great pleasure
of reading his 'Circular Notes'
& his paper in the Feb. No.
of the Proc: of Geological Society.

It is a great satisfaction
to find that so experienced
& accurate an observer
should arrive at the con-
=clusions regarding the
so called 'glacial sea', and
he places in end of it
and clear

language - a mere amateur
himself; he is glad that
his convictions are so
strengthened -

Living for some time in
a remote corner of the earth
Mr. C. Hook had only an
opportunity of seeing an
extract in a newspaper from
Mr. Campbell's last book
before he came home -

Called to duty



Kim - 20th 22/79
G. J. Jan.

I know nothing
of Cockburn Hood
but I am sending
you to Mitchell
who may be able to
throw light on him

Still in bed

— suffer of martyr-
— dom for rights — the
— thing a soul —

The G. front of the
called 2 days ago

my mother, I was
prieved to hear
him that my father
had not passed. The
will be a disappointment
to dear Lily, yet it
is no affair being
set back for a few months.

Now come E.
kind - success
- my father? - it,
I wonder, how?
Louise says 2 weeks
visit to her, always
being 2 boys & girls
such as her & Ruth

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TRANSACTIONS.

General Board of Lunacy,

Edinburgh, 1879.

Dundee,
23 April 1879.

My dear Dr Cunningham

I never heard of
W Cockburn Hood,
either as a Fellow of the
Royal Society or as
an inmate of any of
the Cheerful Hostels which
I conduct.

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belts stretching, now in one hemisphere, which may hereafter be understood.

Tell Louisa that I
received her letter &
wrote W^m. Rose-Innes
with the proposed in-
:scription yesterday.

I hope you are
keeping as well as
when I last saw
you - on Saturday. With
the wind still in the
East I can scarcely
expect you to
improve. But a

Good time & S. W. winds
are coming - then
adieu to the kicks, &
start the hurling.

Most affectly yours

Chas Aubrey

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10.30 AM

Friday - 10.30 AM
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to my - Bureau
of the Court, especially
of his wife who
may be not to clean
estate - Oh to see?

E. W. & no work
in them

H. H. C.

TRANSACTIONS
 OF THE
 NEW ZEALAND INSTITUTE,
 1877.

I.—MISCELLANEOUS.

ART. I.—*New Zealand a Post-glacial Centre of Creation.*

By T. H. COCKBURN-HOOD, F.G.S.

[*Read before the Wellington Philosophical Society, 9th December, 1876.*]

CAPTAIN HUTTON, in a paper which appears in the last volume of the "Transactions of the N.Z. Institute," has shown that the presumed cause of the shrinking of the glaciers of the New Zealand Alps to their present from their ancient colossal dimensions, is more than "a shrewd guess," and that the examination of its former and existing littoral marine fauna, goes far to prove that it was due—not to a change of climate during a period of Southern Polar Glaciation—but to the diminished elevation of that cordillera, combined with other influences, of which presently. He concludes his remarks with the following observation, "the evidences seem to be in favour of there never having been a Glacial Epoch in New Zealand, and consequently none in the Southern Hemisphere:" that is to say, that there never was a period when a general ice-cap covered these islands as it does the greater part of Greenland to-day, and as so many deem it an established fact that, pressing down from polar regions, a well nigh universal one overwhelmed the whole of nearly both hemispheres in post-pliocene times—against part of which theory New Zealand may be deemed to present very strong evidence.

The term "glacial" is a most convenient one by which to designate those periods of intense cold to which, in their turn, various portions of existing lands are now, and have in all time past been subjected from local causes which admit of explanation, as well as from others affecting broad belts stretching, now in one meridian, now in another, towards the tropics, which may hereafter be understood.

It is therefore to be regretted that it has come to be so commonly applied to this one particular era of assumed change in the temperature of the whole globe, that several writers use the terms Pre-glacial and Pliocene as synonymous, even when the consideration of their readers is being directed by them to New Zealand.

This supposed frigid epoch in the earth's history may well, however, be taken as a fresh starting point by those naturalists who agree with Professor Haëckel, in his proposition that during the "*Glacial Epoch between these vast lifeless ice continents there remained only a narrow zone to which the life of the organic world had to withdraw.*"*

Where this oasis was exactly situated, "the seed of our coming, the seed of food, the seed of man," as the Polynesians describe their Hāwaiiki, is not suggested, but it may not unfairly be presumed to have been in that portion of the globe where survivors of its most ancient denizens remain, the certainly unglaciated regions of Australasia. The southern ranges of Australia proper may come to have their local glacial period by-and-bye. Already heavy snows and avalanches do their work there, and fragments of rock have been carried down now and again from their summits, and deposited as *blocs perchés* on the sides of the sub-alpine valleys; but no traces of ancient ice action are to be seen. During comparatively recent times on the contrary, there are many evidences that a more equably warm climate prevailed; in the extra tropical portion of the great island continent the extremes became more severe, as the extensive remnants of the inland sea gradually dried up. We find the remains of crocodiles in the river alluviums, 800 miles south of the present range of these animals, in juxtaposition with those of the great extinct marsupials; the tropical marine fauna of its northern coasts had also a wider range, and lingered long in the gulfs of the South Australian sea; the set of the currents was probably from north to south, and species unknown on the eastern coast flourished in these mediterranean waters.

It is an old conservative country this Australia—not given to abrupt changes—but now, like other lands in the southern hemisphere, is gradually rising, especially its central regions. In the Great Australian Bight the upheaval is estimated at as much as twelve feet in places since 1825. Earthquakes are frequent, as in other lands undergoing a similar process, but their effects are little felt on the eastern coast, although evidences of elevation in modern times are found from Cape Howe all along the shores far to the north. The shocks usually are not smart enough to produce visible consequences; not even to shake the trees on the slopes of

* Hist. of Creation, Vol. I., p. 315.

the mountain gorges sufficiently to cause them to drop their winter-gained loads; “*Piscium et summo genus hæsit ulmo,*” may in the glens under Mount Kosciusko be translated, the oxen remained in the lofty gum-trees.

Very frequently when the accumulations of snow after severe winters disappear under the summer sun, cattle are found fixed in the branches of the tall trees in the narrow, deep ravines, filled up with drifted snows, in which they sank—which may readily be imagined, seeing that these drifts are sometimes 300 yards deep—in the upper gorges of the Indi river, as stated in the account given by my venerable friend the Rev. W. B. Clarke, F.R.S., who, with so much care and arduous labour, explored these wild and difficult regions. There are no evidences whatever, nevertheless, of their having gone through a colder period than the present. The view may be taken that this, one of the oldest of existing lands—part of it is as ancient as old New Zealand, of which but little remains—was an independent “centre of creation” in which the progress of development has not in its prevailing forms of life advanced beyond that point reached elsewhere in early geological eras. In this island continent “we find ourselves at home” with our earliest ancestors, “the beaked animals,” the *Ornithorhynchus* and the *Echidna*; here are to be seen, hopping about, our somewhat nearer ones the rat-like marsupials, similar to those of the early tertiary epoch, our *certain* progenitors of the seventeenth stage or generation. We have always known that man was made of the dust of the earth, but through what forms that dust had previously passed, we had not been precisely informed until now. It may be satisfactory to many to have their *proved* pedigree put before them by Professor Hæckel, at all events many noble families will feel assured that it is at least as correct and authentic as that of their modern ancestors placed before their fellows in the pages of some genealogical dictionaries.

As well as on the land, individuals of very antique aspect yet linger also near its shores and in its rivers: the *Trigonia* and *Cestracion* of mesozoic days, and that strange creature of most ancient lineage the Devonian-looking *Ceratodus*. It may be urged that these are but examples of the persistent recurrence of peculiar forms under the obligation of the law which governs the process of evolution; or it may be held that they present instances of the tendency to revert under the potency of the same law, circumstances being suitable, to original types even after the lapse of untold ages. Six-legged cats, dogs and other creatures with such abnormal characteristics, are alleged even by some to be merely extreme cases of atavism—*i.e.*, to show clearly the derivation of the mammalia from, or at least their common genetic origin with the *Myriapoda*, and their alliance to the ivy and other clasping plants.

Under certain circumstances, as Sir Charles Lyell says, the great Enaliosaurians might re-appear in the ocean depths and their dragon-like congeners invade the lands, and soar above the forests, for from whence they came, from whom descended, there are no records to tell.

They appeared on earth when cosmical conditions were suitable, and disappeared utterly, it is presumed, when these were changed, leaving no transitional links behind that we know of.

In the present century thousands are ready to accept any new idea, however preposterous, propounded by the class who come under the denomination of "advanced thinkers," who so often evince utter contempt for the axiom of Mr. Huxley himself, that "the first duty of a hypothesis is to be intelligible."

It seems strange, nevertheless, that so startling a one as this Narrow Zone, walled round with solid ice, the withdrawal for thousands of years of solar heat from the greater portion of the globe, when the vivifying rays had ceased to warm the seas, and ocean circulation came to a stand—for this must be the inference—should be accepted with more readiness than the idea of the Noachian Deluge; when, according to Cuvier, there remained only "*Narrow regions, from which man re-peopled the earth after those stupendous events which closed the Elephantine period.*" Those events which took place when the long, slowly sinking Equatorial Continent—the Lhanka of the Brahmins, the Lemuria of modern savans, a map of which is placed before us by Professor Hæckel, where he says man was developed from perfected apes, *a hundred thousand years ago, in Pliocene times, perhaps hundreds of thousands in Miocene*, was at last suddenly submerged, during a period of intense volcanic activity, when its foundations were taken away, and other regions were upheaved in its place.

This cataclysmal catastrophe in consonance with Mosaic history, in consonance with the traditions of men of all races, Caucasian, Mongolian, Polynesian, or Negroid, presents none of the extraordinary difficulties which surround the Glacial Hypothesis as thus put before us.

It was a catastrophe affecting a limited area, enormous as compared with that which subsided during the earthquakes of 1819.—The Runn of Cutch, from similar causes acting upon an infinitely smaller scale than they once did in the adjacent regions—but small when contrasted with that over which we are told life was extinguished by a universal ice-cap. The general order of things when the portion of the world known to the advanced families of men, possibly to all the human race, was overwhelmed by the sea, still went on undisturbed, it may be presumed, elsewhere. The giant sloths and armadillos may have moved about on the savannahs of South America, and the great marsupials—the gigantic wombats, kangaroos,

and dasyures over those of Australia; the moas and other wingless birds flourished in the then more extensive land of New Zealand, and the levels under the Rocky Mountains afforded sustenance to herds of mighty animals still, as well as the South African table-lands.

It seems a remarkable fact in the history of organic life, that whilst so many of the contemporary animals have succumbed under various influences during the lapse of time, these great birds of New Zealand should have continued to exist from far earlier ages still until very recent years (if indeed there are not individuals yet remaining), and is probably due to the persistence of an equable climate prevailing over a land in which they had no competitors.

The struggle for life must, as the author of the "History of Creation" admits, have been severe indeed—"fearful," as he remarks—for all forms of tropical fauna and flora especially; hemmed in on a narrow zone between two icy walls stretching nearly from pole to pole, the climate for them must have been rigorous in the extreme. There was in this crowded place of refuge, to which he observes all those wise creatures withdrew "who wished to escape being frozen," an excellent opportunity afforded for the extinction of many nearly effete tribes, and the survival of the fittest; it certainly appears to have been an inconvenient time for man to have begun to push his way—100,000 years ago, Herr Haëckel's date for *pliocene* men, being the great ice age according to Sir Charles Lyell. Unless development has proceeded since with more rapid strides than this writer assumes with his master it did during previous geological eras, primæval men must have witnessed strange scenes.

The migration of the survivors, leaving in many cases no representatives behind them, is a difficult problem to solve,—the wingless birds to their special island habitats; the rodents of South America to theirs, leaving the monotremes and marsupials in sole possession of their ancestral domains.

Without incurring the risk of being deemed deserving of the contemptuous indignation poured upon those "old stagers grown grey in opposite views" who, with "ridiculous arrogance," object under these difficult circumstances to receive the whole theory of descent as enunciated, and the correct pedigrees as offered by so eminent an authority and adventurous a thinker as the author of this history, we may be permitted to ask for some explanation of the formidable objections that stand in the way of our believing in this narrow zone amidst universal ice. The generality of persons who may read his work will scarcely be satisfied by his assurance that "proofs demanded are needless."

One of the first difficulties that suggests itself in the consideration of this particular dogma, this narrow zone to which organic life had to withdraw in post-pliocene times—is that during this epoch, which it appears was subsequent to, if not coincident with, the time when men first commenced to talk sense in Lemuria—*i.e.*, 100,000 years ago—although the circulation of the equatorial currents must have ceased, the chilled waters from both polar regions continued their course with increased force, until they had invaded all submarine depths, and all forms of organic life unable to adapt themselves to the change, or unable to reach the place of refuge, perished.

It would be difficult, however, to prove that polar marine currents have ever operated over greater areas or with more force than they do to-day, and frost now stretches its rigid winding sheet over tracts of land not long since, geologically speaking, teeming with animal life and covered with luxuriant vegetation, whilst in the same latitudes it has relaxed its grasp over others which for ages had been locked in its stern embrace.

Ever varying in their direction during the lapse of years, mighty ocean streams have borne along their islands of ice loaded with the debris of rocks from glaciated regions, strewing the ocean floor as liberally now as in any previous era, dropping boulders to-day upon beds being laid down at the bottom of the sea, to be the chalk hills of future continents, and at still greater abysmal depths of red clay (both composed of exuvie of minute organisms, falling to the bottom incessantly through countless centuries; a discovery the more astonishing when it is considered that this lifeless red clay, identically the same as that of the dry land so familiar to us, and so long a profound mystery, is seemingly chiefly derived from the insoluble residue of these *Foraminifera*, which is estimated at about only two per cent.) changing the climates of adjacent lands, and causing ever varying migrations of their fauna and flora, as well as of the life beneath the waters, in all time past.

The glaciers in present elevated regions, the Cordilleras of South America and New Zealand, the Himalayas, the Alps, the Caucasus, may not be greater than those which descended from the lofty mountains, higher perhaps than any of these that rose above the plains covered with the forests of the carboniferous era.

Under the pluvial conditions which then probably obtained, judging from the climates in which analogous vegetation flourishes at the present time, we may conclude they are not. At all events the marks of ice-action are to be seen, proving that in those days, as well as in our own, certain portions of the earth's surface had their share of glaciation, however much the general aspect of the fauna and flora may suggest that the temperature

of the globe was at that epoch more equable, if not universally higher, which may reasonably be presumed to have been the case; more especially if, as it has been suggested, climatic zones did not exist until the commencement of the tertiary era.

The further careful observations are extended and ice-marks sought for, where they ought to be found in the same latitudes, if the ice-cap covered one hemisphere in all meridians at the same time, the less strong appears the evidence of the struggle for life, it is alleged that animals and plants underwent in the limited unglaciated regions proposed to have remained during one portion of the quaternary period; a struggle which proved too great for many pre-existing forms, and led to their extinction, as some of the advocates of recurring eras of universal glaciation assert most probably effected the destruction of the giant Saurians, once the domineering tenants of land and sea in all parts of the world; whether that tenancy was altogether synchronous in both hemispheres is an interesting question; if its expiry was due to an age of ice, it may well be doubted whether it was.

So far as observations have been made in the southern hemisphere, there are no records of a greater amount of frost than inscribes its marks to-day. South Georgia, in latitude 54° S., is frequently referred to as an evidence of what local influences may bring about in the way of glaciation; exposed to the full force of the berg-laden antarctic current it is wrapped in snow and ice nearly to the water's edge all the year, whilst fifteen degrees to the west forests of beech and fuchsia clothe the sides of the mountains, and humming-birds flit over the glaciers in the Straits of Magellan.

The condition of this island and of Sandwich Island is "a warning," Sir Charles Lyell says, against concluding that glaciation must have been universal over one hemisphere at the same time. The opinion expressed by Professor Agassiz and others respecting the apparent work of ice in the Amazon Valley may nevertheless be correct. A berg-bearing current may have swept over the submerged eastern plains of South America, and the temperature lowered over a broad belt in that meridian; whilst Australia, New Zealand, and South Africa were subjected to no such influence.

The work that is being done by southern currents now must equal in magnitude that performed by the ocean streams which deposited the northern drift, now in one now in another meridian, over the submerged lands of Europe and America. Flowing up to the north, they carry their chilled waters under tropical seas whose surface temperature is 80° to 85° , not only up to the equator, but on, it has been most unexpectedly discovered, into the temperate zone as far as the Bay of Biscay—working, of course, great changes in the submarine inhabitants of vast areas—as similar currents have been doing in all time past, as the great underset flowed

alternately to or from the north, introducing antarctic fauna into the northern hemisphere during one cycle, and arctic at another into the southern temperate zone. Their respective remains, intermingled at first in the upper strata with those of tropical and sub-tropical forms, are now being deposited layer upon layer over the beds which contain such different ones below, and which will again in many places come to entomb the shells and the bones of races similar in type to those which previously there found a grave, when such a change in temperature as has occurred in most regions over and over again takes place.

The most enthusiastic glacialist could ask for no mightier engine than the great antarctic stream bearing its vast islands of ice sixty miles and more in length far towards the tropics in certain meridians.

What local influences are doing now in northern regions, students have more ample opportunity of observing. Notably the condition of great part of Greenland, where, in latitude 70° , ice islands of enormous dimensions float off from a sea-cliff of solid glacier ice 3,000 feet in height. The state of things obtaining in that great land may be contrasted with that in the equally misnamed country, Iceland, even that of its lower portions in 65° N. with that of Lapland in 72° . The climate of the Crimea affords a useful example when compared with that of Venice or Bordeaux. In consequence of the radiation from the Thibetan steppes, we find cereals ripening on the Siberian side of the Himalaya at a height above the sea equal to that of the summit of Mont Blanc, whilst several thousand feet lower down arctic cold prevails, and mighty glaciers do their work above the burning plains of Hindostan, growing under the soft breath of the rain-bearing southerly winds.

Again intense cold prevails over countries on the shores of that great inlet of the North Pacific which, in not very remote times, teemed with animal life of southern types.

In that region where the Amoor river after flowing amidst umbrageous groves and vine-clad hills turns north and enters a frozen sea, a local glacial period has possibly commenced, advancing with slow but unwavering steps, which might easily be accelerated by the subsidence of the shallow sea-bottom which interrupts the flow of polar waters; whilst in other places owing to a deviation in the direction of local currents of warm and chilled waters in seas of no great depth, sub-tropical forms are again multiplying where but recently arctic ones usurped possession.

The iron grasp of frost has loosened its hold over great part of Western America, and a temperate climate for ages has been gaining sway over the arid regions where rivers flow in deep chasms or canons worn by them through the plains under the Rocky Mountains.

There has been no ice work going on there since the Colorado began to cut its mighty drain a mile and a quarter deep, where it is at the same time but one hundred and eighty feet across; the three hundred feet of the lowest portion of this extraordinary chasm being eroded through hard granite. When this great work commenced, according to reasonable calculations, the northern currents must have been spreading drift on the submerged eastern plains, if that operation went on during the glacial period of Sir Charles Lyell.

The moraines of ancient local glaciers may be seen on the slopes of these mountains below 39° N. latitude, and also upon those of the Sierra Nevada, still nearer to the tropics, but traces of general glaciation there or of northern drift on the shores of California of the same age as that on the eastern side of the Missouri have not hitherto been observed. The vast accumulations of shingle on the terraces of Oregon and Washington territory are as ancient, according to American geologists, as those of the highest plateau of the prairies east of the Rocky Mountains, and are composed, as the latter are likewise, of materials of local derivation. They were deposited there when the Cascade Range already presented a formidable wall, and previous to the time when Mount Hood, Mount Rainier, and Shasta, those grand "Lookers-on" of the Pacific Coast, were piled up.

The boulders which lie on these old shingle terraces on the sides of the Willamette and other valleys, and on the shores of Vancouver, may be pointed to as memorials of the "Great Age of Ice," but they cannot be proved to have travelled very far. The grey syenite of which the majority of them consist, is a distinguishing rock of the Cascade Range, from whence glaciers brought them down probably during a local period of cold.

On the Atlantic side of the Mississippi basin, erratics were dropped in certain meridians, as far south as the 37th degree of latitude, when the way was open over the great lake region then submerged to the polar sea, just as they are being now on the American side of the Atlantic, nearer to the tropic than they were at that era.

Ice-polished and striated boulders, floated from afar in distant ages, may lie buried under the soil of the Californian plains, but none have been discovered by American observers. I could see no foreign stones or ancient ice-marks on the slopes of Calaveras or Mariposa, above Yosemite.

There is a vast river in the Pacific coming from equatorial regions, entitled to be described in the same expressive language with which Maury introduces his readers to the consideration of the Gulf Stream. It sweeps near the coast of Japan past Yokohama, leaving the shores of Yesso further off than it does those of Nipon, and has flowed in the same course, tempering its climate and causing hurricanes in its seas, we may conclude from

remotest times, for there are no signs of glaciation in Japan proper.

Although Fusi-Yama (which, according to Japanese tradition, grew in a few days under the eyes of men, as Iorullo did), reared its imposing cone on the sea-board plain, that recently elevated region is but a narrow strip along the shore, and ice-marks ought to be seen on the flanks of its main chain of ancient hills, if the glacial epoch prevailed over the whole of the northern hemisphere simultaneously. But an intelligent traveller who has lately ridden over the interior of the island from north to south informed me that there were none visible on their eastern side; and the talented author of "Frost and Fire"—Mr. Campbell—has sought there also in vain for any testimony of the rocks to the continued reign of the first, whose signs are so familiar to him.

A deflection of the Pacific or Japan stream which flows on past the Kurile Islands, curving round by the Aleutian chain to the coasts of Oregon, causing a rainfall there nearly equal to that of Darjeeling in the Himalayas, would bring ice over the terraced gardens on the slopes of the "Matchless Mountain," and over the whole of Yesso; opposite the northern shores of which for many miles off the land, the sea is frozen every winter, in the latitude of Naples, in consequence of their being swept by that current which, escaping through narrow portals, flows round into the Yellow Sea, chilling the coasts of China. The British colony of Vancouver and Washington Territory, instead of being enveloped in fogs, would be reduced to the condition in which Britain itself was when no Gulf Stream came near its shores, and to which Greenland has been brought in recent times.

There not very long ago the oak grew, and animals throve where ice-streams now flow, and there was a time still more remote when the magnolia blossomed and the vine clung to giant sequoias in its forests; and there may be another not so very far distant when the magnetic current (which may be the cause that produces this intense cold) may vary its direction and go further east again, and the eastern branch of the Gulf Stream may flow inside of Iceland; there Norway and Scandinavia will again have their age of ice, whilst the "lost land" may once more merit its now inappropriate name and be covered with green woods. It may be when the present Arctic Expedition returns, evidences will be produced of semi-tropical vegetation having flourished in still higher latitudes again at later geological eras than when the carboniferous vegetation prepared the material for the coal of high northern regions. Such a discovery as that the Pole itself is now situated in the centre of a land, in former ages covered with umbrageous forests, would clash violently with existing theories. * * *

Every process of evolution may, of course, be more readily conceived to be possible by assigning unlimited time for its performance. But if the

elaboration of new species, by the "aimless action of Natural Selection," necessitates the granting of thirty times the number of millions of years physical considerations render it possible to allow, as Dr. Tait states the question, the difficulty of the position will not be lessened by Herr Haëckel's bold assertion, that "we have not a single rational ground for conceiving the time requisite to be limited in any way."

This writer, although he deems very slow progress to have been the rule, leaves his readers to believe in the possibility of exceptions to it. Notwithstanding the small advances made during the recent period in any line of life (how the cats, the dogs, and the pigeons of the days of the earliest Pharaohs remain represented but by pure cats and dogs and pigeons still, not one attempt at passing beyond the limit of its class having been made by any of these creatures, whose development has received such attention and studied assistance from man), they are not to be daunted by the proposition that in new centres of creation, such as New Zealand, the derivative process was by some means marvellously hastened in its accomplishment.

Recurring periods of heat and cold extending simultaneously over the greater part of the world, may be convenient agents to call into requisition for the purpose of explaining the disappearance of many forms of organic life. The vanishing of others for a time, and their return to the same localities, displacing very different ones that in the interim had flourished there, is, no doubt, due to such cause. But had these cycles been repeated more frequently than even according to the views of Mr. Croll they have been—views much more within our grasp than the consideration of processes requiring æons paralyzing to the minds of most men who attempt to dwell upon them—they would not account for many of the events which we know have taken place in the history of animal life.

Ten thousand or twenty thousand years may be deemed by evolutionists generally, periods altogether too short for the accomplishment of any of the processes of divergence and development necessary to the establishment of species, for which millions have been asked; but much could be done during such a vast lapse of years in the way of perfecting various families and the extinction of others. The recurring periods of the reign of frost over particular areas in alternate hemispheres, which have evidently taken place, would cause no violent changes, advancing as they must have done with slow enough steps to afford ample opportunity for the migration of existing forms of life to suitable situations, so long as any such remained for them to migrate to, which during this Glacial Epoch of Professor Haëckel were certainly reduced to a minimum.

There was no ice-sheet enveloping their ancient haunts, which destroyed

the Diprotodon, the Zygomaturus, and Nototherium, in the marshy savannahs of Australia, but as these became drained in the course of the gradual elevation of the land and converted into arid plains, swept by sirocco-like winds, the succulent vegetation upon which they lived failed, we may presume, and remaining represented by related animals of comparatively pigmy size, they disappeared utterly as the Megatherium, the Megalonyx, and Mylodon of South America, which likewise leaving small analogues behind, passed from the face of the earth under the influence of some such cause, or destroyed by the irresistible attacks of internal parasites, (as we see hosts of domestic animals now throughout extensive districts of Australia, unable to resist the enemies which had proved less dangerous to the indigenous marsupials, from whom they were derived), or of swarms of pestiferous insects, such as the tsetse fly of Africa, or the calf- and foal-murdering one of Patagonia.*

It will not be proposed that any change of temperature destroyed the aboriginal horse of North and South America. Herds of these animals roamed in comparatively recent times from the cold north to the Patagonian plains, and their contemporaries flourish there still. Whatever was the cause of their extinction, it had ceased to act when the Spaniards conquered Mexico, for the new equine race introduced by them has multiplied rapidly, and continues to flourish equally well in a feral as in a domestic state. When the plague or the cholera take their tens of thousands of men, the lower animals remain generally unscathed, and *vice-versa*.

The parasitical worms which are so fatal to the flocks of the Australian sheep-farmer abound in the kangaroo and wallabi, and the former, if left to themselves, would ere long become extinct, destroyed in some districts by the parasites, in others starved out by the increasing hordes of hardy marsupials. The increase of this inferior order of animals as it stands in the derivative pedigree has been immense since the balance was destroyed by the extinction of the dingo, and since the aboriginal men have so much decreased in numbers. Thirty thousand kangaroos of large and smaller tribes have lately been killed on a single settler's run without making any observable diminution in their strength, and until some epidemic arises amongst them, their singularly rapid increase will tax the efforts of the white man to check in these thinly peopled regions. If these marsupials are so inferior a grade of animals, they are at all events admirably adapted for the situation they now occupy; so peculiarly well adapted to it that after

* An interesting circumstance of this kind is now being observed over large districts in the interior of New South Wales, which, if it continued, would lead in time to the disappearance of white cattle and white-legged or piebald horses in the herds, such being attacked by a disease caused by a black *Aphis* covering the pastures, producing fatal effects upon all young animals, and even many grown ones, whilst those whose coats are of dark colours do not suffer at all.

the enormous length of time they have occupied it, not the slightest attempt of divergence is manifested, and apparently as during the untold ages of the secondary era, they are destined to remain *in statu quô*, so long as the present circumstances obtain. It seems as unsafe to hazard any theory upon their inferiority and adaptability to vary as upon beauty being due to sexual selection, seeing that the most perfect beauty is possessed by certain organic forms which have no organs of perception at all.

The disastrous effects of the ravages of insects in the vegetable world are familiar, and the power of the canker-worm and the palmer-worm to change the character and climate of extensive regions is not a modern discovery. Forests of mighty trees that have withstood the battle and the breeze of centuries, whose hardihood and tenacity of life is great enough to enable them to survive the scorching and charring of their trunks by the fires that sweep again and again through the jungles, quickly succumb under the repeated attacks of myriads of seemingly despicable foes. In consequence of the extraordinary increase of a species of moth, innumerable armies of caterpillars for one or two consecutive seasons devoured the leaves of the red gum-trees in the grand forests of Gippsland, amongst the finest in New Holland, and now the weird skeletons of these, the loftiest trees, some of them, in the world, mar the landscape. For another half century or more, they will remain as memorials of what was once the condition of the shadeless plains, the extent of which men are ruthlessly increasing daily, over which the winds coming off the sea, that heretofore had kept this an Australian Eden, will cease to part with their refreshing showers, as they once did over the "rain-bringing" trees, and will carry their burthen on to the cool mountain slopes.

The upheaval of the central region of Australia has been alluded to. The process goes on, and what is taking place in New Holland, New Zealand, South America, and doubtless in Antarctic regions may be perhaps taken as evidence of the balance of weight becoming in favour of the northern polar ones; those who adopt this theory will deem it strengthened if instead of an open polar sea, it is found that they are covered with ever growing mountains of ice.

The violence of the volcanic action in the far south is felt in the convulsive throes that disturb distant places, and which cause ever and anon a more rapid flow of the great covering of ice, sending off vaster streams of bergs than during periods of rest. The earthquake waves which notified the disturbance in 1868, were certainly followed by such a fleet.

It may be said that a considerable portion of Scandinavia is also rising; this may be a local consequence of the subsidence of a parallel belt of the adjacent ocean bottom, a meridional folding of the crust of the earth, as Mr. Campbell suggests.

Ere many centuries have passed away it may be that the remnants of the ancient shallow sea, marked on the map of Australia as Lake Torrens, Lake Eyre, Lake Gardiner, etc.—which, with their margins of black, fetid mud, supporting scattered tufts of salsolaceous plants, resemble the salt lakes of Siberia and Patagonia, regions which were also in recent times raised from beneath the sea—will be silted up and then drained, the climate will be still drier and subject to greater extremes of diurnal temperature, remarkable as there are now in the interior as far as 18° S. latitude. The Barcoo or Thomson river will cut a canal-like channel through the sandhills to the head of Spencer's Gulf as the Darling has done further east. The surplus waters, after the periodical deluges of rain in the tropical country from which they flow, spread out over vast areas of the central depression, and already during very high floods find an outlet from Lake Torrens at Port Augusta, where the land is estimated to have risen seven feet since the first survey of that harbour was made.

The change in this region from a mediterranean sea to arid plains (where, notwithstanding the 10° difference in temperature between places in the southern and those in corresponding latitudes in the northern hemisphere generally, the heat from various causes is much greater than in the African deserts in similar parallels) must have exercised a most potent influence upon the climate of New Zealand and the adjacent oceanic regions, as it does to a considerable extent to-day, when alternate cycles of wet and dry seasons prevail over these great levels, now torrid deserts, and at other times in great part covered with water; an influence not very greatly inferior to that which the drying of the Sahara must have produced upon the climate of Europe, and the dimensions of the Alpine glaciers. When that desert region which now, "like an immense furnace," distributes its heat around over distant lands, was covered by the sea, and a large portion of Europe was likewise submerged, over which came berg-laden arctic currents, it may well be conceived that the higher elevation of its central chain of mountains, estimated by Professor Ramsay to have been from two to three thousand feet at the time their glaciers attained such colossal dimensions, was sufficient to produce all the phenomena attributed to a general age of ice, which may come to be proved to a great extent, should the project of letting the sea into the great depression of the African Desert be carried out.

There may be grounds for supposing an ice-sheet of vast extent to have covered great portion of Northern Europe, Asia, and America, at or about the same era, but evidence of its having been universal is wanting even in the northern hemisphere, and any evidence of an approaching similar state of things in the southern is sought for in vain.

The "Glacial Epoch" in New Zealand is assumed by Dr. Haast, F.R.S., to have been synchronous with the alleged period of the general reign of frost in northern regions, and we are accustomed to hear of the "PLEISTOCENE GLACIERS" as those which have done the most work in the land of the moa. But there seem to be very good reasons for placing the age of their greatest extension back in pliocene times, about the time man was learning experience in Lemuria.

When the Cordillera stood at an equally higher altitude as that claimed by Professor Ramsay for the Swiss Alps, we may be well satisfied with the ability of the rain-bearing winds coming round in their sweep back from equatorial regions over the warm Australian Sea to breed glaciers of magnitude sufficient to do all the work claimed for them—to shape the sides of the valleys and glens, scoop out the basins of the southern lakes, grind out the fiords of the west coast, and break up and collect the materials for the formation of the sub-alpine plains, to be spread out there by the torrential rivers in after times, which, as the land has gradually risen again after partial submergence since, have left the remarkable terraces, whose symmetrical lines produce such a striking feature in the landscape—of magnitude sufficient to carry off masses of rock 20,000 tons in weight, if required, and deposit them as *bloes perchés* below, with as much ease as those masses of Mont Blanc granite were borne along and left on the sides of the Rhone valley. Which operation probably they did perform, but the memorials being of less durable material, have disappeared under the gradual wear and tear of ages, or lie buried under the accumulations of gravel and sand on the plains, or beneath the sea.

In both of these mountain systems, as in the Himalaya, changes in the dimensions of their ice-streams, and debacles caused by the bursting of glacier dams, from time to time occur, on an insignificant scale it is true, when compared with what we may well believe went on in the days of their greatest grandeur, from local causes apparently, but which causes owe their origin to events going on in far distant regions. It is convenient sometimes to compare small things with great, and the operations proceeding quietly now, enable a judgment to be formed as to how the same causes, working with more activity, might readily be able to repeat the phenomena that engage so much attention.

The glaciers in the Swiss Alps, which had been retreating for thirty years, are advancing again at present, those descending from the heights of Monte Rosa are tearing up the green fields and overwhelming the gardens and homes of the peasantry, and, as the alternate advance and retreat of those of Mount Cook and adjacent mountains, present an evidence of the effect of ocean currents upon regions apparently far removed from their influence.

For some years previous to 1872, the antarctic stream came loaded with huge islands of ice, to an extent not witnessed by mariners since the route round Cape Horn became so frequented a highway as it has been since the gold discoveries.

Navigation in those seas was for a time so extremely perilous that insurance companies became alarmed, and many shipmasters sent their vessels to struggle back against the westerly winds by the Cape of Good Hope. Another great separation of bergs from their parent glaciers, an occurrence which has no doubt gone on intermittently in all ages, happened in 1829, as related by Sir Charles Lyell. Then, as in these late years, many bergs retained the dimensions of islands when they had reached the longitude of the Cape of Good Hope; some had nearly circumnavigated the globe before they foundered in Australian seas, and one was still many miles in length when seen off Cape Lenwin. An excellent opportunity was afforded for the conveyance of seeds of the same plants if any are produced or remain possessed of vitality in the soil of the lands from which they came, to different places in their route, a possibility dwelt upon by Mr. Darwin, in alluding to the sprinkling of the same flora in far distant regions; it seems probable that had the climate been suitable, plants now unknown there might have by this means been brought far up into Australia when the land was lower, as there is evidence of bergs having been drifted up in former times high into Spencer's Gulf, on the shores of which large boulders of foreign rocks have been left by them. There are no data as yet upon which to found a theory as to the periodicity of these occurrences, which might connect the action of the main-spring which sets the machinery in motion, with any of the many causes, magnetic, sidereal, etc., which have been proposed as influencing alternating cycles of dry and wet seasons—such as the return of Biela's comet every six and a half years—the time of the solar spots every eleven—the twelve-year cycle supposed to have to do with the long one of the revolution of the planet Jupiter, etc., etc. However this may be, there is every reason for believing that when polar winds are more than usually chilled over certain oceanic areas, they will blow with more force, and mingling with other aerial currents nearer to the tropics than in ordinary seasons, condense their moisture.

Australian climates would be the principal ones affected by such a cause, so we find that after the great ice-stream alluded to, the following years were wet ones in the then occupied part of New South Wales. Again, in 1869, commenced a cycle of splendid seasons for the farmers all over the Australias, dry plains were converted into lakes, and steamers ascended the tributaries of the Murray more than 1,500 miles. The consequences of the ice-stream were also felt in New Zealand. In

1869 the writer visited the great Tasman Glacier on the eastern flank of Mount Cook, which then, as the Cashmere head of the Indus is represented to do, issued from under the terminal foot of the glacier in one grand foaming fountain, boiling up to a height of 60 to 80 feet, "coming from under an arch, lofty, gloomy and Avernus-like, a large ready-formed river, whose colour was that of the soil collected at its source, rolling along immense masses of ice, and whirling them against the rocks with the noise of distant cannon." Some years previously, when the ice had retreated nearly half a mile, the river issued in two streams from under the lateral moraine on either side of the glacier. A local glacial period was commencing, the operations of which became suspended since the amount of ice borne off by the antarctic current diminished again to its normal quantity, as it has done lately, and dry seasons have returned in Australia threatening ruin to the farmers and graziers.

The more the subject is considered, and the effects observed of such agencies, the less necessary does it appear to call in the aid of extraordinary ones of which no traces are visible.

Had there been a general ice-sheet covering New Zealand, its ancient littoral marine fauna which still exist, its moas, and other apterous birds must all have perished, and whence came again those forms of life from which they were developed? It is scarcely to be conceived that this far island of the sea, situated in the latitude it is, would be proposed to have been included in the narrow zone amidst universal ice, the crowded Alsatia where ape-like men contended with men-like apes and divers other creatures with their respective congeners, in the dire struggle for existence that took place within its limited precincts, when the weakest, the least able to consider and provide against the exigencies of the situation, perished.

It is not enough to have events so stupendous, and others still more startling, declared to have taken place at distances of time so enormous that the consideration of them leaves but an indefinite impression upon the mind, merely stated as facts, and related with an air of acknowledged authenticity, as the stories of the reign of Henry VIII., by Mr. Froude.

Instead of engaging the attention of enquirers or allaying their scruples, such facetious proposals are scarcely even calculated to afford as much amusement as the extension of Mr. Darwin's paradox, in the allusion to the correlation of old maids, mice, and roast beef.

In his anxiety to prove the non-miraculous origin of the universe and all things therein, Professor Hæckel assumes a tone of contemptuous pity towards those persons who refuse to profess their absolute faith in the irrational dogma that the primordial forms were endowed with life and the power of propagation of their own instance. Considering that "what we

call spirit disappears with the dissolution of the individual material combination," as another of the teachers who have risen up amongst us puts it, content to believe himself a mere accidental aggregation of particles of carbonic acid, water, and ammonia, possessing nothing the lowest animal does not share, having no future its progeny may not attain to, he treats with scorn those who attribute the wonders of creation to "*the much talked-of purpose in nature,*" to their having been, as he expresses it, "*invented and constructed for his amusement by an ingenious Creator,*" whereas they have "*in reality arisen from the aimless action of natural selection.*"

Whilst propounding his views about the narrow zone to which those creatures wise enough to object to being frozen withdrew, he appears to have forgotten the postulate with which he commenced; to have lost sight of the fact that this aimless action of natural selection must be deemed a myth, that the whole theory of descent, as Mr. Darwin himself says, must fall to the ground, if one fatal case is proved of a number of species having suddenly started into life all at once.

If ever any theory demanded in its fullest import the acceptance of that old canon in natural history, quoted by his great master, "*Natura non facit saltum,*" that of the gradual progress of organic life requires it to be acknowledged as its most inexorable law—a law as immutable as that which produces the unchanging forms assumed by certain substances in the process of crystallization.

When the problem comes to be considered how life began again in isolated oceanic regions, such as New Zealand, when this terrible *annus mirabilis* had passed by, and the ice had retreated from the sequestered shores; those who believe in the preliminaries, in the universal ice-cap, in the scheme of the evolution of species, so ably, so seductively some may prefer to say, proposed by Mr. Darwin in his attractive pages, and so confidently asserted by his adventurous disciples, who respect no limits recognized by their master, find themselves face to face with a difficulty of which no explanation is vouchsafed.

It was difficult enough to imagine any solution that seemed to afford an escape from the dilemma those were placed in who accepted Dr. Haast's ideas regarding the pleistocene glaciation of New Zealand. He does not appear however to assume that the ice-sheet he would draw over these islands was universal over the southern hemisphere, and may consider that there were regions near where life was not extinguished, and from which their laertian progenitors might have made their way and founded the families of the apterous birds—if such be their descent—without commencing *de novo* the whole process of evolution from some simple ancestor.

Accepting even the proposition of the spontaneous generation of the

primordial form, whenever required—granting the possibility of the coming into existence of a body containing an inner principle of life, some mysterious force—that Mr. Bastian's experiments but prove that every atom of what chemists deem dead matter, is pregnant with the power of self-development, merely held in a state of utmost tension, from which it is ready to spring forward into life, when chance is given—discharging from their minds any such “emotional sensation” as the process being in obedience to a creative power—the believers in this place of refuge amidst the ice have to solve the problem how it came to pass that the progeny of the primordial form went through all the stages, which required thousands of millions of years, according to his own teaching, to accomplish before, so successfully in the new centre of creation, New Zealand.

How the gigantic birds were quickly elaborated from their reptilian progenitors, and these from theirs during the brief space of the post-glacial age. If time is necessary for any important process of evolution, it must have been for this supposed wonderful transformation of the cold-blooded, solid-boned, scale-covered lizard, into the hot-blooded, hollow-boned, feathered birds, and the latter have certainly flourished in high perfection in New Zealand it will be admitted from most remote times.

We know from the history of Australia, during late geological ages, that the ancestors of the moas could not have migrated from thence. The connection between New Zealand and the north-east of New Holland, New Guinea, Celebes, the Aru Islands, and other small marsupial strongholds, portions once of the ancient bird-inhabited Pacific Continent, was severed in a far distant era, when the marsupial line of life had not perhaps advanced beyond the assumed stage of its batrachian infancy.

In that old land of Oceanica, or Apteryxia we may designate it, the lizard race had already far risen in the scale of being, and if the pedigree be true, some tribes of their feathered descendants had colonized its north-eastern regions, where their representatives remain to this day; one family especially having held its ground well. The emu was not to disappear before the new marsupials any more than its analogue in South America, which probably tells us of a more ancient story still in the history of land and sea; the cassowary also has remained in tropical Australia, although the nearer ally of the *Dinornis*, its rival in size, whose remains have been discovered by the Rev. Mr. Clarke, F.R.S., had not been able to continue its race. On the mountain tops of the submerged continent, representatives of its most ancient denizens also survive. New Britain, New Ireland, and Ceram have their cassowaries as well as New Holland and New Guinea, and the great southern peninsula was in complete possession of the grandest specimens of the ornithic race for long ages after its separation by a wide sea

from the nearest portion of the ancient land, as Madagascar remained, no doubt, also for long ages, the happy home of the *Æpyornis* after Lemuria went down.

But if ignoring these considerations which seem to make the history of New Zealand certain, as that of the other large insular countries mentioned, and all the many old islands of the sea, to whose venerable story Mr. Wallace says, fearlessly, their inhabitants give us the key; if disregarding the absence of all evidence of its ever having been covered with an ice-cap, and that there is no possible reason for alleging it to be a logical conclusion that it must have been so covered, the glacial enthusiasts will risk their belief in all things else, so long as they can picture to their minds this island in the sea of ice, where all was war and carnage; if, instead of the moas being the long descended representatives of a royal race of birds, come from one of the most ancient aboriginal families upon earth, they deem them mere creatures of yesterday, modern adventurers, it is clear that they must be prepared to admit that their advancement must have been most improperly rapid.

Their lacertilian forefathers, and theirs before them, must have been addicted to saltatory practices more daring than those of our *proved* American cousin, that strange Mexican batrachian the irrepressible axolotl; and have set at defiance the old established laws of slow progressive development followed in all other epochs, as laid down emphatically in the Theory of Descent, endangering the foundations of that edifice, so far as immeasurable time is requisite for the safety of its construction.

Their advance in life must have been far more precipitate than that made by the inhabitants of the Gallapagos, where the frogs or allied batrachian patriarchs have no nobler descendants than the lizard and the tortoise, and yet these families can probably trace their descent from ancestors of fair standing in the world, when they first landed on the scarce cooled lavas. Gay sea-going lacertians, and slumbering chelonians on some floating log may have reached their shores, and from their eggs came the few four-footed creatures domiciled in these islands, amongst them the little altered descendant of one of them, nearly the last of its race, the only marine lizard now known. The ocean depths may however be tenanted still by forms of life we little imagine. Or, notwithstanding the antipathy the batrachian race evince to being cooped up in isolated regions, the Gallapagos population may have a more ancient local pedigree, and be descended from the survivors of a shower of young frogs. The distance is not too great to suppose the possibility of their having been caught up in some strong revolving storm from an American pool and carried thus far; it is not long since a number of these creatures were

landed in excellent health and spirits on the deck of a vessel in the Pacific, half that distance from the Australian coast.

If such a fortunate chance occurred, which, however, is scarce possible, and gave a somewhat fairer start to the higher forms of life in New Zealand, their offspring have devoured the race of their ancestors, as until very recently frogs were unknown there; now introduced from Australia in some localities they croak from every pond their appreciation of its swamps, safe from destroying snakes. Touching these same frogs, it appears to have been a want of judgment in their various descendants, a blunder justifying the term of "the aimless action of natural selection," not to have gone on improving and perfecting the attributes possessed by them. None of their progeny being able to jump about and avoid obstacles in their path after the connection between the brain and limbs has been severed, one would imagine that the course of progressive development should have improved, instead of arresting the advantageous capacity enjoyed by some of their analogues and remote progenitors of producing new limbs, and even heads, when accident removes the original ones.

On the whole most persons will prefer to consider the moas the long descended aboriginal inhabitants of this land where they have reigned lords amongst wingless birds from the far distant era when it formed a portion of a great continent, which on the score of antiquity has equal right to be delineated on the map of the old world as Lemuria.

All that is now land has been sea, and the seas land, not once, but probably over, and over, and over again, and as a continuity of the various dry portions of the globe has at one time or another existed (excepting, of course, new lands like the Gallapagos and other volcano-born isles), the ancient connection explains how it came to pass that wingless birds descended from the same original created type are found in South America, in Africa, and in all these islands of the sea.

It seems easier to believe in the tertiary men, who might if they desired, have gone to war mounted on Anchitheriums (for we may be permitted to take for granted that there may have been a family of these creatures large enough to carry their short-legged, ape-like riders), who were there to witness, we are told, the coming upon the stage of the elephantine races, and all the many quaint-looking giant creatures, long passed away, than to imagine that their descendants could have been present at the birth of the first taniwha-descended, post-glacial moa.

Certainly the supporters of this idea may suggest that some of the tertiary men devoted themselves during the long pliocene ages (which, when it suits his argument, are reduced to moderate periods by Professor Haëckel), to the breeding of birds without wings, and achieved in the pursuit success

equal to that of Mr. Bakewell and Mr. Booth in increasing the size and modifying the forms of their herds ; and that their remote descendants, not having lost the art, commenced a moa farm in this island of the Pacific, having brought with them a basket of eggs from Hawaiiiki or Lemuria.
