

Paper 61 — The Mammalian Era on Urantia

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This chart is a revision of the January 14, 2012 version.

Endnotes and some Urantia Book cross-references have been deleted to enhance readability.

Sources for Paper 61, in the order in which they first appear

- (1) Charles **Schuchert**, *A Text-book of Geology, Part II: Historical Geology, Second, Revised Edition* (New York: John Wiley & Sons, Inc., 1924)
- (2) Thomas C. **Chamberlin** and Rollin D. **Salisbury**, *A College Text-book of Geology* (New York: Henry Holt and Company, 1909)

Key

- (a) **Green** indicates where a source author first appears, or where he/she reappears.
- (b) **Yellow** highlights most parallelisms.
- (c) **Tan** highlights parallelisms not occurring on the same row.
- (d) An underlined word or words indicates where the source and the UB writer pointedly differ from each other.
- (e) **Blue** indicates original (or “revealed”) information, or UB-specific terminology and concepts. (What to highlight in this regard is debatable; the highlights are tentative.)
- (f) **Red** indicates where the UB writer apparently misread the source text, resulting in a statement whose erroneousness would have been recognized at the time the paper was written as well as now.

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PAPER 61 — THE MAMMALIAN ERA ON URANTIA

61:0.1 The era of mammals extends from the times of the origin of placental mammals to the end of the ice age, covering a little less than fifty million years.

XLI: THE DAWN OF THE RECENT IN CENOZOIC TIME (Schuchert 588)

[contd] Long ago Newberry said that the picture which Geology holds up to our view of North America during the greater part of the Cenozoic time is, in all respects but one, more attractive and interesting than could be drawn from its present appearance.

Then a warm and genial climate prevailed from the Gulf to the Arctic Ocean, and most of the continent exhibited an undulating surface of rounded hills and broad valleys covered with forests,

[Compare S 594 and 596.]

inhabited by birds and animals far more varied than any of the present day, or wide expanses of rich savannah over which roamed countless herds of mammals, many of gigantic size, of which our present meager fauna retains but a few representatives (S 588).

61:0.2 During this Cenozoic age the world's landscape presented an attractive appearance—

rolling hills, broad valleys, wide rivers, and great forests.

Twice during this sector of time the Panama Isthmus went up and down; three times the Bering Strait land bridge did the same.

The animal types were both many and varied. The trees swarmed with birds,

and the whole world was an animal paradise, notwithstanding the incessant struggle of the evolving animal species for supremacy.

61:0.3 The accumulated deposits of the five periods of this fifty-million-year era contain the fossil records of the successive mammalian dynasties and lead right up through the times of the actual appearance of man himself.

1. THE NEW CONTINENTAL LAND STAGE THE AGE OF EARLY MAMMALS

61:1.1 50,000,000 years ago the land areas of the world were very generally above water or only slightly submerged.

XXVII: THE EOCENE PERIOD (Chamberlin & Salisbury 772)

FORMATIONS AND PHYSICAL HISTORY (Chamberlin & Salisbury 772)

The western interior. (Chamberlin & Salisbury 776)

Deposition on land was therefore a feature of the period, as of all subsequent time, and among the accessible formations of this and later periods, those of terrestrial origin are more widespread than those of marine origin (C&S 776).

The Pacific coast. Marine and brackish-water beds. (Chamberlin & Salisbury 774)

After the Eocene, there was a time of temporary elevation, erosion, and volcanic activity along the Pacific coast, with considerable basaltic flows in Washington and Oregon (C&S 776).

The formations and deposits of this period are both land and marine, but chiefly land.

For a considerable time the land gradually rose but was simultaneously washed down to the lower levels and toward the seas.

THE EOCENE LIFE (Chamberlin & Salisbury 784)

The Transition from the Mesozoic
(Chamberlin & Salisbury 784)

It is an open question whether the placental mammals of North America and Eurasia arose from non-placental mammals which lived in these continents earlier, or whether they were immigrants. No satisfactory evidence of a transition from non-placental mammals has been produced, and the strength and the suddenness of the placental development suggest invasion from some quarter where their evolution had reached an advanced stage (C&S 785).

[See 60:3.20 and 65:2.12.]

The habit of bringing forth relatively mature offspring,

and of nourishing and protecting them gave the mammals an immense survival advantage.

61:1.2 Early in this period and in North America the placental type of mammals suddenly appeared,

and they constituted the most important evolutionary development up to this time.

Previous orders of nonplacental mammals had existed, but this new type sprang directly and suddenly from the pre-existent reptilian ancestor whose descendants had persisted on down through the times of dinosaur decline.

The father of the placental mammals was a small, highly active, carnivorous, springing type of dinosaur.

61:1.3 Basic mammalian instincts began to be manifested in these primitive mammalian types.

Mammals possess an immense survival advantage over all other forms of animal life in that they can:

61:1.4 1. Bring forth relatively mature and well-developed offspring.

61:1.5 2. Nourish, nurture, and protect their offspring with affectionate regard.

To this advantage were added superior agility and higher brain power (C&S 785).

61:1.6 3. Employ their superior brain power in self-perpetuation.

61:1.7 4. Utilize increased agility in escaping from enemies.

61:1.8 5. Apply superior intelligence to environmental adjustment and adaptation.

[?]

61:1.9 45,000,000 years ago the continental backbones were elevated in association with a very general sinking of the coast lines.

Mammalian life was evolving rapidly.

XLII: THE EVOLUTION OF MAMMALS AND THE RISE OF MENTALITY IN THE CENOZOIC (Schuchert 614)

Origin. (Schuchert 615)

The earliest mammals of the Mesozoic had their origin in active and more or less tree-living lizard-like reptiles of the Permian (Cynodontia and Theriodontia.) These gave rise to egg-laying mammals (the Hypotheria) like the living duck-billed mole and echidna ... (S 616).

A small reptilian, egg-laying type of mammal flourished,

In the latter part of the Mesozoic arose the pouched mammals (marsupials), forms like the living kangaroos so wonderfully differentiated in Australia (S 616).

and the ancestors of the later kangaroos roamed Australia.

Mammal Succession in North America (Schuchert 618)

Lower Eocene Mammals. (Schuchert 619)

Among these Lower Eocene mammals were diminutive horse-like forms (*Eohippus*), fleetfooted rhinoceroses,

tapirs without a proboscis,

the first ruminants and pig-like forms, insectivores reminding one of the European hedgehogs, carnivores, lemurs, monkeys, and probably also marsupial opossums (S 619).

Archaic Mammals. (Schuchert 618)

[contd] The North American Paleocene mammals were still archaic, that is, they were very primitive, generalized, omnivorous or fruit-eating, dominantly placental, and small (S 618).

Lower Eocene Mammals. (Schuchert 619)

It was in the main the mammalian life of a mountainous country, superior in foot and tooth structure to the indigenous archaic fauna, and of a higher intelligence (S 619).

XL: THE TOOTHED BIRDS OF MEDIEVAL TIMES (Schuchert 582)

Loss of Flight. (Schuchert 586)

Nearly all the continents at some time during the Cenozoic had large ground-living ostrich-like birds.... There were about twenty kinds, the largest of which, *Dinornis maximus*, stood 10 feet high, 2 feet above the largest ostrich.

Soon there were small horses, fleet-footed rhinoceroses,

tapirs with proboscises,

primitive pigs, squirrels, lemurs, opossums, and several tribes of monkeylike animals.

They were all small, primitive,

and best suited to living among the forests of the mountain regions.

A large ostrichlike land bird developed to a height of ten feet

Another closely related but smaller form was *Aepyornis* of Madagascar, a bird that laid the largest of all known eggs, **9 by 13 inches.**

and laid an egg **nine by thirteen inches.**

It was the finding of **these** eggs by the early navigators that led to the vast exaggerations which thrill the reader with wonder and terror in the accounts of the Roc given by Sinbad the sailor in the Arabian nights (S 587).

These were the ancestors of the later **gigantic passenger birds that were so highly intelligent, and that onetime transported human beings through the air.**

XLII: THE EVOLUTION OF MAMMALS ... IN THE CENOZOIC (Schuchert 614)

General Characters. (Schuchert 614)

Most mammals have a completely terrestrial habitat,

61:1.10 The mammals of the early Cenozoic lived on land,

while the seals, seal-lions, sea-cows, whales, and porpoises live in the oceans.

under the water,

One order of wide distribution, the bats, have developed the front limbs into wings,

in the air,

while other stocks have lateral or body membranes between the limbs, and spreading these, glide from tree to tree (S 614-15).

and among the treetops.

Mammals, structurally the highest group of animals, are warm-blooded vertebrates with milk glands. These glands, which vary in number from **one to eleven pairs**, are the **mammary glands** or breasts, the structures from which the class has taken its name, for *mamma* means *breast* (S 614).

They had from **one to eleven pairs** of **mammary glands**,

All mammals are more or less **covered with hair**, which is as characteristic of them as feathers are of birds (S 614).

and all were **covered with considerable hair.**

SOURCE OR PARALLEL

In most mammals there are **two sets of teeth**, the milk dentition or temporary teeth which eventually fall out, and the permanent teeth which succeed them (S 614).

Increase in Size of Brain. (Schuchert 617)

[Compare S 617-18.]

XXVII: THE EOCENE PERIOD (Chamberlin & Salisbury 772)

FORMATIONS AND PHYSICAL HISTORY
(Chamberlin & Salisbury 772)

The western interior. (Chamberlin & Salisbury 776)

Some of [the sediment] took the form of fans and alluvial plains, and some of it probably **lodged in lake basins formed by warping**, or by the obstruction of valleys by **lava flows** (C&S 776).

FOREIGN (Chamberlin & Salisbury 780)

Europe. (Chamberlin & Salisbury 780)

In western and central **Europe** the maximum **submergence** of the Eocene seems to have been accomplished by the middle of the period (C&S 782).

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In common with the later appearing orders, they developed **two successive sets of teeth**

and possessed large brains in comparison to body size.

But among them all no modern forms existed.

61:1.11 **40,000,000** years ago the land areas of the Northern Hemisphere began to elevate, and this was followed by new extensive land deposits and other terrestrial activities,

including **lava flows, warping, lake formation,** and erosion.

61:1.12 During the latter part of this epoch most of **Europe** was **submerged.**

Considerable lakes, estuaries, and perhaps other areas of deposition remained over western Europe within the area from which the sea withdrew ... (C&S 780). [See also C&S 782.]

A narrow sound east of the Urals probably connected the Arctic Ocean with the expanded Eocene Mediterranean.

Out of this extended sea rose many islands, some of which corresponded in position to the Alps, Carpathians, Apennines, and Pyrenees (C&S 782).

Other continents. (Chamberlin & Salisbury 783)

It was formerly thought that the Atlantic and Pacific oceans connected freely across Panama during the early Tertiary, but the work of Hill renders it doubtful whether there were more than shallow and restricted connections in the Eocene, and whether there was connection of any sort later (C&S 783).

General geography of the Eocene. (Chamberlin & Salisbury 783)

It has been conjectured that North America was connected with Asia on the west, via Alaska,

and with Europe on the east, via Greenland and Iceland.

Land seems to have failed of making a circuit in the high latitudes of the north only by the strait or sound east of the Urals (C&S 784).

Following a slight land rise the continent was covered by lakes and bays.

The Arctic Ocean, through the Ural depression, ran south to connect with the Mediterranean Sea as it was then expanded northward,

the highlands of the Alps, Carpathians, Apennines, and Pyrenees being up above the water as islands of the sea.

The Isthmus of Panama was up; the Atlantic and Pacific Oceans were separated.

North America was connected with Asia by the Bering Strait land bridge

and with Europe by way of Greenland and Iceland.

The earth circuit of land in northern latitudes was broken only by the Ural Straits,

which connected the arctic seas with the enlarged Mediterranean.

Europe. (Chamberlin & Salisbury 780)

[contd from six rows up] On the bottom of this great body of water, which should perhaps be thought of as a part of the ocean rather than as a mediterranean sea, limestone was deposited on an extensive scale.... Since it is often thick (locally several hundred feet), as well as wide-spread, the sea must have swarmed with foraminifera, and the period must have been long (C&S 782).

Some idea of the deformative movements since the Eocene may be gained from the fact that the nummulitic [foraminiferal] limestone occurs at elevations of more than 10,000 feet in the Alps, up to 16,000 in the Himalayas, and 20,000 feet in Tibet (C&S 782-83).

Other continents. (Chamberlin & Salisbury 783)

[contd] In Africa, marine Eocene is known along the northern and western coasts, and in the Soudan.... At the head of the great Australian Bight, there is a thick bed of Eocene chalk (C&S 783).

There is marine Eocene along some parts of the western coast [of South America], in Patagonia (Magellanian series), where the beds are usually unconformable on the Cretaceous, probably in Argentina, and along at least a part of the coast of Brazil (C&S 783).

61:1.13 Considerable foraminiferal limestone was deposited in European waters.

Today this same stone is elevated to a height of 10,000 feet in the Alps, 16,000 feet in the Himalayas, and 20,000 feet in Tibet.

The chalk deposits of this period are found along the coasts of Africa and Australia,

on the west coast of South America,

Eocene beds, not always distinctly separable from the Oligocene, are extensively developed in the *West Indies*, where limestone is the dominant type of rock (C&S 783). [Note: According to C&S, only Australia has Eocene chalk.]

THE LIFE OF THE OLIGOCENE
(Chamberlin & Salisbury 801)

The land animals. (Chamberlin & Salisbury 801)

Mammals continued their rapid evolution without interruption, and perhaps even with some acceleration (C&S 802).

XLI: THE DAWN OF THE RECENT IN
CENOZOIC TIME (Schuchert 588)

PART I. THE NORTH AMERICAN
CENOZOIC (Schuchert 591)

The Unfolding of Cenozoic Events in North America (Schuchert 597)

During Eocene time the holarctic continent *Eris* (see Fig., p. 555) permitted wide radiation of its land life east and west throughout Eurasia and North America.... North and South America were also united toward the close of the Mesozoic and during much of the earlier half of the Eocene (S 598).

and about the *West Indies*.

61:1.14 Throughout this so-called *Eocene* period

the evolution of mammalian and other related forms of life continued with little or no interruption.

North America was then connected by land with every continent except Australia, and the world was gradually overrun by primitive mammalian fauna of various types.

[Note: No floods are detailed in this section.]

2. THE RECENT FLOOD STAGE THE AGE OF ADVANCED MAMMALS

XLII: THE EVOLUTION OF
MAMMALS ... IN THE CENOZOIC
(Schuchert 614)

Mammal Succession in North America (Schuchert
618)

Oligocene Mammals. (Schuchert 620)

[contd] It was during the Oligocene
that mammals for the first time took on a
modern aspect, for here nearly all were
progressive forms (S 620).

[Compare S 618.]

XXVII: THE EOCENE PERIOD
(**Chamberlin & Salisbury** 772)

THE EOCENE LIFE (Chamberlin &
Salisbury 784)

The Transition from the Mesozoic (Chamberlin &
Salisbury 784)

The **angiosperms** may have been a
factor in the placental dispersion, through
the fact that they are a **staple source of
food** of the mammals (C&S 786).

61:2.1 This period was characterized
by the further and rapid evolution of
placental mammals,

the more **progressive forms** of mammal-
ian life developing during these times.

61:2.2 Although the early placental
mammals sprang from carnivorous
ancestors, very soon herbivorous branch-
es developed, and, ere long, omnivorous
mammalian families also sprang up.

The **angiosperms** were the **principal food**
of the rapidly increasing mammals,

XLI: THE DAWN OF THE RECENT IN
CENOZOIC TIME (Schuchert 588)

PART I. THE NORTH AMERICAN
CENOZOIC (Schuchert 591)

Life Characteristics in North America (Schuchert 600)

The *land floras* of the Cenozoic had arisen in the Cretaceous and the woody trees and bushes were much like those of the present (S 601).

the modern *land flora*, including the majority of present-day plants and trees, having appeared during earlier periods.

61:2.3 35,000,000 years ago marks the beginning of the age of placental-mammalian world domination.

XXVII: THE EOCENE PERIOD
(Chamberlin & Salisbury 772)

FOREIGN (Chamberlin & Salisbury 780)

General geography of the Eocene.
(Chamberlin & Salisbury 783)

In the southern hemisphere, it has been surmised that *Antarctica* was greatly extended, connecting with *South America*, *Australia*, and possibly with *Africa*, and that Africa and South America were connected across the Pacific from some earlier time until after the beginning of the Eocene (C&S 784).

The southern land bridge was extensive, reconnecting the then enormous *Antarctic* continent with *South America*, *South Africa*, and *Australia*.

If these conjectured extensions of land were real, it will be seen that the division of land and water in the northern and southern hemispheres was far less unequal than now, [*contd next pg.*]

and that the land was massed in high latitudes to a greater extent than at present, while tropical seas were more extensive. If extensive polar lands were the cause of glacial periods, as has been suggested, the geographic conditions of the Eocene were favorable in the extreme, if the relations sketched above were the real ones. In spite of this, the climate of the period seems to have been genial, and less markedly zonal than now (C&S 784).

In spite of the massing of land in high latitudes, the world climate remained relatively mild because of the enormous increase in the size of the tropic seas,

nor was the land elevated sufficiently to produce glaciers.

FOREIGN [OLIGOCENE] (Chamberlin & Salisbury 799)

Europe. (Chamberlin & Salisbury 799)

In Europe, as in North America, there was considerable igneous eruption, during the Tertiary, and especially during the Oligocene.... Between eruptions, vegetation grew in the marshes and shallow lakes and over the surface of the lava. The substance of this vegetation is locally (Faroes, and Iceland) preserved in the form of coal between the lava beds (C&S 800).

Extensive lava flows occurred in Greenland and Iceland, some coal being deposited between these layers.

61:2.4 Marked changes were taking place in the fauna of the planet.

THE EOCENE LIFE (Chamberlin & Salisbury 784)

Marine Life (Chamberlin & Salisbury 794)

The sea life was undergoing great modification;

Not only were the existing orders, families, and genera established, with some exceptions, but even the present species had begun to appear (C&S 794).

most of the present-day orders of marine life were in existence,

Geologically, the most striking feature of the marine Eocene life was the extraordinary abundance and size of the **foraminifers** (Fig. 534) (C&S 794).

[Compare C&S 794.]

THE OLIGOCENE FORMATIONS
(Chamberlin & Salisbury 797)

In North America. (Chamberlin & Schuchert 797)

The **Florissant beds in South Park, Colo.**, consisting largely of volcanic ash, and famous for their extraordinary number of fossil insects, are classed as Oligocene (C&S 798).

THE EOCENE LIFE (Chamberlin & Schuchert 784)

The Land Animals (Chamberlin & Salisbury 787)

The insect life. (Chamberlin & Salisbury 794)

[contd] There has been little important change in the **insect** world since the beginning of the Cenozoic era. Few new **families** have appeared, though the genera and species have changed (C&S 794).

THE LIFE OF THE OLIGOCENE
(Chamberlin & Salisbury 801)

The land animals. (Chamberlin & Salisbury 801)

All the **species** of insects of the Florissant beds (over 700) are **extinct** (C&S 801).

and **foraminifers** continued to play an important role.

The insect life was much like that of the previous era.

The **Florissant fossil beds of Colorado** belong to the later years of these far-distant times.

Most of the living **insect families** go back to this period,

but many then in existence are now **extinct**, though their fossils remain.

61:2.5 On land this was pre-eminently the age of mammalian renovation and expansion. Of the earlier and more primitive mammals, over one hundred species were extinct before this period ended.

THE EOCENE LIFE (Chamberlin & Schuchert 784)

The Land Animals (Chamberlin & Salisbury 787)

The main herbivore line. (Chamberlin & Salisbury 787)

In the course of the early evolution strange forms appeared, and soon became extinct. Among them were the *Dinocerata* (Fig. 530), grotesque monsters whose skulls were armed with three pairs of protuberances, perhaps horn cores, and a pair of enormous canine teeth or tusks projecting below (at least in the male), and an extravagant attempt at armature on both upper and nether sides. Their brains were smooth and singularly small for such ponderous bodies (C&S 789).

The era of bulk and heavy armor, such as had been possessed by the reptiles, had passed, and an era of agility and dexterity had begun. No small factor in this progress was the increase in intelligence indicated by the larger brains (C&S 789).

[See two rows down.]

[The rise of placentals may have caused the downfall of the reptiles, though this cannot be affirmed (C&S 785).]

Even the mammals of large size and small brain soon perished.

Brains and agility had replaced armor and size in the progress of animal survival.

And with the dinosaur family on the decline, the mammals slowly assumed domination of the earth,

speedily and completely destroying the remainder of their reptilian ancestors.

The Transition from the Mesozoic (Chamberlin & Salisbury 784)

[contd] Four salient features marked the transition of life from the Mesozoic to the Cenozoic: (1) Among marine animals, nearly all Cretaceous species were replaced by new ones; (2) among land plants so many species lived over as to make the plane of division between the Mesozoic and Cenozoic very difficult of location; (3) the **great saurians** almost disappeared, and most other reptiles showed **profound changes**; and (4) placental **mammals** appeared in force, and promptly **took a leading place** (C&S 784-85).

The Land Animals (Chamberlin & Salisbury 787)

Reptiles and amphibians. (Chamberlin & Salisbury 794)

There were **turtles** on both land and sea, and some of them attained large size. There were **crocodiles** which belonged about equally to land and water; also **snakes**, some of them large.

Amphibians were present, but apparently not abundant (C&S 794).

The carnivore line. (Chamberlin & Salisbury 791)

Patriofelis ("the father of cats," a name not to be taken too literally) of the Bridger epoch, presented a suggestive combination of characters, some features resembling those of **cats**, and others those of **seals**.

61:2.6 Along with the disappearance of the **dinosaurs**, other and **great changes** occurred in the various branches of the saurian family.

The surviving members of the early reptilian families are **turtles**, **snakes**, and **crocodiles**,

together with the venerable frog,

the only remaining group representative of man's earlier ancestors.

61:2.7 Various groups of mammals had their origin in a unique animal now extinct.

This **carnivorous** creature was something of a cross between a **cat** and a **seal**;

Some species seem to have been aquatic.

it could live on land or in water

and was highly intelligent and very active.

Primitive representatives of the dog family appeared in Europe late in the period (C&S 791-92).

In Europe the ancestor of the canine family evolved,

XLIII: THE EVOLUTION OF MAMMALS ... IN THE CENOZOIC (Schuchert 614)

Oligocene Mammals. (Schuchert 620)

Among the carnivores, small dogs were remarkably abundant and diversified, in fact, more so than ever before or since (S 620).

soon giving rise to many species of small dogs.

Rodents were also common, such as beavers, squirrels, pocket gophers, mice, and hares (S 620).

About the same time the gnawing rodents, including beavers, squirrels, gophers, mice, and rabbits, appeared

XXVII: THE EOCENE PERIOD (Chamberlin & Salisbury 772)

THE LIFE OF THE OLIGOCENE (Chamberlin & Salisbury 801)

Edentates, rodents, and insectivores. (Chamberlin & Salisbury 792)

By the middle of the period, rodents became a notable element in the fauna, the *Tillotherium* of the Bridger formation having finely specialized incisors (Fig 533) (C&S 792).

and soon became a notable form of life,

Even to-day, the rodents retain many primitive characters, and since the Miocene they have undergone few radical changes (C&S 792).

very little change having since occurred in this family.

The land animals. (Chamberlin & Salisbury 801)

The *Carnivora* came into clear definition and were represented in the White River beds by ancestral **dogs, cats, coons, and weasels**, while some creodonts remained (C&S 802).

[See 61:2.1, above.]

THE EOCENE LIFE (Chamberlin & Salisbury 784)

The Land Animals (Chamberlin & Salisbury 787)

The main herbivore line. (Chamberlin & Salisbury 787)

[See 61:1.4, above.]

[contd] While the condylarths and creodonts were near each other at the beginning of the period, the **hoofed** herbivores and the **clawed** carnivores soon became distinct.

The condylarths (Fig. 529) were small generalized forms with **five toes and forty-four teeth**, not yet developed into the true herbivorous type.

The condylarths **died out before the end of the Eocene**, but one branch, adapted to forests and marshes, seems to have diverged early, and to have given rise to the undulates (C&S 787-88).

The later deposits of this period contain the fossil remains of **dogs, cats, coons, and weasels** in ancestral form.

61:2.8 **30,000,000** years ago the modern types of mammals began to make their appearance.

Formerly the mammals had lived for the greater part in the hills, being of the mountainous types;

suddenly there began the evolution of the plains or **hoofed** type, the grazing species, as differentiated from the **clawed** flesh eaters.

These grazers sprang from an undifferentiated ancestor having **five toes and forty-four teeth**,

which **perished before the end of the age**.

The divergence of ungulates into odd- and even-toed. (Chamberlin & Salisbury 789)

The first class reached its extreme type at length in the horse, and the second in cloven-hoofed cattle; but these perfected types were not attained in the Eocene, for the evolution of the perissodactyls **did not pass beyond three-toed forms** in the Eocene (C&S 789-90).

[contd] The **horse** has become a classic **example of evolution** (C&S 790).

The primitive Eocene forms lived **both in Europe and America**, and the evolution followed similar lines in the two continents (C&S 790).

The evolution continued through the remaining periods of the Tertiary, true horses appearing in the Pliocene (C&S 790).

The **rhinoceros family** appears in the record in the later part of this [*i.e.*, Eocene] period,

but had its development chiefly in the next (C&S 790).

Suina (pigs, **peccaries**, **hippopotamuses**) were represented in the Bridger epoch by a primitive **small hog** with strong canine teeth of somewhat carnivorous aspect (C&S 790-91).

Toe evolution **did not progress beyond the three-toed stage** throughout this period.

61:2.9 The **horse**, an outstanding **example of evolution**,

lived during these times **in both North America and Europe**,

though his development was not fully completed until the later ice age.

While the **rhinoceros family** appeared at the close of this period,

it underwent its greatest expansion subsequently.

A **small hoglike creature** also developed which became the ancestor of the many species of swine, **peccaries**, and **hippopotamuses**.

XLIII: THE EVOLUTION OF HORSES
AND OTHER HOOFED ANIMALS
(Schuchert 624)

The Camels (Schuchert 632)

[contd] The family Camelidæ now includes the two species of camels of the desert areas of central Asia and the llamas and guanacos of the higher and colder parts of South America. These strange animals had their origin and essential evolution in western North America and their history runs parallel with that of the horses (S 632).

[Compare: Strangely enough, *Tylopoda* (camels, llamas) seem to have their beginnings on the American continent in the middle and later Eocene, and to have flourished here until the Pliocene (C&S 791).]

The llamas spread southward through the tropic into South America in the Pliocene,

and at the same time the camel stock radiated northward and finally across the Alaska-Siberia land bridge into Asia and then into Africa (S 632).

[Compare: [contd from three rows up] Then, having previously sent a branch to South America to evolve into llamas and vicunas, and another into the Old World to become the present camels, the tribe died out in its original home (C&S 791).]

In the Lower Miocene, the camels, like the horses, began to diversify, and large camels were still plentiful in North America during the earlier half of the Pleistocene but soon thereafter became extinct (S 632).

Camels and llamas had their origin in North America about the middle of this period and overran the western plains.

Later, the llamas migrated to South America,

the camels to Europe.

and soon both were extinct in North America,

though a few camels survived up to the ice age.

XXVII: THE EOCENE PERIOD
(Chamberlin & Salisbury 772)

THE EOCENE LIFE (Chamberlin & Salisbury 784)

The Land Animals (Chamberlin & Salisbury 787)

The primates (Quadrupedia). (Chamberlin & Salisbury 793)

No traces of apes have been found in the Eocene, but representatives of the lower primates, the **lemuroids**, appeared in the Wasatch epoch in America, and in a similar horizon in Europe (C&S 793).

The mammals go down to sea. (Chamberlin & Salisbury 793)

[contd] Just as the land reptiles of Mesozoic times **took to the sea** by choice or necessity,

so did the mammals in their day.

Thus arose cetaceans (**whales, dolphins, porpoises**), sirenians (manatees, dugongs), and pinnipeds (**seals, sea-lions**) (C&S 793).

61:2.10 About this time a notable thing occurred in western North America:

The early ancestors of the ancient **lemurs** first made their appearance.

While this family cannot be regarded as true lemurs, their coming marked the establishment of the line from which the true lemurs subsequently sprang.

61:2.11 Like the land serpents of a previous age which **betook themselves to the seas**,

now a whole tribe of placental mammals deserted the land and took up their residence in the oceans.

And they have ever since remained in the sea,

yielding the modern **whales, dolphins, porpoises, seals, and sea lions.**

Birds. (Chamberlin & Salisbury 794)

[contd] Fossils of ancestral gulls, herons, flamingoes, albatrosses, buzzards, falcons, eagles, owls, woodcock, quails, plovers, and ostrich-like, flightless birds of great size, with not a few forms of doubtful interpretation, have been found, showing great deployment of this class (C&S 794).

61:2.12 The bird life of the planet continued to develop, but with few important evolutionary changes. The majority of modern birds were existent,

including gulls, herons, flamingoes, buzzards, falcons, eagles, owls, quails, and ostriches.

61:2.13 By the close of this *Oligocene* period, covering ten million years, the plant life, together with the marine life and the land animals, had very largely evolved and was present on earth much as today. Considerable specialization has subsequently appeared, but the ancestral forms of most living things were then alive.

3. THE MODERN MOUNTAIN STAGE AGE OF THE ELEPHANT AND THE HORSE

XLI: THE DAWN OF THE RECENT IN
CENOZOIC TIME (Schuchert 588)

PART I. THE NORTH AMERICAN
CENOZOIC (Schuchert 591)

Climate (Schuchert 602)

With the Miocene ... the lands in many parts of the world began to rise into mountains, and gradually the climates became cooler and drier (S 602).

61:3.1 Land elevation and sea segregation were slowly changing the world's weather, gradually cooling it,

but the climate was still mild.

XXVIII: THE MIOCENE PERIOD
(Chamberlin & Salisbury 805)

Foreign (Chamberlin & Salisbury 815)

Arctic latitudes and climate. (Chamberlin & Salisbury 818)

Forty-six of the 137 species of plants found in North Greenland (Lat. 70° and less), including species of sequoia and magnolia, are also found in central Europe, and the floras of Spitzbergen and Grinnell Land were hardly less luxuriant (C&S 818).

THE LIFE OF THE MIOCENE (Chamberlin & Salisbury 818)

The Land Plants (Chamberlin & Salisbury 818)

[contd] The mid-latitude flora of the Miocene records the gradual disappearance of subtropical types,

and an increase of deciduous trees (C&S 818).

XLII: THE EVOLUTION OF MAMMALS ... IN THE CENOZOIC
(Schuchert 614)

Mammal Succession in North America (Schuchert 618)

Miocene Mammals. (Schuchert 620)

The Miocene, and especially the later Miocene, was therefore characterized by an increase of grassy plains,

Sequoias and magnolias grew in Greenland,

but the subtropical plants were beginning to migrate southward.

By the end of this period these warm-climate plants and trees had largely disappeared from the northern latitudes,

their places being taken by more hardy plants and the deciduous trees.

61:3.2 There was a great increase in the varieties of grasses,

though this statement is not based on the presence of fossil grasses but is deduced from the change that took place during this period in the mammalian **teeth** from those of the browsing type to the grinding or **grazing kinds** (Fig., p. 625) (S 621).

and the **teeth** of many mammalian species gradually altered to conform to the present-day **grazing type**.

XVIII: THE MIOCENE PERIOD (Chamberlin & Salisbury 805)

[Preamble] (Chamberlin & Salisbury 805)

The slight emergence of the coastal borders [of North America] after the Eocene (or early Oligocene) was followed by a **slight submergence** of the same regions during the Miocene (C&S 805).

61:3.3 **25,000,000** years ago there was a **slight land submergence** following the long epoch of land elevation.

XLI: THE DAWN OF THE RECENT IN CENOZOIC TIME (Schuchert 588)

PART I. THE NORTH AMERICAN CENOZOIC (Schuchert 591)

Continental Deposits of the Rocky Mountains. (Schuchert 596)

[In the Rocky Mountains area, elevation was again going on, resulting in drier and cooler climates (S 599).]

The Rocky Mountain region remained highly elevated

[contd] Fresh-water and eolian deposits of Cenozoic time cover great areas in the United States, chiefly in the foothills and the plains country **east** of the Rocky Mountains (see Pl., p. 593, Map 1) (S 596).

so that the deposition of erosion material continued throughout the lowlands to the **east**.

PART II. MOUNTAIN MAKING AND ORIGIN OF PRESENT SCENERY (Schuchert 603)

At the close of the Pliocene or early in the Pleistocene, the **Sierra Nevadas** were elevated bodily from 5000 to 7000 feet

The **Sierras** were well re-elevated;

and they are still going up (S 603).

in fact, they have been rising ever since.

It is interesting to note here that the **great San Andreas earthquake rift of California**, which extends for **600 miles** southeast into the Mohave desert, had its origin at this time (S 603).

The **great four-mile** vertical fault in the California region dates from this time.

XLII: THE EVOLUTION OF MAMMALS ... IN THE CENOZOIC (Schuchert 614)

Mammal Succession in North America (Schuchert 618)

Miocene Mammals. (Schuchert 620)

[contd] The Miocene was the **“Mammalian Golden Age,”** and the epoch is replete with interest because of the changes wrought in the faunas and in the floras by the alteration in climate to cooler and semiarid conditions (S 620-21).

61:3.4 **20,000,000** years ago was indeed the **golden age of mammals.**

The third marked **migration of mammals into North America** took place not only during the Miocene but during the Pliocene as well, and the migrants came **from Asia** by way of the Siberia-Alaska **bridge.**

The Bering Strait land **bridge** was up, and many groups of **animals migrated to North America from Asia,**

The most conspicuous among Miocene forms were the **four-tusked, browsing, long-faced mastodons, the short-legged rhinoceroses, the cats, and the beavers** (S 622).

including the **four-tusked mastodons, short-legged rhinoceroses, and many varieties of the cat family.**

The **first of the true deer appeared** in the Lower Miocene and in addition there were hornless deer and antlered deer-antelopes that were slender and graceful little creatures (S 622).

61:3.5 The **first deer appeared,**

XXVIII: THE MIOCENE PERIOD
(Chamberlin & Salisbury 805)

THE LIFE OF THE MIOCENE (Chamberlin & Salisbury 818)

The Land Animals (Chamberlin & Salisbury 819)

Ruminants. (Chamberlin & Salisbury 820)

The first immigrants belonged to the deer and ox families (C&S 820).

The more primitive genera of camels had disappeared, but 15 species of more modern type have been identified from the Loup Fork formation (C&S 820).

There is some doubt as to the precise stage to which the remains of bison found in Nebraska and Kansas are to be assigned. [Etc.] (C&S 820)

Tapirs and rhinoceroses. (Chamberlin & Salisbury 823)

[contd] Tapirs were but meagerly represented but rhinoceroses, though the running and swimming branches had disappeared, were prominent. The American species were still mainly hornless (*Aceratherium*), though slight indications of horns appeared in one genus (*Dicera-therium*) (C&S 823).

and North America was soon overrun by ruminants—

deer, oxen,

camels,

bison,

and several species of rhinoceroses—

XLII: THE EVOLUTION OF MAMMALS ... IN THE CENOZOIC (Schuchert 614)

Mammal Succession in North America (Schuchert 618)

Miocene Mammals. (Schuchert 620)

Peccaries abounded, and the last of the giant pigs, the entelodonts, occur in the Lower Miocene, one of them being over 6 feet tall (*Dinohyus*) (S 622).

but the giant pigs, more than six feet tall, became extinct.

XLIV: THE EVOLUTION OF THE ELEPHANTS (Schuchert 640)

[Preamble.] (Schuchert 640)

[contd] Among the animals of the Cenozoic, there was no group more spectacular in its evolution and distribution than the bulky trunk-bearing elephant stock, and among present-day land mammals, they still lead in size, strangeness of form, and bulk of brain (S 640).

61:3.6 The huge elephants of this and subsequent periods possessed large brains as well as large bodies,

In the Pleistocene ... their distribution was nearly world-wide and in all climates, even the very cold ones of Siberia and Alaska north to the Arctic Ocean (S 641-42).

and they soon overran the entire world except Australia.

For once the world was dominated by a huge animal with a brain sufficiently large to enable it to carry on. Confronted by the highly intelligent life of these ages, no animal the size of an elephant could have survived unless it had possessed a brain of large size and superior quality.

Migration. (Schuchert 645)

Hence the proboscidians have been world-wide travellers, equalled **only by the horse**, and **exceeded only by man** (S 645-46).

[Of elephants there are at least a dozen extinct species (S 644).]

[Preamble.] (Schuchert 640)

Of living elephants there are, however, **but two** kinds, the larger-big-eared ones of Africa, some of which attain a weight of about 8 tons and a height of 13 feet at the shoulders, and the somewhat less heavy and smaller-eared type found in India and central Asia (S 640).

XXVIII: THE MIOCENE PERIOD
(**Chamberlin & Salisbury** 805)

Foreign (Chamberlin & Salisbury 815)

Close of the Miocene in Europe.
(Chamberlin & Salisbury 817)

[D]eformative movements, involving the great **mountain systems** of the continent, were in progress in southern Europe during the later part of the Miocene (C&S 817).

Igneous activity appears to have attended the movements of the time,

but **not on so great a scale** as in North America (C&S 817).

[Compare S 603.]

In intelligence and adaptation the elephant is approached **only by the horse** and is **surpassed only by man** himself.

Even so, **of the fifty species of elephants in existence at the opening of this period,**

only two have survived.

61:3.7 **15,000,000** years ago the **mountain regions** of Eurasia were rising,

and there was some **volcanic activity** throughout these regions,

but **nothing comparable** to the lava flows of the Western Hemisphere.

These unsettled conditions prevailed all over the world.

Europe. (Chamberlin & Salisbury 815)

The **strait of Gibraltar** is thought to have been closed, and southern **Spain joined to Africa;**

but there were perhaps straits across Spain, as **across southern France,** connecting the Atlantic with the southern sea (C&S 816).

[contd] Southern Europe appears to have been an extensive archipelago, the plateau of Spain, parts of the Pyrenees, the Alps, and the Carpathian Mountains, and portions of adjacent lands, being **islands** (C&S 816).

Late in the period, there was a notable **withdrawal of the sea** from the land (C&S 816).

In spite of the wide sway of the southern sea of Europe, the Miocene formations do not appear at the surface in great areas ... They occur in Syria, but not in Arabia and Persia, showing the earlier **connection between the Mediterranean and Indian Ocean regions**

had come to an end (C&S 816-17).

61:3.8 The **Strait of Gibraltar** closed, and **Spain was connected with Africa** by the old land bridge,

but the Mediterranean flowed into the Atlantic through a narrow channel which extended **across France,**

the mountain peaks and highlands appearing as **islands** above this ancient sea.

Later on, these European **seas began to withdraw.**

Still later, the **Mediterranean was connected with the Indian Ocean,**

while at the close of this period the Suez region was elevated so that the Mediterranean became, for a time, an inland salt sea.

XLI: THE DAWN OF THE RECENT IN
CENOZOIC TIME (Schuchert 588)

PART I. THE NORTH AMERICAN CENO-
ZOIC (Schuchert 591)

*The Unfolding of Cenozoic Events in North
America* (Schuchert 597)

Miocene Epoch. (Schuchert 599)

The Atlantic waters were cool and this is best shown in the Chesapeake formation, known to extend all the way from Massachusetts to Alabama. These cool waters with their life came from the Arctic Ocean, and indicated that the old holarctic land Eris had been broken through between Greenland and Norway in about Middle Miocene time (S 599).

XXVIII: THE MIOCENE PERIOD
(Chamberlin & Salisbury 805)

THE LIFE OF THE MIOCENE (Chamberlin
& Salisbury 818)

The Marine Life (Chamberlin & Salisbury 824)

The marine fauna of the Pacific coast indicates a climate but little warmer than that of the present ... (C&S 827).

[?]

61:3.9 The Iceland land bridge submerged, and the arctic waters commingled with those of the Atlantic Ocean.

The Atlantic coast of North America rapidly cooled,

but the Pacific coast remained warmer than at present.

The great ocean currents were in function and affected climate much as they do today.

61:3.10 Mammalian life continued to evolve.

XLII: THE EVOLUTION OF MAMMALS ... IN THE CENOZOIC (Schuchert 814)

Mammal Succession in North America (Schuchert 618)

Miocene Mammals. (Schuchert 620)

Prominent among the Miocene mammals were the horses, which roamed the plains in great herds.... Camels were also plentiful (S 622).

Enormous herds of horses joined the camels on the western plains of North America;

this was truly the age of horses as well as of elephants.

XLIII: THE EVOLUTION OF HORSES AND OTHER HOOFED MAMMALS (Schuchert 624)

The Horses (Schuchert 624)

Brain and Mentality. (Schuchert 629)

[contd] The brain of living horses is large and richly convoluted, implying a high intelligence, but it is not equal to that of the elephant.

The horse's brain is next in animal quality to that of the elephant,

but in one respect it is decidedly inferior,

The docility of the horse and its ability to learn are notable. On the other hand, it is emotional, and its psychology is largely linked up with its normal mode of defense—flight—since the first impulse of a domestic horse on seeing any incomprehensible thing is to run away. In the wild state this same impulse is of the greatest possible aid as a means of survival (Lull.) (S 629).

for the horse never fully overcame the deep-seated propensity to flee when frightened.

The horse lacks the emotional control of the elephant, while the elephant is greatly handicapped by size and lack of agility.

During this period an animal evolved which was somewhat like both the elephant and the horse, but it was soon destroyed by the rapidly increasing cat family.

61:3.11 As Urantia is entering the so-called “horseless age,” you should pause and ponder what this animal meant to your ancestors.

[Preamble.] (Schuchert 624)

In the early history of man he fed on the horse, and at Solutré, in the department of Saône-et-Loire, France, there is one pile of horse bones estimated to represent 80,000 individuals.

Later the horse became man’s chief means of travel and his beast of burden in agriculture and warfare (S 624).

The horse is the most useful and beautiful of man’s domesticated animals, and has been one of the greatest factors in his civilization (S 624).

Men first used horses for food,

then for travel, and later in agriculture and war.

The horse has long served mankind and has played an important part in the development of human civilization.

61:3.12 The biologic developments of this period contributed much toward the setting of the stage for the subsequent appearance of man.

XXVIII: THE MIOCENE PERIOD
(Chamberlin & Salisbury 805)

THE LIFE OF THE MIOCENE (Chamberlin & Salisbury 818)

The Land Animals (Chamberlin & Salisbury 819)

Primates. (Chamberlin & Salisbury 823)

[contd] In the Old World, true apes had appeared. One type was a rather large annectant form, combining some of the characters of apes and monkeys; another was a generalized type related to the chimpanzee and gorilla, and about as large as the former (C&S 823).

Carnivores. (Chamberlin & Salisbury 823)

The dog family embraced numerous wolves and foxes;

the cat family, panther-like animals and saber-toothed cats; the *Mustelidæ*, weasel-like and otter-like forms, and an ancestral coon (C&S 823).

In central Asia the true types of both the primitive monkey and the gorilla evolved,

having a common ancestor, now extinct.

But neither of these species is concerned in the line of living beings which were, later on, to become the ancestors of the human race.

61:3.13 The dog family was represented by several groups, notably wolves and foxes;

the cat tribe, by panthers

XLII: THE EVOLUTION OF MAMMALS ... IN THE CENOZOIC (Schuchert 614)

Mammal Succession in North America (Schuchert 618)

Pliocene and Pleistocene Mammals. (Schuchert 622)

Of North American mammals, there radiated over the same land bridge into South America in Pliocene time large **sabre-tooth tigers** (*Smilodon*), large cats, dogs, racoons, horses, llamas, deer, mastodons, tapirs, peccaries, etc. (S 623).

Miocene Mammals. (Schuchert 620)

Among the carnivores, the **dog** kinds were in great variety, some small, others as large as the largest bears. **True cats** appeared here for the first time, and the sabre-tooth tigers were plentiful though not large.

There were also **weasels, martens, otters, and racoons**, but no true bears are known in America before the Pleistocene (S 622).

XXVIII: THE MIOCENE PERIOD (Chamberlin & Salisbury 805)

THE LIFE OF THE MIOCENE (Chamberlin & Salisbury 818)

The Land Animals (Chamberlin & Salisbury 819)

The lower vertebrates. (Chamberlin & Salisbury 823)

Not much is known of American Miocene **birds**, but their advancement in later stages implies that they **continued their evolution** with measurable rapidity, a conclusion supported by the European evidence.

and **large saber-toothed tigers**, the latter first evolving in North America.

The **modern cat** and **dog** families increased in numbers all over the world.

Weasels, martens, otters, and racoons thrived and developed throughout the northern latitudes.

61:3.14 **Birds continued to evolve**, though few marked changes occurred.

Reptiles had very generally assumed modern forms, and were represented by turtles, snakes, and crocodiles (C&S 823-24).

Reptiles were similar to modern types—snakes, crocodiles, and turtles.

61:3.15 Thus drew to a close a very eventful and interesting period of the world's history. This age of the elephant and the horse is known as the *Miocene*.

4 . T H E R E C E N T CONTINENTAL-ELEVATION STAGE T H E L A S T G R E A T MAMMALIAN MIGRATION

[See three rows down.]

61:4.1 This is the period of preglacial land elevation in North America, Europe, and Asia.

XXIX: THE PLIOCENE PERIOD (Chamberlin & Salisbury 828)

Crustal Movements of the Pliocene (Chamberlin & Salisbury 835)

On the whole, the close of the Pliocene must be looked upon as a time of great deformation, a critical period in the history of North America. New lands were made by emergence from the sea, and old lands were deformed and made higher;

new mountains were made, and old ones rejuvenated;

streams were turned from their courses in some places, and nearly everywhere started on careers of increased activity. The fact that such notable changes, with increased elevation of land, occurred during the epoch next preceding the glacial period,

The land was greatly altered in topography.

Mountain ranges were born,

streams changed their courses,

is one of the considerations which led to the once wide-spread belief that the elevation was the cause of the climate of the latter period (C&S 839).

Many of the prominent volcanic peaks of the west [U.S.] date from this time ... Many lesser cones belong to the same period (C&S 840).

[Preamble] (Chamberlin & Salisbury 828)

[contd] The most distinguishing feature of the Pliocene, so far as the present continents are concerned, is the predominance of terrestrial deposits.

This is a consequence (1) of the exceptional deformations which took place during the period, and just before its beginning, and (2) of the recency of the period, which has saved its deposits, to a large extent, from removal. Similar deposits in similar amounts during and after other periods of comparable deformation, have been largely removed by subsequent erosion (C&S 828).

Foreign (Chamberlin & Salisbury 840)

[contd] From considerable areas of Europe covered by water during the Miocene, the waters retreated late in the period or at its close; but the sea covered southern and southeastern England, Belgium, and parts of France during at least some portion of the Pliocene, and still more extensive areas of the present continent about the Mediterranean (C&S 840).

Marine Pliocene is known in Egypt, where the sea is thought to have extended up the Nile to Assuan (C&S 840).

and isolated volcanoes broke out all over the world.

61:4.2 10,000,000 years ago began an age of widespread local land deposits on the lowlands of the continents,

but most of these sedimentations were later removed.

Much of Europe, at this time, was still under water, including parts of England, Belgium, and France,

and the Mediterranean Sea covered much of northern Africa.

[Preamble] (Chamberlin & Salisbury 828)

[contd from three rows up] These deposits of the Pliocene are perhaps most obvious in intermontane regions such as the **Great Basin...** [Broad aprons of detritus] are now most considerable at **bases of mountains** whose steep slopes join plains of low gradient, and where the climate is sub-arid ... In **lake** basins, subaërial sediments merge into lacustrine, and the two may be interstratified (C&S 828).

The Lafayette Formation (Chamberlin & Salisbury 829)

Thickness. (Chamberlin & Salisbury 831)

The known thickness ranges from 0 to **200 feet** or more. Sections of 20 or 30 are common, and of more than 50 feet are rare (C&S 831).

Constitution. (Chamberlin & Salisbury 831)

The **color** of the formations ranges from brick-red through various pinks, purples, oranges, and yellows, to white (C&S 832).

Fossils. (Chamberlin & Salisbury 832)

Fossils are rare (C&S 832).

Crustal Movements of the Pliocene (Chamberlin & Salisbury 835)

In the basin region, faulting and deformation gave rise to depressions between the Sierra Nevada and the Wasatch Mountains, preparing the way for **two great Pleistocene lakes** (Bonneville and Lahontan) (C&S 838).

In the **Sierra** region, the post-Tertiary (or late Tertiary?) uplift was still more marked (C&S 838).

In North America extensive depositions were made at the **mountain bases**, in **lakes**, and in the **great land basins**.

These deposits average only about **two hundred feet**,

are more or less **colored**,

and **fossils are rare**.

Two great fresh-water lakes **existed** in western North America.

The **Sierras** were elevating;

[The western margin of North America in the Middle Miocene again began to fold and rise into mountains, giving rise to the Pacific System... These mountains of fire were most active during the Pleistocene and the grandest of them in this country are **Rainier** (14,526 feet above the sea), **Shasta** (14,380 feet, see Pt. 1, Fig., p. 195), and Lassen (10,347 feet) ... (S 606).]

Shasta, Hood, and Rainier were beginning their mountain careers.

But it was not until the subsequent ice age that

[It is conceived that the continental protuberances, which stand up some three miles, on the average, above the sea-bottom, may have a movement somewhat akin to that of great ice-sheets, though much slower, and that they tend to **creep** slowly out **toward the lower ocean basins**. [Etc.] (C&S 934)] [See also C&S 837.]

North America began its **creep toward the Atlantic depression**.

61:4.3 For a short time all the land of the world was again joined excepting Australia, and the last great world-wide animal migration took place.

THE LIFE OF THE PLIOCENE (Chamberlin & Salisbury 840)

The land animals. (Chamberlin & Salisbury 841)

The intermigration [of the continental faunas, including those of North and **South America**] of the early part of the period was a consequence of the land connections, not yet worked out in detail, brought about by deformative movements. The extent of the **connection of North America with Eurasia** at the northwest and northeast respectively is uncertain, but the evidence of good migratory routes for the land mammals during a portion of the period may be accepted as conclusive (C&S 841).

North America was connected with both South America and Asia, and there was a free exchange of animal life.

XLII: THE EVOLUTION OF MAMMALS ... IN THE CENOZOIC (Schuchert 614)

Mammal Succession in North America (Schuchert 618)

Pliocene and Pleistocene Mammals. (Schuchert 622)

The most striking of the South American edentates were the huge Pleistocene ground sloths and the highly armored glyptodonts related to the armadillos (Fig., p. 665) and looking like great land tortoises. Both of these animals migrated into the southern United States and are found there in Pleistocene strata (S 623).

Euro-asiatic connection with North America is again indicated by the migration of American camels into China and India during the Pliocene. At the same time the hollow- and twisted-horned antelopes came into America, ... along with the short-faced bears (arctotheres) now known in Oregon, Mexico, and South America (S 623).

XLIII: THE EVOLUTION OF HORSES AND OTHER HOOFED MAMMALS (Schuchert 624)

The Rhinoceroses (Schuchert 635)

In Miocene and Pliocene times, these animals had their widest distribution, living then in all continents except Australia and South America.

The ancestral and aquatic stocks died out in North America during the Oligocene, and all of them early in the Pliocene (S 636).

Asiatic sloths, armadillos,

antelopes, and bears entered North America, while North American camels went to China.

Rhinoceroses migrated over the whole world except Australia and South America,

but they were extinct in the Western Hemisphere by the close of this period.

61:4.4 In general, the life of the preceding period continued to evolve and spread.

XLII: THE EVOLUTION OF MAMMALS ... IN THE CENOZOIC (Schuchert 614)

Mammal Succession in North America (Schuchert 618)

Pliocene and Pleistocene Mammals. (Schuchert 622)

[See four rows down.]

[During the Pliocene, North America was more emergent than at any other epoch of the Cenozoic, and there is therefore but little of **marine life** to describe. Elsewhere it is seen to be very much like that of the present (S 600).]

Of mastodons there were several species; the horses, in considerable variety, were **still three-toed**;

llamas and the tallest **giraffe-like camels** continued to live; rhinoceroses with and without horns were present; sabre-tooth tigers and **true cats** existed, some of them as large as a lion (S 622).

XXIX: THE PLIOCENE PERIOD (Chamberlin & Salisbury 828)

THE LIFE OF THE PLIOCENE (Chamberlin & Salisbury 840)

The land animals. (Chamberlin & Salisbury 841)

Giraffes and giraffe-like animals, some of them of great size, invaded southern Europe and Asia, coming probably from **Africa** (C&S 843).

The **cat family** dominated the animal life,

and **marine life** was almost at a standstill.

Many of the horses were **still three-toed**,

but the modern types were arriving;

llamas and **giraffelike camels** mingled with the horses on the grazing plains.

The **giraffe** appeared in **Africa**, having just as long a neck then as now.

A remarkable group of sloths, armadillos, and ant-eaters had developed [in South America] from an edentate stem; strange hoofed animals of orders unknown elsewhere (*Typotheria*, *Toxodontia*, *Litopterna*) had arisen from some very primitive ungulate form;

monkeys of the South American type had evolved probably from a North American Eocene lemuroid, while rodents of the porcupine type had been derived from some unknown immigrant (C&S 841-42).

Mastodons seem to have occupied all the continents, but it is doubtful whether the elephant reached America before the Pleistocene (C&S 843).

The evolution of the horse was advanced to the existing genus *Equus* (C&S 843).

[See S 623.]

XLIII: THE EVOLUTION OF HORSES AND OTHER HOOFED MAMMALS (Schuchert 624)

The Horses (Schuchert 624)

Evolution. (Schuchert 626)

Curiously, however, even though horses were present throughout the Pleistocene in both North and South America, they had all died out at some time before the advent of the red men (S 628).

In South America sloths, armadillos, anteaters,

and the South American type of primitive monkeys evolved.

Before the continents were finally isolated,

those massive animals, the mastodons, migrated everywhere except to Australia.

61:4.5 5,000,000 years ago the horse evolved as it now is

and from North America migrated to all the world.

But the horse had become extinct on the continent of its origin long before the red man arrived.

XXIX: THE PLIOCENE PERIOD
(Chamberlin & Salisbury 828)

THE LIFE OF THE PLIOCENE (Chamberlin & Salisbury 840)

The land plants. (Chamberlin & Salisbury 840)

[contd] During the Pliocene there was a further sorting out of the mixed flora of previous periods, and the southerly migration of what are now tropical and subtropical plants continued (C&S 840).

The land animals. (Chamberlin & Salisbury 841)

There are also strong hints of the existence of a connection [of North America with Eurasia] which afforded passage for some species, but not for others. The prohibition was perhaps the increasing cold in the later stages of the period, leading up to the glacial period which followed.

The increasing cold, with its effect on intermigration, was perhaps the chief factor in developing the difference between the mammals of the Old World and the New (C&S 841).

61:4.6 The climate was gradually getting cooler;

the land plants were slowly moving southward.

At first it was the increasing cold in the north that stopped animal migrations over the northern isthmuses;

subsequently these North American land bridges went down. Soon afterwards the land connection between Africa and South America finally submerged, and the Western Hemisphere was isolated much as it is today.

From this time forward distinct types of life began to develop in the Eastern and Western Hemispheres.

61:4.7 And thus does this period of almost ten million years' duration draw to a close, and not yet has the ancestor of man appeared. This is the time usually designated as the *Pliocene*.

5. THE EARLY ICE AGE

XXX: THE PLEISTOCENE OR GLACIAL PERIOD (Chamberlin & Salisbury 846)

[PREAMBLE] (Chamberlin & Salisbury 846)

[contd] The distinguishing feature of this period is its extensive glaciation, ice-sheets covering six or eight million square miles of the earth's surface where mild climates had prevailed not long before. But for the ice-sheets and their effects, this period might properly be joined to the Pliocene, making one period of high and extensive lands and correspondingly restricted oceans (C&S 846).

61:5.1 By the close of the preceding period the lands of the northeastern part of North America and of northern Europe were highly elevated on an extensive scale,

in North America vast areas rising up to 30,000 feet and more.

Mild climates had formerly prevailed over these northern regions,

[?]

and the arctic waters were all open to evaporation, and they continued to be ice-free until almost the close of the glacial period.

XLV: PLEISTOCENE TIME AND THE
LAST GLACIAL CLIMATE (Schuchert
647)

Causes of Glacial Climate (Schuchert 660)

Probably the greatest single factor is high altitude of the continents, with great chains of new mountains (the hypso-metric causes) which disturb the general direction and constitution of the air currents (the atmospheric causes) and the ocean currents as well (S 660).

[All of the water of these ice-sheets had been taken from the oceans and precipitated as snow on the continents (S 647).]

General Distribution of Glaciation (Schuchert 650)

Thickness of the Ice-sheets. (Schuchert 652)

LeConte places the thickness at 10,000 feet over Canada and 6000 feet over New England.... Geologists as a rule believe that the thickness at the centers of ice dispersion could not have been less than 4000 feet, and that it may have exceeded this average length (S 652).

61:5.2 Simultaneously with these land elevations

the ocean currents shifted, and the seasonal winds changed their direction.

These conditions eventually produced an almost constant precipitation of moisture from the movement of the heavily saturated atmosphere over the northern highlands. Snow began to fall on these elevated and therefore cool regions,

and it continued to fall until it had attained a depth of 20,000 feet.

The areas of the greatest depth of snow, together with altitude, determined the central points of subsequent glacial pressure flows.

And the ice age persisted just as long as this excessive precipitation continued to cover these northern highlands with this enormous mantle of snow, which soon metamorphosed into solid but creeping ice.

[**Preamble.**] (Schuchert 650)

[*Compare* Fig. 227.—Map of maximum glaciation of North America.... The solid black areas are mountains covered by local glaciers. After L. Martin, 1916. (S 651)]

More than half of the glaciated area during the Pleistocene was in North America,

and more than half of the remainder in Europe (S 650).

[*See* Fig. 226.—World map of Pleistocene glaciation. Carnegie Institution of Washington. (S 649)]

[*Contrast* Fig. 226.—World map of Pleistocene glaciation. Carnegie Institution of Washington. (S 649)] [*Note:* Map shows New Zealand almost covered with ice, not Australia.]

Alternating Cold and Warm Stages (Schuchert 652)

Some geologists recognize three, and others as many as **six** glacial stages, with from two to five interglacial warmer times (Fig., above) (S 653).

61:5.3 The great ice sheets of this period were all located on elevated highlands, not in mountainous regions where they are found today.

One half of the glacial ice was in North America,

one fourth in Eurasia, and one fourth elsewhere, chiefly in Antarctica.

Africa was little affected by the ice,

but **Australia** was almost covered with the antarctic ice blanket.

61:5.4 The northern regions of this world have experienced **six** separate and distinct ice invasions,

although there were scores of advances and recessions associated with the activity of each individual ice sheet.

XXX: THE PLEISTOCENE OR
GLACIAL PERIOD (Chamberlin &
Salisbury 846)

[PREAMBLE] (Chamberlin & Salisbury 846)

General Distribution of Glaciation (Chamberlin &
Salisbury 846)

North America. (Chamberlin & Salisbury
846)

Three great centers of ice radiation,
besides Greenland, have been recognized.
These are the Labradorean, the Keewatin,
and the Cordilleran (C&S 846).

Greenland was glaciated somewhat
more extensively than now, but its
glaciers appear never to have extended to
the continent, as was formerly
conjectured (C&S 849).

Other continents. (Chamberlin & Salisbury
849)

Iceland was buried in ice, and even
Corsica had glaciers (C&S 849).

[Fig. 561.—Sketch-map showing the area of
Europe covered by the continental glacier at
the time of its maximum development. (Jas.
Geikie.) (C&S 848)]

[*Note:* Compare Schuchert's timetable of glacial
and interglacial stages with UB's dates, S 654.]

The ice in North America collected in
two and, later, three centers.

Greenland was covered,

and Iceland was completely buried
beneath the ice flow.

In Europe the ice at various times covered
the British Isles excepting the coast of
southern England, and it overspread
western Europe down to France.

61:5.5 2,000,000 years ago the first
North American glacier started its
southern advance. The ice age was now in
the making, and this glacier consumed
nearly one million years in its advance
from, and retreat back toward, the
northern pressure centers.

THE WORK OF AN ICE-SHEET
(Chamberlin & Salisbury 863)

The Succession of Ice Invasions (Chamberlin & Salisbury 874)

III. **The Kansan glacial stage.** (Chamberlin & Salisbury 875)

[contd] The Kansan stage is represented by a sheet of till occupying a large surface area in **Kansas**, Missouri, Iowa, and Nebraska (Fig. 582). Theoretically it extends under the later glacial formations to the northward, as far back as the **Keewatin** center of radiation (C&S 875).

The **central** ice sheet extended south as far as **Kansas**;

the eastern and western ice centers were not then so extensive.

61:5.6 **1,500,000** years ago the first great glacier was retreating northward. In the meantime, enormous quantities of snow had been falling on Greenland and on the northeastern part of North America, and ere long this eastern ice mass began to flow southward. This was the second invasion of the ice.

[The first two glaciers were not extensive in northern Europe (64:1.6).]

61:5.7 These first two ice invasions were not extensive in Eurasia.

XLV: PLEISTOCENE TIME AND THE LAST GLACIAL CLIMATE (**Schuchert** 647)

Life of the Pleistocene (Schuchert 664)

The most striking of the Pleistocene mammals in North America were the three species of elephants and the one of **mastodon**. The last named, *Mammot americanum*, migrated from Siberia into Alaska, and ranged over nearly all of the United States and southern Canada (Fig. A, p. 643) (S 664).

During these early epochs of the ice age North America was overrun with **mastodons**,

Of the elephants, the most interesting and widely distributed was the Siberian woolly mammoth (*Elephas primigenius*), an animal of the cold climate, standing about 9 feet tall at the shoulders, and coming to North America by way of Alaska (S 664).

woolly mammoths,

The horses were exceedingly numerous in the earlier Pleistocene, and roamed, apparently in great herds, all over Mexico and the United States and even into Alaska (S 664).

horses,

Of peccaries there was an abundance, and there were also camels and llamas (S 664).

camels,

[A gigantic elk ranged from Mississippi to New York (C&S 920).]

deer,

During the times of glaciation the caribou ranged south into Pennsylvania and musk-oxen into Utah, Arkansas, and Ohio (S 664).

musk oxen,

Other ruminants related to the musk-ox occurred earlier in the period, and of bison there were at least seven kinds, ranging from Florida to Alaska, one species (*Bison latifrons*) with a horn spread of 6 feet (S 666).

bison,

The ground-sloths were represented by a large and widely spread form, *Megalonyx*, first discovered and named by President Thomas Jefferson.

ground sloths,

Of rodents the most interesting was the late Pleistocene giant beaver (*Castoroides ohioensis*), as large as a black bear (S 666).

giant beavers,

Among the carnivores, the most formidable was the great sabre-tooth tiger (*Smilodon*), which lived over the greater part of the United States (S 666).

[contd from three rows above] The giant southern form *Megatherium* (Fig., p. 665), had a body as large as that of an elephant, though shorter in limb, while the oldest and smallest of the sloths was *Mylodon* (S 666).

[Compare S 664: the mammoth, elephant and horse died out during the Pleistocene.]

XXX: THE PLEISTOCENE OR GLACIAL PERIOD (Chamberlin & Salisbury 846)

THE LIFE OF THE PLEISTOCENE PERIOD (Chamberlin & Salisbury 914)

Marine Life (Chamberlin & Salisbury 917)

On the more southerly coasts. (Chamberlin & Salisbury 918)

[contd] Away from the immediate influences of the ice-sheets, the record of marine life does not indicate any profound departure from the progressive modernization that had been in progress through the Tertiary period (C&S 918).

saber-toothed tigers,

sloths as large as elephants,

and many groups of the cat and dog families.

But from this time forward they were rapidly reduced in numbers by the increasing cold of the glacial period.

Toward the close of the ice age the majority of these animal species were extinct in North America.

61:5.8 Away from the ice the land and water life of the world was little changed.

SOURCE OR PARALLEL

URANTIA PAPER 61

THE WORK OF AN ICE-SHEET
(Chamberlin & Salisbury 863)

The Succession of Ice Invasions (Chamberlin & Salisbury 874)

There is also good evidence that in some of [the interglacial intervals] the climatic conditions became at least **as mild** as they are to-day (C&S 874).

THE LIFE OF THE PLEISTOCENE PERIOD (Chamberlin & Salisbury 914)

Marine Life (Chamberlin & Salisbury 917)

On the more southerly coasts. (Chamberlin & Salisbury 918)

When the ice was pushing into the ocean on the **coast of Maine**, as in the late Wisconsin epoch, and an arctic fauna occupied that coast, it is scarcely probable that a warm-temperate fauna lived on the southern coast;

nor is it probable that, when icebergs were being set free into **Puget Sound**, and along all the coast to the north, a warm-temperate fauna lived on the California coast; but warm-temperate faunas on those coasts **during interglacial epochs** are entirely consistent with a climate such as that suggested by the Don beds (C&S 918).

Between the ice invasions the climate was about **as mild** as at present, perhaps a little warmer.

The glaciers were, after all, local phenomena, though they spread out to cover enormous areas.

The coastwise climate varied greatly between the **times of glacial inaction** and those times

when enormous icebergs were sliding off the **coast of Maine** into the Atlantic,

slipping out through **Puget Sound** into the Pacific,

and thundering down Norwegian fiords into the North Sea.

6. PRIMITIVE MAN IN THE ICE AGE

61:6.1 The great event of this glacial period was the evolution of primitive man.

- [See 62:1.2.] Slightly to the west of India, on land now under water
- [See 62:2.1.] and among the offspring of Asiatic migrants of the older North American lemur types, the dawn mammals *suddenly* appeared.
- [See 62:2.1.] These small animals walked mostly on their hind legs,
- [See 62:2.3.] and they possessed large brains in proportion to their size and in comparison with the brains of other animals.
- [See 62:2.6.] In the seventieth generation of this order of life a new and higher group of animals *suddenly* differentiated.
- [See 62:3.2.] These new mid-mammals—almost twice the size and height of their ancestors
- [See 62:3.3.] and possessing proportionately increased brain power—
- [See 62:3.5.] had only well established themselves
- [See 62:3.10.] when the Primates, the third vital mutation, *suddenly* appeared.
- [See 62:3.11.] (At this same time, a retrograde development within the mid-mammal stock gave origin to the simian ancestry;
- and from that day to this the human branch has gone forward by progressive evolution,

[See 62:3.11.]

while the simian tribes have remained stationary or have actually retrogressed.)

61:6.2 *1,000,000* years ago Urantia was registered as an *inhabited world*.

[See 62:4.6.]

A mutation within the stock of the progressing Primates *suddenly* produced two primitive human beings, the actual ancestors of mankind.

[See 63:5.1 and 64:1.4.]

61:6.3 This event occurred at about the time of the beginning of the third glacial advance;

thus it may be seen that your early ancestors were born and bred in a stimulating, invigorating, and difficult environment. And the sole survivors of these Urantia aborigines, the Eskimos, even now prefer to dwell in frigid northern climes.

[See 64:6.5 and 64:7.18; compare S 685.]

61:6.4 Human beings were not present in the Western Hemisphere until near the close of the ice age.

[See 63:5.2 and 64:7.8.]

But during the interglacial epochs they passed westward around the Mediterranean and soon overran the continent of Europe.

Man in the Glacial Period (Chamberlin & Salisbury 922)

In Europe. (Chamberlin & Salisbury 928)

Two climatic groups of animals are associated with the human relics,—a **subarctic** and a **subtropical** (C&S 929).

In the caves of western Europe may be found human bones mingled with the remains of both **tropic** and **arctic** animals,

While it cannot be positively affirmed that there have been no climatic oscillations of a similar kind since the last glacial epoch, there is a somewhat strong presumption that those implied by these two classes of animals were connected with climatic oscillations of the glacial period. This presumption therefore connects man with at least the **later of the glacial epochs** (C&S 929).

testifying that man lived in these regions throughout the **later epochs of the advancing and retreating glaciers.**

7. THE CONTINUING ICE AGE

61:7.1 Throughout the glacial period other activities were in progress, but the action of the ice overshadows all other phenomena in the northern latitudes.

[PREAMBLE] (Chamberlin & Salisbury 846)

The Criteria of Glaciation (Chamberlin & Salisbury 849)

6. Thickness. (Chamberlin & Salisbury 855)

No agent besides glaciers habitually leaves its deposits so unequally distributed, and in such disregard of pre-existing topography (C&S 856).

No other terrestrial activity leaves such characteristic evidence on the topography.

[Compare C&S 849-60.]

The distinctive boulders and surface cleavages, such as potholes, lakes, displaced stone, and rock flour, are to be found in connection with no other phenomenon in nature.

THE WORK OF AN ICE-SHEET
(Chamberlin & Salisbury 863)

Formations Made by the Ice-sheets (Chamberlin & Salisbury 864)

The topography of the ground moraines varies within wide limits. It is commonly **undulatory**, involving **gentle swells** and sags (northeast half of Fig. 228).

In some cases the swells take on rather definite elongate shapes, with their longer axis in the direction of ice movement. They are then called **drumlins** (Fig. 575) (C&S 865).

Ground moraines, **terminal moraines**, and **lateral moraines** are the principal types of drift deposited by glaciers directly (C&S 865).

The **ground moraine** of the North American ice-sheets is thickest in a broad belt a little within the margin of the drift (Fig. 560),

extending from central New York through Ohio, Indiana, Illinois, Iowa, Minnesota, and Dakota, and thence northward to an unknown limit in Canada (C&S 865).

The ice is also responsible for those **gentle swells**, or surface **undulations**,

known as **drumlins**.

And a glacier, as it advances, displaces rivers and changes the whole face of the earth. Glaciers alone leave behind them those telltale drifts—

the **ground**, **lateral**, and **terminal moraines**.

These drifts, particularly the **ground moraines**,

extend from the eastern seaboard north and westward in North America

and are found in Europe and Siberia.

61:7.2 **750,000** years ago the fourth ice sheet, a union of the North American central and eastern ice fields, was well on its way south;

The Succession of Ice Invasions (Chamberlin & Salisbury 874)

V. **The Illinois glacial stage.** (Chamberlin & Salisbury 876)

[contd] The exposed part of the Illinois drift appears at the surface in the **southern** and western portions of **Illinois** (C&S 876).

The west edge of the Illinois ice-lobe pushed out into Iowa a score of miles, forcing the **Mississippi** in front of it (C&S 876).

[The *Labradorean ice-sheet* was not much smaller, and extended from northern Labrador southwestward for 1600 miles to the **Ohio River** (S 650).]

[In these times the Siberian glacier was making its southernmost march ... (64:4.5).]

[Compare Fig. 561.—Sketch-map showing the area of Europe covered by the continental glacier at the time of its maximum development. (Jas. Geikie.) (C&S 848)] [See also 64:4.7.]

[See 64:5.4.]

at its height it reached to **southern Illinois**,

displacing the **Mississippi** River fifty miles to the west,

and in the east it extended as far south as the **Ohio River** and central Pennsylvania.

61:7.3 In Asia the Siberian ice sheet made its southernmost invasion,

while in Europe the advancing ice stopped just short of the mountain barrier of the Alps.

61:7.4 **500,000** years ago, during the **fifth** advance of the ice, a new development accelerated the course of human evolution. *Suddenly* and in one generation the six colored races mutated from the aboriginal human stock. This is a doubly important date since it also marks the arrival of the Planetary Prince.

61:7.5 In North America the advancing fifth glacier consisted of a combined invasion by all three ice centers. The eastern lobe, however, extended only a short distance below the St. Lawrence valley, and the western ice sheet made little southern advance.

VII. **The Iowan glacial stage.** (Chamberlin & Salisbury 876)

The known Iowan drift was formed by a lobe of the Keewatin ice-sheet, which extended down into the north-central part of Iowa, but fell short of the Kansan invasion of the same region (C&S 876).

[See 64:7.8.] [Note: The source for the passages in Papers 61 and 64 on the glacial stages in Europe appears to be *Men of the Old Stone Age* (1916), by Henry Fairfield Osborn.]

IX. **The Wisconsin glacial stage (or stages).** (Chamberlin & Salisbury 877)

[contd] Following this epoch of readjustment, the ice radiated from the Labradorian, Keewatin, and Cordilleran centers (Fig. 560), and from many isolated heights.

Nearly all the well-known mountain glaciation of the west is referred to this epoch (C&S 877).

[From the Labradorian center, the extension was notably greatest to the southwest, and in this direction the limit is some 1,600 miles from the center of dispersion ... The extension of the Keewatin ice-sheet to the southward was scarcely less. It found its limit in Kansas and Missouri, about 1,500 miles from its center ... (C&S 846-47).]

But the central lobe reached south to cover most of the State of Iowa.

In Europe this invasion of the ice was not so extensive as the preceding one.

61:7.6 250,000 years ago the sixth and last glaciation began. And despite the fact that the northern highlands had begun to sink slightly, this was the period of greatest snow deposition on the northern ice fields.

61:7.7 In this invasion the three great ice sheets coalesced into one vast ice mass,

and all of the western mountains participated in this glacial activity.

This was the largest of all ice invasions in North America;

the ice moved south over fifteen hundred miles from its pressure centers,

and North America experienced its lowest temperatures.

[See 53:4.1.]

61:7.8 200,000 years ago, during the advance of the last glacier, there occurred an episode which had much to do with the march of events on Urantia—the Lucifer rebellion.

61:7.9 150,000 years ago the sixth and last glacier reached its farthest points of southern extension,

[Fig. 560.—Sketch-map showing the North American area covered by ice at the stage of maximum glaciation. (C&S 847)]

the western ice sheet crossing just over the Canadian border; the central coming down into Kansas, Missouri, and Illinois; the eastern sheet advancing south and covering the greater portion of Pennsylvania and Ohio.

XLV: PLEISTOCENE TIME AND THE LAST GLACIAL CLIMATE (Schuchert 647)

Effects of the Glacial Climate (Schuchert 655)

Origin of the Great Lakes. (Schuchert 655)

[contd] All ice-sheets push out lobes along the preëxisting valleys, and those of the Great Ice Age, especially during the Wisconsin stage, were no exception to this rule. Accordingly, the Keewatin ice-sheet, when it finally melted and retreated across the area of the Great Lakes, had lobes that extended along the ancient valleys (see Fig., p. 135 of Pt. 1),

61:7.10 This is the glacier that sent forth the many tongues, or ice lobes,

scouring them deeper, and leaving in front, as they receded, small lakes that grew to ever greater proportions and were variable in outline (S 655-56).

which carved out the present-day lakes, great and small.

During its retreat the North American system of Great Lakes was produced.

And Urantian geologists have very accurately deduced the various stages of this development and have correctly surmised that these bodies of water did, at different times,

At this time, certain of the present small rivers were large, as the St. Croix, Wisconsin, Rock, and Illinois, draining the vast melting waters of the Keewatin ice-field into the Mississippi River.

empty first into the Mississippi valley,

In central New York the “finger lakes” were considerably larger than they are now and their waters for a long time drained into the Susquehanna River, and later through the Mohawk and Hudson rivers.

then eastward into the Hudson valley,

Finally, when the ice had retreated well into Canada, all the Great Lakes were connected far more widely than they are now and drained out eastward through the Ottawa and St. Lawrence valleys (S 656).

and finally by a northern route into the St. Lawrence.

XXX: THE PLEISTOCENE OR GLACIAL PERIOD (Chamberlin & Salisbury 846)

THE WORK OF AN ICE-SHEET (Chamberlin & Salisbury 863)

The Duration of the Glacial Period (Chamberlin & Salisbury 890)

If the history is correctly read, it was only at a comparatively late date that the waters of the Upper Great Lakes went out through the Niagara River.... Spencer places the period at about 39,000, and Taylor at 50,000 years as an approximate maximum. [Etc.] (C&S 893)

It is thirty-seven thousand years since the connected Great Lakes system began to empty out over the present Niagara route.

61:7.11 *100,000* years ago, during the retreat of the last glacier, the vast polar ice sheets began to form, and the center of ice accumulation moved considerably northward. And as long as the polar regions continue to be covered with ice, it is hardly possible for another glacial age to occur, regardless of future land elevations or modification of ocean currents.

61:7.12 This last glacier was one hundred thousand years advancing, and it required a like span of time to complete its northern retreat.

[*Contrast:* Counting these [laminated clay] layers throughout Sweden, De Geer has determined that Stockholm was under the Pleistocene ice about 9000 years ago, that the ice-sheet began to leave southernmost Sweden 12,000 years ago, and northern Germany 17,000 years ago (S 659).]

The temperate regions have been free from the ice for a little over fifty thousand years.

THE LIFE OF THE PLEISTOCENE PERIOD (Chamberlin & Salisbury 914)

[*Preamble*] (Chamberlin & Salisbury 914)

Destructive effects of glaciation. (Chamberlin & Salisbury 914)

It is reasonable to believe that the successive ice-sheets, several million square miles in extent, **destroyed** much life, and **caused great change** in that which survived (C&S 914).

61:7.13 The rigorous glacial period **destroyed** many species and **radically changed** numerous others.

To-and-fro migration. (Chamberlin & Salisbury 914)

As the zones were shifted back and forth alternately by the advances and retreats of the ice, every organism was under special stress to adapt itself to a new zone, to migrate, or to die (C&S 915).

Many were sorely sifted by the **to-and-fro migration** which was made necessary by the advancing and retreating ice.

The Terrestrial Life of the Non-glacial Regions
(Chamberlin & Salisbury 918)

[**Preamble.**] (Chamberlin & Salisbury 918)

One of its features was northerly types which appear to have been driven south by the advancing ice, and later, to have followed its retreating edge northward. The **mammoth** and **mastodon**, the **bear**, **bison**, **reindeer**, and **musk-ox**, were characteristic members of this group (C&S 918).

The boreal group. (Chamberlin & Salisbury 919)

Williston suggests that while **mammoths** were abundant in Kansas and on plains where forests did not prevail,

mastodons were mostly confined to valleys and timbered regions, notably those of the eastern States, the eastern part of the Mississippi basin, and the Pacific coast (C&S 920).

The **mammoth** ranged from **Mexico** northward, reaching **Canada** and Alaska at times of maximum deglaciation.

In **Siberia**, the mammoth was **covered with wool** and hair, and was obviously adapted to a cold climate (C&S 919).

[It was most abundant in the forested regions and rare in the plains country, and persisted so long that the animal may have been hunted to **extermination by the red men** (S 664).]

Those animals which followed the glaciers back and forth over the land were the **bear**, **bison**, **reindeer**, **musk ox**, **mammoth**, and **mastodon**.

61:7.14 The **mammoth** sought the open prairies,

but the **mastodon** preferred the sheltered fringes of the forest regions.

The **mammoth**, until a late date, ranged from **Mexico** to **Canada**;

the **Siberian** variety became **wool covered**.

The mastodon persisted in North America until **exterminated by the red man**

much as the white man later killed off the bison.

61:7.15 In North America, during the last glaciation,

[**Preamble.**] (Chamberlin & Salisbury 918)

In mid-latitudes, there were several types on the verge of extinction in North America, such as the horse, tapir, llama, and sabre-tooth cat (C&S 918).

A second prominent feature of the faunas was a southern group consisting of gigantic sloths, armadillos, and water-hogs, whose forebears had come from South America a little earlier when the isthmian route was open to land animals (C&S 919).

[*Preamble*] (Chamberlin & Salisbury 914)

To-and-fro migration. (Chamberlin & Salisbury 914)

An incidental result of this wholesale migration was an unwonted commingling of plants and animals, for every aggressive form pushed forward in the van of the advancing zone, and hence came into new organic environment, while every laggard fell behind, and was overtaken by less reluctant migrants (C&S 915)

Relics of glacial migrations. (Chamberlin & Salisbury 916)

As the ice retired to the north,

the horse, tapir, llama, and saber-toothed tiger became extinct.

In their places sloths, armadillos, and water hogs came up from South America.

61:7.16 The enforced migration of life before the advancing ice led to an extraordinary commingling of plants and of animals,

and with the retreat of the final ice invasion,

the arctic life of the surrounding lowlands moved northward after it, and the temperate life came on to take its place. In the **mountains**, however, the arctic life still found congenial conditions, by ascending to higher and higher altitudes as the warmer climates advanced. It was thus cut off from the retreating arctic life of the lowlands, and at length isolated (C&S 916).

In some of the higher parts of the northern **Appalachians**, plants, insects, and small mammals whose kin now live in the arctic zone, remain to this day. The same point is still more strikingly illustrated in the **Alps** (C&S 916).

[See 74:0.1.]

[*Note*: Henry Fairfield Osborn lists '**Holocene**' as the most recent age in *Men of the Old Stone Age*, p. 21.]

many arctic species of both plants and animals were left stranded high upon certain **mountain** peaks,

whither they had journeyed to escape destruction by the glacier.

And so, today, these dislocated plants and animals may be found high up on the **Alps** of Europe and even on the **Appalachian** Mountains of North America.

61:7.17 The ice age is the last completed geologic period, the so-called *Pleistocene*, over two million years in length.

61:7.18 **35,000** years ago marks the termination of the great ice age excepting in the polar regions of the planet.

This date is also significant in that it approximates the arrival of a Material Son and Daughter and the beginning of the Adamic dispensation,

roughly corresponding to the beginning of the **Holocene** or postglacial period.

61:7.19 This narrative, extending from the rise of mammalian life to the retreat of the ice and on down to historic times, covers a span of **almost fifty million years**. This is the last—the current—geologic period and is known to your researchers as the *Cenozoic* or recent-times era.

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