The CONSTRICTION THEORY (An ALTERNATIVE To CONTINENTAL DRIFT) And SUNKEN ATLANTIS

By

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FOREWORD

This book, over and above its scientific contents, represents the right and fight for an idea. Conducted by a single-handed man against the continued opposition of men and time, it is proposed to stand as a testi mony to the eternal fact that men will always come forward with new ideas and discoveries only to be met by other men who will equally oppose them. Theories grow to either survive or die. Many a theory that held sway over decades and was upheld by millions of men ultimately perished like vast empires before them, and many a theory that was obstructed over the decades and turned down by countless opponents finally flourished victoriously like a little struggling flower.

This book is a closely-interwoven two-channel story (1) The story of Earth at large over the span of its untold millions, namely the "Constriction Theory". Originally conceived in 1934 by another scientist, the late Professor Odhner, to whom goes all the credit of the pionnering work, it has been taken over and revived by the present author, (2) the story of a celebrated sunken continent, the continent of "Atlantis", of which Plato gave us the first known published account.

The "Constriction Theory", as its name already implies, draws its roots and substance from the fact that whereas earth loses continually heat by radiation to outer space, its crust (or Lithosphere) suffers the cooling action of its superposed oceanic blanket (or Hydrosphere). The inverse interaction of these two basic thermal patterns of the earth provokes inevitably transformations and constriction (shrinking) in the earth's crust, with a consequential corrugation of the earth's original features : i.e. further downbuckling of the oceanic basins, and synchronous uplift of the continental platforms. This "global corrugation" of the outer rind of the earth is as inevitably accompanied by second-order phenomena, such as the transformation through space-time of oceanic circulation patterns, uplift of new mountain-ranges from geosynclinal bottoms, etc. This gross picture of the Constriction Theory is here given in

profile as a simple introductory notion to the more detailed treatment exposed in the book, that can very adequately be proposed as a textbook.

Regarding the continent of "Atlantis", this is shown to be nothing more than a late victim and case in the Constriction Theory within a long chain of such crustal readjustments, a phenomenon when seen from this angle that has nothing of the extraordinary appearance which otherwise its treatment in isolation would tend to give it in certain minds. Earth/had in its long history now and then suffered catastrophes and readjustments, and Atlantis is just only one of them.

The localization by the Author of Atlantis along a segment of the (now sunken) mid-Atlantic Ridge south of the Azores, throws new light and life into prehistoric population patterns and historic contexts, as well as brings about a vivid reconstruction of the "Atlantean" physical kingdom itself.

Man must always seed, even if single-handed, even if in arid and hostile conditions. Other men will sure happen to pass by some day who will consider that the seed has given fruit, and will then reap both for themselves and for the original sower.

Dr René Malaise is today 85 years of age and full of conviction and optimism which communicate very convincingly to the reader. His recompense lies in the minds and hands of those readers, who on reading him, will discover that he had sown the seed for a new crop.

Andrew J. Mantura

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In an attempt to explain vertical movements in the earth's crust, also to understand migration and spreading of marine animals to waters now unattainable for them, the late Swedish Conchologist, Dr.sc. N I L S Hj. O D H N E R advanced in 1934 his Constriction Hypothesis. He estimated that the only force available and of the required magnitude to operate such changes was the nuclear force of constriction and dilatation of matter when subject to changes in temperature. This force is by far superior to that of gravity, the only force hitherto considered in connection with such movements. The present author, also active at the Swedish Museum of Natural History, at the Entomological Dept., had met with the same problems regarding the distribution of insects and other land animals or plants. In a teamwork we improved and tested together the constriction theory during more than 30 years. As all new observations made in different branches of science fitted into our theory and no contradictions of any kind were found, we were convinced that the theory was probably superior to all hitherto advanced ones. If fundamentally wrong, some major contradictions ought to have come to light as in all other theories once so many different scientific branches were involved, but none has hitherto appeared. In later years, the once discarded continental drift theory in the sense of Wegener, was again taken up as the result of observations that the magnetic orientation of molecules in magmatic and sedimentary rocks of Paleo- and Mesozoic ages (p.) retain the direction of the magnetic poles frozen into them at the time of their consolidation. Their directions indicate that the poles at that time were situated far from their present position. Otherwise the drift theory is based on speculation only, or on observations that may better fit into the constriction theory. Although there is a multitude of contradictions and fundamental errors in the drift theory, supporters of it persistently omit to mention these, and the continental drift theory is nowadays generally regarded as almost axiomatic.

Geological epochs are from a human point of view inconceivably long and are generally counted in millions of years. Our present time, named the Holocene, has had a duration of 10,-12,000 years and only the latter half of it constitutes our historical time. The period before the Holocene is named the Ice Age or Pleistocene and it

lasted about 2 million years. Notwithstanding its name its climate was not always cold, but mostly rather warm with comparatively short cold stages, five in all, the last stage itself subdivided into two cold spells (Fig.22, p.). The cold stages in Europe are labelled Donau, Günz, Mindel, Riss and Würm, Donau being the oldest. Before the Pleistocene there was a long warm period, the Tertiary (Fig. 1,C) with a duration of 60 to 70 million years, and prior to the Tertiary the equally warm and much longer Cretaceous and Jurassic.

The constriction theory is based on the generally accepted fact that heat is constantly conducted from the red-hot interior of the earth to the surface and from there into outer space. It is obvious that the earth's surface must be cooler during an ice-age than if the climate was tropical or subtropical. The earth's outer surface is not even, but wrinkled into low broad vaults alternatively positive or negative. Geologists name the positive or raised vaults anticlines or geanticlines if very large and the descending vaults synclines or geosynclines. Most highlands are anticlines and marine basins synclines. The synclines may also be filled with sediments and constitute lowlands, but remain synclines. If the warming up of the vaults continue over long periods of time, as for instance during the warm combined Cretaceous and Tertiary, the earth's surface will undergo an extremely slow expansion, but, as all the different vaults owing to the sphericity of the earth obstruct each other from expanding laterally, the different vaults finally accentuate their curvature. The all important homogeneous strata of the vaults beneath the uppermost crack-zone merge owing to the elasticity of the minerals gradually into the deeper subcrustal masses without a sharp limit regardless of the increasing temperature.

Our only means of obtaining information about the interior of the earth is by seismology or the study of earthquakes and the waves generated by them. These studies have shown that the earth is solid down to a depth of 2,900 ($\pm$ 2) kms, and only beneath this depth becomes suddenly fluid (Fig.4, p.). The rigidity and strength of the subcrustal minerals have a finite strength comparable to the maximal strength of surface magmatic rocks (granite) at least to a depth of 6-700 kms. It is at such a depth that the epicentres of deepest earthquakes have been located, which is equal to the depth to which the cold of the ice-age may have penetrated through conduction.

Wegener and his follower regarded the continents as blocks or ships plowing their way through the ~~oceanic~~ earth's crust, but in recent years the earth's surface is supposed to be divided into about a dozen large blocks or plates with a thickness of about 100 kms. The observation of the magnetic anomaly bands lateral of the submarine mountain ranges (see explanation on p.), older the further removed from the range the bands are, has created the belief magma is upwelling between two such parallel submarine ranges, and capable of pushing the entire lithospheric plate sideways with the continents as passive rafts riding on the moving tectonic block like on a conveyor belt. These spreading tectonic plates are thought to be consumed at trenches or fore-deeps, where they bend down beneath another plate and plunge into the earth's mantle.

Earthquakes originate from sudden ruptures ad different depths. At depths of 6--700 kms a major stress is most unlikely to arise suddenly. If a stress is gradually ~~dually~~ increasing, a flow would eliminate the tension owing to the great pressure and no rupture occurs. Earthquakes are frequently localized along submarine mountain chains as the Mid-Atlantic Ridge (Fig.31, p.) so that the substratum beneath them cannot be essentially plastic and no upwelling can thus occur. The hard blocks of the crust must accordingly be at least 6-700 kms thick and only at still greater depth the substratum may possibly ~~become~~ sufficiently plastic to allow the blocks to move about. The plasticity of the substratum must nevertheless be sufficiently hard for the seismic waves to travel with increasing speed through it. To start and perpetuate drifting motion in such a tough and viscous medium a force of no ordinary magnitude must be required.

Three kind of waves originate from the epicentre of an earthquake (Fig.2). The long waves are confined to the crust only, but the other two types of waves travel with increasing speed through the deeper strata of the earth. The "Primary" (P) waves are the fastest and are compressional waves in which each particle vibrates in the direction of propagation. The "Secondary"(S) waves vibrate at right angle to the direction of propagation like sea waves on the surface of the water. The primary waves may propagate through both solid and fluid matter. Their velocity is greater the harder and denser (heavier) the medium is, and accordingly slower in fluids. The secondary waves increase also in velocity with increasing specific weight and compression of the medium, but they cannot propagate at all in fluids or gases (Fig.3). Down to a depth of 2,900 kms (±2) both kinds of waves likewise increase their velocity very rapidly, which is regarded as an indication that the minerals of this solid part of the earth's interior (or "Mantle") are becoming increasingly dense with greater specific weight owing to increased pressure. In certain large stars the gravity is estimated to be so enormous, with its matter accordingly so compressed that a cubic centimetre of it may weigh millions of tons. In our much smaller planet Earth the superheated solid minerals near the fluid core are evidently considerably heavier than those closer to the surface.

According to the theory of continental drift the moving power behind the drifting continental blocks is speculated to be mighty but very slow currents in the solid mantle with the entire mass circulating from the vicinity of the core upward towards the upper crust, where after travelling horizontally for a certain time, it would sink back again thus creating a circulatory movement. These so called convection currents are supposed to be strong enough to rip apart continental blocks by rising to the surface beneath submarine mountain chains, then spread the sea-floor laterally from both sides of the mountain range, finally pushing aside whole continents. Solid matter may under great pressure react as a fluid, i.e. ice in a glacier. In a slowly rising convection current the pressure from gravity on the minerals will gradually decrease and crystallization and solidification correspondingly diminish the plasticity, which ceases completely on approaching the surface. According to the theory it is only because the minerals are so strongly heated near the core that they expand thereby becoming so light that they will float upward, and when cooled they will become heavier and again sinking back. The study of the seismic waves show that this theory must be quite erroneous because the deep matter down to the core although superheated, is much heavier than the cooler one beneath the outer crust, and not lighter and with less density. As the buoyancy of these deep materials is the only proposed moving force behind the speculative convection currents the very existence of these currents and of the force must be non existing. The rigidity of minerals in the mantle has been estimated to be of an order three times as great as that of soft steel at surface temperature or stronger than for instance granite. To start a flow in such a rigid matter a force of immense magnitude would be required. With the lack of even a minimal force any movement is out of question (Fig.4). Both the continental drift and the spreading sea-floor theories are thus erroneous. A theory without an observation sustaining it is always most doubtful and can never compete with actual observations. The whole theory of continental drift or of spreading sea-floors is accordingly a scientific castle built on shifting sands.

McKenzie & Richter (1976) maintain apparently their believe in the existence of the purely theoretical convection currents, but now on a lesser depth of ab. 700 kms. They are on the other hand forced to admit on their page 72 "there is still no satisfactory theory explaining how the circulation is maintained for tens of millions of years".

We shall now return to the constriction theory. If the earth's crust had been warmed up during say 100 million years or more in succession its somewhat cooler upper surface will expand extremely slowly, but owing to the great length of time involved

the results will be most important. The different vaults will press laterally on one another with tremendous force. Part of this pressure is taken up by the elasticity of the minerals, but, owing to the spherical form of the earth, the different vaults ultimately are forced to accentuate their curvature (Fig.5). The continental anticlines will rise to great height and the synclines will sink accordingly. The anticlines will thus reach up into cooler air and cracks in their upper surface would collect water, which would further cool them with the result that the elevation usually will be checked at least in their central part. A comparatively small anticline between two stronger synclines, as the former Alboran High-land between present Spain and Morocco, may sometimes be pressed up to an extreme height and ultimately collaps. The higher the land is elevated the more will sand and gravel be washed down from the summit. The anticlinal vault will accordingly become very thin in its middle section. After the collapse, the anticline, on striving to retain an original horizontal status, will be transformed into a marine syncline in its thinned out central part sink and one over Fez in Morocco and the other along the Guadalquivir Valley in Spain. Two straits, connecting the Mediterranean with the Atlantic north and south of the strongly elevated Alboran High-land had silted up towards the end of the Miocene and the Mediterranean was then transformed into salt- and evaporite-deserts owing to the strong evaporation. Towards the transition to the Pliocene the central part of the Alboran High-land collapsed and the Gibraltar Strait opened up as a gigantic waterfall (Jessen 1927, Kossmat 1936, U.S.Glomar Challenger 1972, etc.). The Mediterranean with the Alboran Basin again became a sea.

A synclinal vault will in addition to its own weight press with tremendous force on the hot subcrustal masses beneath it and this pressure is transformed into additional heat. We do not know the increase of the melting point with pressure, but we may assume that the molecules of the minerals are first transformed into denser and heavier ones, then softened and finally liquefied. This softening and liquefaction affects not only the subcrustal masses, but also the vault itself, which becomes corroded and weakened. The vault cannot indefinitely resist the tremendous counterpressure from below. In mighty bulges the bottom of the syncline is then thrust up with the softened sedimentary marine layers on its top. A new mountain range thus rises from the bottom of the former marine basin and becomes an anticline (Fig.6).

Once the vault consist of the gradually cooler upper part of the subcrustal masses and they merge gradually into one another there is no definite limit between them.

When the new mountain range rises from the middle of the marine basin, the two anticlinal vaults on both sides continue to press in lateral direction on the base of the still soft new mountain. Its sometimes parallel bulges are thereby pressed closer together and the containing minerals are simultaneously subjected to a very strong lateral pressure. In all mountains the sedimentary and especially the magmatic rocks show traces of such a pressure. The spectacular conformity of the South American and African coasts came into existence when the Mid-Atlantic Ridge was thrust up from the bottom of a syncline, probably in the Miocene, as evidenced by magmatic rocks dredged up from the Ridge and which are of Miocene age (Shand 1949). At the same time as the Mid-Atlantic Ridge was thrust up the adjacent continental blocks on both sides collapsed. It was the trend of the mountain chain that decided the cut of the continental borders, and not that the continents had drifted apart. On sinking back the former lateral continental blocks usually collapse in a step-like fashion (Fig.7). (Comp. terrasses on the bottom of the Atlantic Ocean laterally of the Mid-Atlantic Ridge). Such a process happened apparently to the above mentioned continental blocks, and as they during their continental stage, were subaerially eroded in the middle and there rendered thinner, they now constitute Atlantean marine basins. The washed down sediments from the original continental blocks are frequently so gigantic that even after the collapse of the blocks they remain as dry land above the surface of the sea, a borderland to the new marine basin. Parts of the plants and animals of the old continent may thus survive the collapse.

There is also another important consequence for biological life arising out of the accentuation of the earth's relief caused by the warming up of the synclines and anticlines the world over. As long as the climate continued to remain warm for many million years during the combined Cretaceous and Tertiary epochs, ice and snow became extremely rare even in the polar regions if present at all. The geosynclines of the world continued their extremely slow but persistent downbuckling. The waters of the oceans followed suit and the general sea-level sank progressively. How deeply a syncline may be depressed before a new mountain will arise from its bottom we have an example in North America. From before the Jurassic in Paleozoic and Mesozoic times a rather narrow syncline in the shape of a shallow arm of the sea was depressed so slowly that the sedimentation could keep its depth almost constant during more than 100 million years. When its bottom finally was thrust up as a

mountain range the sedimentary layers had attained a thickness of 45,000 feet or nearly 15,000 meters. Broad marine basins may be depressed to the same depth or even deeper, if situated where sedimentation is minimal and in any case less intense than in the proximity of land. Such basins have consequently a capacity of storing very large quantities of sea-water. With the majority of sea-basins simultaneously depressed during this last warm epoch the general supply of sea-water must have accumulated into these depressed synclines and large tracts of the former sea-bottom must have become dry land. Terrestrial animals and plants ~~got~~ obtained thereby extraordinary opportunities of spreading and migrating. During the Pliocene, the last of the Tertiary epochs, all continents had been strongly elevated and accordingly the rivers dug for themselves deep, frequently perpendicular canyons in the steep continental shelves (Fig.8), the ground-water level sank and the interior of the continents became increasingly dry. Desert conditions prevailed frequently in the interior. Biological life spread over the former sea-bottoms and mixed with species from other continents.

How low the general sea-level really was we have a measurement in the now submarine canyons that are traceable down to 3,000 m or more. Their walls are frequently air-weathered. The generally warm climate of the Tertiary was subequal all over the world and the now submarine canyons are distributed not only off the coasts of Europe and North America, but as well along Africa, Australia, India and South America both along the Atlantic, Indian and Pacific coasts (Fig.9). The Northern Arctic Ocean was land-locked both in the Pliocene and Quaternary by a broad land--bridge running between Scotland and Greenland over Iceland (Fig.25, p.). The now submarine Mid-Atlantic Ridge reached then also above water-level as a continent similar to the Central American isthmus and separated thus the Eastern and ~~the~~ Western North Atlantic Basins. This ridge extended along the entire Atlantic Ocean from Iceland around the whole African Continent to Soqutra in the Indian Ocean with branching ridges further east into this latter ocean (Fig.34, p.). When the sea-level was at its lowest at the end of the Pliocene it did not reach up to the treshold of Gibraltar. The Gibraltar Strait then became dry for the second time. The surface of the Mediterranean sank again progressively although not as deeply as at the end of the Miocene (Fig.10). In the meantime the cold of the Donau Glacial Stage (p.) cooled the water of the oceans causing their bottoms to constrict with the result

that the surface of the oceans again rose during the following great transgression that marked the end of the Tertiary (Fig.11).

When a mountain chain is thrust up from the bottom of a syncline the central bulge is the most powerful and the lateral ones diminish gradually away from it. The large central fold consists at its base of the previously molten rocks and when the pressure eases off these molten rocks solidify again and crystallize during the following cooling episode increasing thereby their volume. This is the reason why young mountain ranges as the Andes and the Himalayas slowly may rise during thousands of years. The more numerous the lateral ranges, and the further away from the central one are they situated the less magmatic rocks do they contain in their interior. These lateral folds consist thus mostly of sedimentary layers from the bottom of the former syncline. The further away from the central range the lateral ones are situated the lower are these side-ranges and ~~of~~ softer and less consolidated are their sediments, therefore easier eroded and washed away. During a subsequent continental stage, the lowest side-ranges, consisting of the soft sedimentary rocks will be the quicker obliterated by erosion, and in the end only the central chain with its more resistant magmatic rocks would remain.

Both the magmatic and the sedimentary rocks of a newly elevated mountain will retain their internal heat for possibly millions of years. When their minerals on cooling reach the so called "Curie Point", which varies in different minerals between 680° and 200° C, their molecules will align themselves along the magnetic poles whose direction will be frozen into them. The lowest and outhermost side-ranges will cool first and perhaps only after a few hundred thousand years the next will reach the Curie Point, with the central range cooling last. After the continental stage has lasted for perhaps several million years all the sedimentary side-ranges would be eroded away and their former existence remaines revealed today as paralell magnetic anomaly bands. An example are those bands flanking the now submarine Mid-Atlantic Ridge. That the lateral magnetic anomaly bands farther away from the twin-shaped central ridge are older than those closer to it is thus no proof that the sea-floor is spreading.

Paleomagnetic studies have recently revealed a most astonishing instability in the earth's magnetic field. During the last 3.6 million years the earth's magnetic field has reversed nine times. During such a reversal time a magnetic needle would point south instead of north as now. Combining the potassium-argon isotopic time--scale with these magnetic reversals, which are global with reversal of the entire magnetic field, a time-scale is obtained that reaches further back in time than that based on carbon-14 (Fig.1, p.). Cox, Dalrymple & Doell (1967) state; "In the past years it has been definitely established that the earth's magnetic field has two stable states: it can point either toward the North Pole as it does today or toward the South Pole, and it has repeatedly alternated between the two orientations. .... the mechanism of reversals is still far from understood." These magnetic reversals are frozen into the anomaly bands observed lateral of submarine mountain chains as, e.g. the Mid-Atlantic Ridge.

Toward the end of the Tertiary the continents had been so overelevated that they reached up into thinner and cooler air and the substantsially lowered water-

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-level accentuated this elevation (Ramsay 1909-10, 1924, Lindberg 1972). The recently upthrust mountains compelled the air-currents to become still cooler when passing the summits. Ice and snow began to make their appearance in the polar regions and glaciers became more and more common in their suitable places. Cold melting water reached the sea and as cold water is heavier than warm it gradually spread over the sea-bottoms. This deterioration of the general climate and cooling of the bottom-water of the oceans was a very slow process, thus about 3 million years ago glaciers from the Antarctic Continent reached down to sea-level and started to produce ice-bergs (p.). The interior of the sontinent may have been glaciated earlier in Tertiary as evident from studies of age from ice-cores. Gradually also the bottoms of the marine basins became cooled, but it took an extremely long time for the cold radiated by the bottom-waters to reach down into the deeper, homogeneous layers through conduction. No water-circulation could hasten the cooling as all cracks were pressed together. The heat from below and from the action of pressure had first to be neutralized, and almost a million years were possibly required before the homogeneous layer below the uppermost crack-zone of the syncline could be cooled. Finally when this happened the minerals of the vault constricted with the result that the bottom of the superdepressed vault were raised and such at a comparatively rapid pace. This can be likened to the same phenomenon as occur on suspension bridges. In winter the heavy suspension cables are cooled, they constrict and become shortened. The road or drive along the bridge hanging from the cables is then elevated.

10

The sea-water stored in the basins overflowed their borders and drained the previously dried sea-bottoms. The undisturbed sculptural pattern of the now submarine continental shelves indicate that the general sea-level rose with almost unbelievable rapidity (Fig.13 and 54, p.). For biological life this world-wide transgression of several thousand meters meant a wholesale destruction of innumerable species and genera of animals and plants. Only a minority of the former rich Tertiary fauna and flora could reach safety on the steep continental borders and survive in much less suitable environments. This world-wide transgression deserves the very good claim to be regarded as the boundary between the Tertiary and the Quaternary.

During the Tertiary and the Quaternary, the two Antarctic sub-continents, divided by a strait between Weddels Sea and Ross' Sea, were connected respectively with Australia, New Zealand and South America by narrow land-bridges (Wright & Prisley 1922, p.433)(Fig.12). As long as these land-bridges remained above water-level warm marine currents could reach the shores of Antarctica. At the end of the ice-age these land-bridges sank owing to marginal constriction (see explanation below). When the last one finally sank the west-wind, caused by the earth's rotation, could maintain a strong, cold circumpolar marine surface current from the west thus preventing all the warm currents going south. As a result, the previously partially glaciated Antarctic Continent became completely covered by ice (p.).

When the deep basins of the oceans are filled with cold water and the cooling has proceeded so far that the concave bottoms have contracted and the water has risen, the cold water cools down the now submerged coasts of islands and continents. Thus these islands and continents become exposed to a cooling process only at their boundaries and the constriction may be called a marginal constriction. An island with its base has the form of a very low cone, but we may imagine that the island is instead cylindrical with precipitous coasts reaching down to great depths. If such a cylindrical island has its coasts cooled so that they are contracted, the island would be exposed to the same pressure as the rim of a wheel when the hot iron tyre is shrunk on. However islands are not cylindrical, but conical; consequently when the deeper layers under the base of the island are exposed to strong cooling and contract, the beach above water-level does so likewise, is bent down and submerged. In this way the water penetrates further inland and a new zone is exposed to cooling. In other words, we may say that the radius of the solid earth is shortened somewhat along this narrow belt. The cooling process propagates downwards quicker than by simple conduction of heat. This is due to the fact that when the surface blocks are cooled they each shrink and the cold water penetrates faster down through the developing cracks to the more homogenous layers. Here to begin with, the process is one of simple conduction of heat, but as soon as the outer parts of the homogeneous layer are cooled down, they press with increasing force against the deeper layers. Once this force has reached such dimensions that the lower layers begin to be compressed and transformed into heavier minerals, this stores further large quantities

of heat with the result that furter cooling and shrinking takes place and a king of chain reaction sets in. Still more heat is stored when pressure becomes so great that the minerals reach plasticity or semi-fluidity (Fig. 14 A to G).

Owing to the depression of the coasts, the island becomes smaller and smaller, and the now liquefied rocks are compressed and squeezed increasingly towards the centre of the island, which undergoes an uplift concurrently with the downdip of its shores. The observed widening of volcanic cracks on Iceland are caused by such an uplift and not through any movements of spreading sea-floors. The fluid magmas squeezed towards the centre of the island are compelled to find an outlet, thus forming a volcano. In its very last stages, this volcano is left above water-level and finally may even disappear. As the land decreases in size animals and plants gather towards the middle of the island and the base of the volcano. This is the reason why so many of the present day volcanic islands house such peculiar forms of life, organisms which occur only on small islands despite the fact that they now consist only of volcanic rocks, and thus show no sign of former land connection in the form of continental strata. Such species of animals and plants of limited occurrence, because of geographical factors, are called endemic. These animals and plants constitute remnants of the fauna and flora, which lived on the former continent of which these small islands now represent vestiges. On a narrow land-bridge or on an island-arc, where marginal constriction can press from two sides the developement follows the same lines and reaches the same result. Coasts of larger continents are also affected by this constriction depending on their nature. This will be treated below on p. .

If, when a new mountain is rising from the bottom of a syncline, one of the adjacent anticlines is considerably larger than its duplicate on the opposite side, this larger anticlinal vault on collapsing exercises an extra strong later pressure against the newly formed mountain chain which would be still soft at its base. The mountain chain may then be pushed over in the form of a wide arc and be tilted towards the outer rim of the arc. In Japan, for instance, the mountain chain shows a distinct tilt towards the Pacific (Fig.7, p.). This is also the reson why the Alps, the Himalayas, the Kuril Islands, etc. are arcuate.

Every syncline, from whose bottom a new mountain chain has been elevated, has its edges bent and broken nearest to the rising mountain chain; along such edges the earth's crust is weakened by relatively shallow cracks. If now the mountain chain, after its upthrust, is displaced laterally and pushed aside as an arc in conjunction with the collapse and lessening of the curvature of the adjacent anticlinal vault, a deep crack or crush-zone occurs on the convex side of the forming arc, and this further diminishes the resistance on this line of the broken earth's crust (Fig.7). If the climate during a subsequent ice-age deteriorates and the temperature of the sea-water becomes cold, the divergent forces and the constricting tension caused by the cooling have their strongest effect precisely in this zone of weakness, i.e. between the constricting foot of the mountain and the constricting sea-bottom outside the coast. As a consequence the cracks in the outer layer of the earth's crust are progressively deepened in the crush-zone as the cooling penetrates downwards and even the deeper lying minerals are exposed to constriction. In this way the cracks penetrate further and further down and finally reach a depth of hundreds of kilometers. (The trend of the crack to bend landwards away from the sea depends on that the subcrustal masses there are less hard then under the strongly cooled ocean-bottom.) This is much the same phenomenon as may be observed in an experiment with a piece of paper. One may pull on the edge with considerable force without ripping the paper, but if one makes the smallest cut in the edge of the paper, the entire paper-sheet is rent apart, the rent proceeding from the slight cut.

When the continental base at the foot of the mountain chain and the ocean-floor adjoining it are each contracted, the crush-zone previously formed along the dividing line is deepened into a very broad and deep crack-zone resulting in a major crack in the earth's crust, sometimes running obliquely more than a thousand kms down (Fig.15). The uppermost opening of this crack-zone (or fore-deep) may be structured by rocks, gravel and mud washed down from the mountain chain. Deeper below, the crack is filled with tumbled down giant blocks, these being fragments of the rock base. In the deeper part of the crack, where the masses are somewhat plastic, the widening of the crack may be relatively delayed by crystallization accompanied by increase in volume of the minerals in the walls of the crack; this depending on the locally reduced pressure. Gravity anomalies (p.) become therefore negative over a fore-deep.

The tensions in the earth's crust are thus extremely great along the marine fore-deeps, where earthquakes of variable strength are frequent phenomena. Close to the fore-deep there are epicentra of earthquakes near to the surface or at shallow depth, and such shallow shocks occur even under the mountain chain running along the coast. The greater the distance from the fore-deep the more common are earthquakes originating from medium depth between 60 and 100 kms. Hardly any earthquakes occur, however, out at sea from the fore-deep. The deepest centra are always situated inland beneath a continent and down to depths of 300 to 700 kms.

Since the epicentra of deep earthquakes occur at increasingly greater depth the greater their distance from the fore-deeps, we may assume, either that a connection exists between the fore-deep and earthquakes of medium and great depth, or that the fore-deeps are continnued downwards by a broad crack-zone. Eartquakes can definitely be localized in this crack-zone and they presumably occur through tensional movements in the earth's crust caused by the cooling action of cold sea-water. These movements cause land-slides or new cracks to open up in the zone. Accordingly, as the coastal strip and the sea-bottom outside it diminish in volume through shrinkage the crack between them increases in width. The giant blocks, which have tumbled down into the crack, lie jammed between the walls of the crack and one another. As the crack gradually widens, the blocks from time to time lose their support, and, if the crack-zone is at this point sufficiently steep, the blocks crash down until they gain new support to become jammed again (Fig.16). When the fall is broken, as well as when new cracks are formed, transversal and ~~longitudinal~~ compressional seismic waves are created, the nature of which suggests that they are not due to explosions. Where the crack-zone runs more horizontally, no land-slides may take place, but they are localized to those sections where the fissure plunges steeply. The crack-zone would thus run from the fore-deep obliquely downwards in a more or less steep incline under the continent and off Japan it extends to about 1,500 kms from the fore-deep landwards below the Siberian Continent.

The space between the jammed blocks in the crack-zone is filled with sea-water. When the blocks tumble down, the water is pressed up through holes in the sea-bottom, carrying with it powdered rocks, sharp-edged chips of stone and sand

through blow-holes in the covering mud-bottom. This explains why sediments from the bottom of fore-deeps frequently consists of only sharp-edged sand and gravel.

The widest effect of the constriction of the sea-bottom in widening the crack takes place near its mouth. The tumbling down of rocks near the mouth of the crack will cause sudden sinking of a part of the bottom of the fore-deep. Sea-water will then rush in to fill up the empty space thus producing a giant wave. As this wave originates near the bottom of the ocean it affects the entire volume of water. Out into the open sea the wave is hardly noticeable on the surface, but on nearing a coast it runs to great heights and may cause great havoc and destruction. Such tsunami waves from, for instance, the Northern Pacific have caused heavy damage and loss of lifes in South America, but hardest hit are the nearest coasts.

The overwhelming majority of all present volcanos are situated near coasts or along deep crack-formations, as, for instance, in Central Africa. By no means all coasts are volcanic although they are subjected to marginal constriction. What then are the conditions which must be fulfilled if vulcanos are to emerge ? Islands are often volcanic, and it is clear in such cases the magmas have been squeezed by constriction from all directions with the result that they could only escape upwards The only straight coasts where volcanos are found are those of the Pacific type where a mountain range with a fore-deep runs along the line of the coast. If there is no fore-deep, or the coast is of the Atlantic type with the mountains running transverse to it, no volcanos are to be found. In both the latter cases, if marginal constriction is to compress the underlying masses into a molten state, it must not only overcome the inherent resistance of the masses to compression, but also that of the ocean-bottom to stretching. Such a resistance to stretching can hardly exist off coasts where a crack-zone hundreds of kilometers deep separates the coastal declivity from the floor of the ocean basin. As shrinking proceeds the crack is merely widened and the entire force can without restriction be transformed into pressure and heat.

Where extremely ancient mountain chains run along the line of the coast, as for instance in Scandinavia or Brazil, it may be supposed that the surface rupture and crush-zone has already been eroded before cooling started at the end of the

Tertiary. The surface layer there has already been replaced by underlying homogeneous minerals and no extensive crack could arise along the coast when the shrinking started. The ice-sheet of the Quaternary played probably also a part in increasing the rigidity of the earth's crust so no eruption could break it through.

The occurrence deeper down of eruptive masses, owing to the stored heat and previous considerable compression, is partly responsible for the rapid resumption of the elevation of the land once the ice-sheet has disappeared, an elvation that had been interrupted since the Tertiary. The elevation of Scandinavia and Canada after the ice-age was thus accelerated not only by the concentration of heat with its tendency to expand, but also by the process of crystallization accompanied by an increase in volume and release of heat, which began when the cooling action of the ice had ceased and the pressure had diminished so that the masses again solidify.

The present occurrence of volcanic activity indicates that marginal constriction still continues to exercise its downwarping influence along coasts of islands and continents. As marginal constriction continues the local pressure is increased and ever larger quantities of basic rocks are melted. When the quantity of molten magma reaches a certain volume, it overcomes the resistance exercised by the solid earth's crust above it. Molten masses force then their way up in the form of a volcanic eruption. When the eruption has continued for some time the pressure is reduced and the eruption ceases. When the pressure and the increased quantity of molten magma again reaches a critical point the eruption starts again. The magma centre may be compared to a local suppuration, which is drained by a fistula. According to Verhoogen (1946) there are insuperable difficulties in attributing all volcanic activity to a deep common fluid zone in or below the mantle. One of these difficulties consists in the different petrographic composition of the different lavas. As an example he quotes the two Central African volcanos Nyamlagira and Nyrangongo in the Virunga group, whose craters are situated only 12 kms apart, but whose lava has completely different composition. In his view, all volcanic lava comes from reservoirs at the depth of at the most a few kms, and that the lavas are the result of local melting. Both the volcanos mentioned must have separate reservoirs, and, if these reservoirs were situated very deep down, the channels up to the earth's surface would inevitably communicate at different heights, with a mixture of magmas as a necessary consequence. Verhoogen's study support the conception that volcanic activity can be caused by local pressure from marginal constriction.

The earlier mentioned gravity anomalies may be positive or negative and indicate that the rocks beneath the surface of the earth are composed of minerals of different specific weight from the average; positive if heavier and negative if lighter (Fig. 17). The constriction theory is the only theory that explains the cause of these anomalies. When a mountain is thrust up the pressure on the molecules of the previously strongly compressed minerals is suddenly decreased. On solidifying they expand and become lighter. Mountains, volcanos, fore-deeps and continental anticlinal vaults have negative gravity anomalies because the internal pressure on

the minerals there is slight. On coasts subjected to marginal constriction the subcrustal rocks become heavier, turned liquid and squeezed inland owing to great pressure, and the gravity anomalies become strongly positive (Fig.16, p.). Submarine mountain ranges, submerged anticlinal vaults, and almost drowned ranges with volcanos, for instance, the Mariana Islands, all subjected to more or less total constriction, show positive anomalies.

Toksöz (1975,p.96) thinks the positive gravity anomalies on the continental side of a fore-deep (fig.16) is caused by a descending lithospheric plate cooler than the surrounding mantle. and in his opinion its minerals are thus denser and more heavy. This must be incorrect once we generally believe the increased velocity and speed of the seismic waves in the deeper layers ~~is because~~ arise from the fact that their minerals are heavier due to compression (comp. p.).

A narrow montanous isthmus is subject to marginal constriction along its base and from both sides just like an island. The fluid magmas are pressed from both sides towards the middle of the mountain base and then upwards to seek an outlet. The central range of the sinking isthmus becomes thus crowned ~~by~~ with a row of active volcanos. The hard crust of the mountain becomes very thin below the crest and weaker. After the submergence the extreme lateral tension from the bottom of the adjacent marine basin is reinforced with the constriction of the slopes on the chain itself. As the lateral tension increases, the craters of the volcanos broaden scope. Emanating from such enlarged and elongated craters, cracks appear in the thin crest running from volcano to volcano all along the summit of the range until the entire mountain is ripped in two, separated by a deep crack penetrating down into the crust (Fig.18). As the constriction continues the crack widens and penetrates deeper down even through and below the local reservoir. That the central crack up to the present time penetrates deeper and deeper down is evident from the frequent earthquakes localized for instance along the Mid-Atlantic Ridge. The sometimes observed upwelling of warm water and lava from the very bottom of the central chasm indicates also that the ~~xxxx~~ crack is reaching down into hot layers. The deep central valley between submarine twin-ranges came accordingly into existence in a similar way as the fore-deeps or grabens, whereas the latter are broadly U-shaped in cross-section the former are narrowly V-shaped.

There is thus a fundamental principal difference regarding the genesis of the submarine twin mountain-chains. The theory of drifting continents and spreading sea-floors claim that a rising magma column pushes apart the two lateral crests, while the constriction theory explains the twin-shape as the result of lateral tension from both sides by the shrinking of the lateral abysses. If the drift theory should prove to be correct, the sides of the central valley would show the minerals

to be in a state of compression, whereas according to the constriction theory a tension with parallel cracks would be found.

In order to try to find evidence of such a compression, a joint French-American expedition was commissioned equipped with research submersibles capable of diving to a depth of several thousand meters. In 1974 the joint "French-American Mid--Ocean Undersea Study", abbreviated to "Project Famous", sent the following report: "One of the most important discoveries, made by geolo̊ists riding the American submarine ALVIN, has been evidence that the ocean floor is being pulled apart by forces acting elsewhere, rather than being forced apart along its centerline - as originally believed - by the intrusion of lava into the median valley."

"This was indicated by numerous rifts in the valley floor, the major ones parallel to the valley itself. No such features had been evident in photographs taken by cameras previously lowered from research ships. The close-up observations reveal no compressional features in the rift, as would be expected if it were being forced open there."

Heirtzler & Bryan(1975,p.88) as crew of the "ALVIN" states: "It was found that fissures exist everywhere from the valley's central line to its bounding walls on the east and the west, generally increasing in width with distance from the valley axis." The bottom of the central valley was filled with very young lava solidified when the range was submerged and since subjected to gradually increasing lateral tension. "The width varied from a few centimeters near the axis to tens of meters near the walls. Even the narrowest cracks were several meters deep. The wider ones were between 10 and 100 meters deep. In places there were small differences in elevation between one side of a fissure and the other. Across fissures up to a few meters in width it was possible to see matching halves of the same pillow lava on opposed wall."

The originally molten volcanic lava solidified rather suddenly when coming in contact with the cold bottom water as the range cracked open when submerged owing to the strong lateral tension of the constricting sea-bottoms on both sides of it. The observed cracks in the bottom of the central chasm caused certainly shallow earthquakes to begin with and were followed by further shocks as the original crack penetrated deeper down. The observations made from the "ALVIN" confirm in a most striking way the correctness of the constriction theory versus that of spreading sea-floors.

According to the theory of sea-floor spreading the floor is moving apart from the spreading axis along submarine ranges at a rate that is "remarkably steady over the ages in many areas. They vary from about half an inch to a little more than two inches per year away from the axis of spreading". ... "When the ridge contains a medium 'rift-valley', as many do, the axis lies within it." (Heirtzler 1968).

In addition to the aforementioned complete absence of any power to elevate the solid matter of the mantle as a flow to earth's surface, the occurrence of earthquake centra caused by sudden ruptures show the matter there to be hard and not plastic. In a plastic flow a sudden rupture is not possible. When the pressure ceases near the surface, the plasticity of rising matter comes to an end (Comp. p.). The opening will then be clogged and the sea-floor instead of spreading will be uplifted by the pressure from below as a single mountain.

With the separating axis located along the rift-valley it is also curious that, according to the drift theory, the two parallel ridges are still quite close together . If we suppose the separating speed is minimal or only half an inch a year, then once the Mid-Atlantic Ridge is of Miocene age or more than ten million years old, the two crests ought to be about 125 kms apart. Either has the spreading not yet

started or the sea-floor is moving beneath the undisplaced rigid twin-mountain, an absurd idea, whichever way. Once it is proved the Ridge had sunken in post-glacial time (p.) the correctness of the theory becomes increasingly questionable.

Bolt (1973, p.26), Wyllie (1975, p.50), and other seismologists have observed the existence of a low-velocity layer, varying from place to place, at a depth around 100 kms indicating the presence of a more or less fluid stratum. The assumption this low-velocity layer to occur under the entire hard crust of the earth is a fundamental requirement for the theory of ~~the~~ movement of the tectonic conveyor belts. That the rate varied from place to place may, in the present author's opinion, depend on the possibility that marginal constriction has locally softened the subcrustal masses ? So far, nobody has explained the force responsible for the conveyor movements, neither of upwelling magma between the submarine twin-ranges, nor the raising of so-called "plumes" penetrating the entire mantle and producing so-called "hot spots". If the constriction theory is accepted, the nuclear force of expansion and constriction will meet the request of an acceptable force, and all observed geological phenomenon may then come out in a natural way.

According to drifters the tectonic plates may inexplicably first move in one direction and then either stop or start moving in ~~a~~nother ~~one~~. Thus Burke & Tuzo Wilson (1976, p.50) believe the breaking up of Gondwanaland occurred 120 million years ago with the fracture along the present line of the Mid-Atlantic Ridge. (That rocks dredged from the northern part of the Ridge, according to Shand (1949), are of Miocene age, is not mentioned.). The hitherto stationary African Continent started then to move towards the ~~west~~. Then 30 million years ago Africa came to a stop and South America together with the Mid-Atlantic Ridge had to double its speed westwards.

Regarding the evolution of the Andes, James (1973, p.65-67) states that underthrusting by a descending oceanic tectonic plate buckled the sedimentary rocks of an older lowland and pushed them upward and ~~xxxx~~ward, in Triassic and Jurassic times. "Rising magma from the descending oceanic plate formed an arc of volcanos in the coastal waters of ~~the of~~ western South America." ... "100 to 60 million years ago, a second volcanic arc began to form eastward of the Jurassic arc. Upwelling magma swelled the crust, pushing aside the ancient sedimentary rocks, which crumpled to form the fold mountains of the eastern cordillera. Material eroded from these mountains poured into altiplano region. Formation of the present volcanic range began 10 to 15 million years ago, reaching by Pliocene or Pleistocene time, one or two million years ago, the present structure."

~~He~~ claims further that for classical concepts of mountain building it always was a mystery how the sedimentary strata of a geosyncline could melt and be deformed and likewise was the origin of the subsiding basin itself a mystery. The constricting theory alone can give the answer, viz.,

From the bottom of a very broad geosyncline a mountain range ~~was~~ thrust up in Mesozoic time. As the original vault was very broad, remains of this vault on both sides of the newly formed range could continue pressing downwards. After a time, new mountain chains may be folded up from the bottom of both the side vaults parallel

to the older ridge. In ~~this~~ such a way whole series of parallel mountain ranges may arise. The Western Cordillera were thus folded up at the end of the Mesozoic while the Eastern Cordillera arose successively out of the remains of the originally extremely broad concave vault. In this case, the folding of the remains of the geosyncline took place first in the Eocene, subsequently in the Miocene, and finally in the Pliocene. Then the cooling action of the ice age put ~~a stop~~ an end to any further downward pressure on whatever vestige still remained of the original syncline. In the broad valley of present Altiplano sediments from the lateral ranges accumulated during millions of years..The oldest ones melted probably in the deepest part of the rest-syncline, but the cold of the ice age compelled them again to solidify at great depth.

The Western Cordillera arose thus in Mesozoicum and at the same time as a consequence the highland to the west of the syncline lost its abuttment and collapsed. From this highland, sediments ~~was~~ were washed down and accumulated on the bottom of the syncline. These sediments, conglomerate and gravel, are now found along the western coasts of South America and as the stones and grains of the sediments decrease rapidly in size from the coast inland these sediments must have been washed down from ~~the~~ a west where now the ocean is several thousand metres deep.

Heezen & MacGregor (1973) have studied sediment cores drilled down to basement rocks in different parts of the Pacific by the ship GLOMAR CHALLENGER. These studies have been compared with data obtained by acoustical signals returned from the interfaces of layers of contrasty sea-floor sediments. The two authors believe in plate tectonics with sea-floor spreadings from the summit of the East Pacific Ridge or Rise ~~wit~~ with the main part of the Pacific floor moving essentially westward towards the island arcs of the Western Pacific. Somewhat west of Midway Island the direction is supposed to have been changed almost due north. This change of moving direction of the stated oldest part of the sea-floor is suggested by a row of guyots pointing towards the Kamchatka Peninsula. The two authors have accepted the original explanation of Hess (1946) that the guyots are old volcanos truncated by wave action to an old existing level of the sea. The present author (Malaise 1969, p.149 - 153) does not share this view, but found it much more likely the flat basaltic summit, similar as on the guyots studied by Carsola & Dietz (1952), are lakkelites covering older, less resistant strata. The isolated guyots represent thus remnants of an old peneplan or undulating highland, eroded subaerially by running water during a former continental stage, locally protected by the basalt and later rapidly drowned during the transgression marking the end ot the Tertiary. The lack of sediments on the East Pacific Rise indicate that this twin-mountain range, like the Mid-Atlantic Ridge, formerly reached above water-level and sank rather recently. In the present author's opinion,most of the Pacific Region was dry land during most of the Tertiary and partly during the Pleistocene(p.).

As the Mid-Atlantic and Indian Ocean Ridges surround the entire African Continent, this continent must be fixed and not in motion, as stated by some drifters. It is equally most remarkable that the supposed collision between the two large Asiatic and North American Continents has not resulted into an uplift comparable to that

of Tibet instead of producing the Bering Sea. But here also the Bering Sea and the probably Post-Glacialy sunken Bering Land-Bridge (Beringia of Hulten 1937) are evidently a stable original configuration of the earth's crust, and not the product of any motion.

The oldest sedimentary rocks of the Indian Continental Block are of Jurassic age and contain both in the north and south marine tropical fossils that lived on coral-reefs (Fell 1972). As part of Peninsular India was covered by inland-sea during the Permo-Carboniferous this continental block was, according to the drift theory, drifting northwards from the South Pole with such exceptional speed that in a headlong crash with the Asiatic Block it elevated the Tibetan Highland. This drift must accordingly have occurred before the Jurassic, during the Triassic. Once we know that the Himalaya Range was thrust up in the Tertiary from the bottom of the Tethys Ocean about 100 million years after the end of the Triassic, the effect was somewhat belated.

Probably realising this discrepancy the two authors McKenzie & Sclater (1973) state that the Indian Subcontinent separated only 75 million years ago from a supposedly unique former supercontinent that joined India to the Antarctic-Australian Block, moved then north with great speed crossing the Indian Ocean, and, quoting the two authors on p.70: "Beginning about 45 million years ago the northern edge of the Indian plate must have begun crumpling up the many layers of shallow-water sediments, known as a geosyncline, laid down over millions of years on the continental shelf that bordered the southern edge of Asia. The result was the upthrusting of the Himalayas."

270 million years ago India like Australia and possibly also Antarctica were partly covered by ice. Even during the warm Cretaceous, 75 million years ago, the climate around the South Pole must have been too cool for a tropical coral-reef fauna, but we know that sediments indicate the existence during millions of years of an uninterrupted warm ~~climat~~ sea all around India. Thus Fell states: "... all data are in agreement that the entire marine faunal assemblages of India for the Jurassic, Cretaceous and Tertiary periods comprise elements of the coral-reef zone." Magnetic anomaly patterns may be differently interpreted, but tropical marine sediments cannot but indicate that they were layed down when a tropical climate prevailed. Compare also Fig. p. from Molnar & Tapponnier 1977 on Indias northward drift during the last 71 million years from the vicinity of the South Pole to its present position. Also regarding India it is thus hard to believe in the correctness of spreading sea-floor theories. Many more absurdites of the drift theory are mentioned by Mantura (1972).

Whereas according to the drift theory without any proven force immence tectonic blocks are carried as on conveyor belts thousands of kilometers horizontally pushing their way through extremely rigid subcrustal masses the constriction one counts only on changes in meters vertically. Land may slowly emerge from the bottom of a shallow sea, a synclinal low-land may slowly be submerged, or a mountain chain be thrust up from the bottom of a deep marine basin, but lateral displacements may occur only exceptionally and only on a small scale (se pp. and). Continental blocks may be transformed into marine basins in connection with upthrusting of mountains from an adjascent marine syncline, but large scale lateral movements does not occur. The continental blocks are accordingly stable laterally and so are the marine basins. For all changes a responsible power is always accounted for, viz. changes in temperature, expansion when warmed and constriction when cooled.

A much discussed problem has been the cause of the ice-ages. In the long history of the earth, ice-ages have occurred repeatedly at intervals of 150 to 250 million years (Fig.19). As already mentioned after a long warm period, the anticlines and synclines of the earth's crust are forced to accentuate their relief. The elevation of the continental blocks and especially the extreme depression of the geosynclines resulting in an extreme lowering of the surface of the oceans in combination withthe upthrusting of new mountain chains cools the atmosphere with the result that snow and ice gather on the poles in the shape of extensive ice-sheets (Ramsay 1924). At the onset of an ice-age the bottom of the marine basins constrict owing to the cold melting water that results in a strong transgression of the sea. Gradually thereafter the climate again becomes genially warm and the polar ices disappear. In the course of the ensuing millions of years the mountains and the continental blocks are once again lowered by erosion. This interplay between long warm periods when the mountains are eroded and a new orogenesis followed by an ice-age has been called "The Pulse of the Earth" by the Dutch geologist J.H.F.Umbgrove (1947). In South Africa we have found traces of at least six different older ice-ages. It is almost certain the South Pole has then been situated over South Africa during most of the earth's geological existence.

About 250 million years ago, during the Permo-Carboniferous such an ice-age occurred; however it was not restricted to South Africa, parts of Australia, South America and India being also covered by extensive ice-sheets (Fig.20). According to the continental drift theory it has generally been assumed that the continental blocks then lay close together around the South Pole with the different ice-sheets being only components of a single immense ice-sheet. The American geologists A.A. Meyerhoff & Curt Teichert (1971) state that the ice-sheet of the connected continent would have been too large and too removed from any ocean to receive moisture enough to produce and maintain such an immense sheet. In the opinion of the present author the South Pole wandered about at that time and was alternatively situated either in Africa, Australia, India or South America. The geographical axis of the world was accordingly not stable at that time over the different places except for limited periods of time. Like a spinning top the earth wobbled about its geographical axis along different inclinations, and like a top irregularly arresting its wandering, with the South Pole over some place at one time and another place at another time.

In the mining town of Newcastle in the New South Wales, Australia, six to ten different layers of glacial tillite and moraine of Permo-Carboniferous age are separated by tropical or subtropical strata containing fossils of insects and of the Batrachian Labyrintodon (v.Klebelsberg 1949). This alternating change from tropical to glacial climate cannot be explained by continental drift, but that to its nature must be progressive in a single continous direction only. ~~but far better by repeated wobbling around a fixed polar centre.~~

Before the Carboniferous the magnetic and geographical axes of the earth were apparently subparallel; these conditions suddenly changed in Mid-Carboniferous when the geographical axis suddenly started to wobble while the Magnetic Pole remained

fairly stable. These unstable conditions continued until Mid-Permian, when the geographical South Pole became stabilized over the Antarctic Continent. This dating is based on the upper Newcastle tillite and is confirmed by Stehli (1957, 1963) on Permian temperature zones that varied exactly as to-day. Towards the end of the Mesozoic the two axes of the earth were again more or less subparallel. According to a lecture in Stockholm in 1965 by S.K.Runcorn, the mean geomagnetic field has been dipolar along the present geophysical axis since the early Tertiary, and the continents and the poles have been stationary since then. This statement is certainly correct as it is confirmed by faunal and botanical observations. According to Reid & Chandler (1933, p.70) the Eocene flora of Great Britain and Newfoundland were more dissimilar when the two continents were supposed to have been jointed together or just had separated, than in later periods when fully separated. Wyatt Durham (1952, abstract) states: "It is concluded that available data with respect to the temperature facies and geographic relationship of the Paleocene-Eocene marine faunas of the world indicate that no 'Continental Drift', in the sence of Wegener and Du Toit at least, has occurred since late Cretaceous time." He states further on p.340: "The distribution of tropical marine faunas during the Paleocene--Eocene indicates that the North Pole must have occupied the same position then as now, thus negating this aspect of 'Continental Drift' during the Tertiary."

One gets the impression the earth's hard crust and the fluid core had temporarily rotated independently of each other. This presupposes that during and before the Carboniferous not only the core but also the mantle was fluid.

Sir Harold Jeffreys states 1953 in a presidental adress quoting Kelvin that with a hard crust having a thickness of 33 to 50 kms "the crust would bend so freely under tidal forces that the ocean surface could rise no more than its bottom would, and tidal observations would measure only the difference." Had the hard crust been considerably thicker, then the polar depressions of 21,479 meters at each pole (and most of the ocean waters gathered into them.) would have put a speedy stop to the wobbling. Molten matter would solidify almost instantly throughout when their critical temperature is reached. It is tempting to speculate that this critical temperature was reached at a moment when the South Pole happened to be situated over Antarctis. Such a sudden solidifying would explain the occurrence of the discontinuities in the earth's mantle where the seismic waves

change sharply (Fig.4, p.). The existence of these observed stable discontinuities at different depths speak against the occurrence of either rising or descending convection currents.

In contrast to the more stable magnetic axis of the earth, connected with the heavy iron core, is the geographical axis supported on a lighter mantle and the hard crust, and amenable to wanderings. Under exceptional conditions could the hard crust be displaced, if the force of inertia could be overcome. The centrifugal force condemned on the other hand the magnetic and geographic axes to strive again for equilibrium and readjust themselves on subparallel tracks.

To change the angle of the earth's geographical axis an extremely strong force is required, but in this case the force may be introduced from outside the earth itself. The close passing of a large celestial body would influence the magnetisme of the earth enough to change the declination of the magnetic axis. A hit of a large meteorite would under certain conditions be able to alter the geographical axis. In this actual case the geographical axis would be more affected than the magnetic one.

During the billions of years of its existence the earth as well as the moon and other planets have been repeatedly hit by several sizeable meteorites (Fig.21). In most cases such a hit will, in addition to the disastrous local effect, either slow down or speed up the rotation. The inclination of the axis can only be affected by a hit on the very pole itself or very close to it. Quite a lot of meteoritic craters are known all over the world, for instance in Canada, U.S.A., Argentina, Arabia, Australia, etc. The largest generally accepted meteoritic crater of the world is the Vredefort Ring southwest of Johannesburg in South Africa with a diameter of 130 kms. Inside the "Ring" is an old plug of granite simulating the central dome of a lunar crater. "Their axis indicate that the granite was buried some 45,000 feet beneath the sedimentary cover when the impact occurred." (Stubbs 1968).

This gigantic meteorite must have hit almost the exact South Pole of the time. If it consisted of a solid chunk of iron, as most meteorites do, it may have penetrated the earth's crust and be embedded into the mantle. This would explain the observed excentricity of the earth's centre of gravity (Gutenberg 1939). This

extremely large South African meteorite may have been powerful enough to bring about the observed wobbling of the earth and the Vredefort Ring represents most probably the scar thus left over after one of the most important accidents in the worlds past history. The rare condition for a tilting of earth's axis had thus been fulfilled. My theory for the cause of diffusion of the Permo-Carboniferous ice--sheets seems thus rather well grounded.

Owing to the slight friction between the hard crust ~~resting~~ with on the geographical poles and the fluid core, the deviation between these two components of the earth gradually decreased only during the Mesozoic. The geographic and magnetic axes of the earth became then roughly subparallel only towards the beginning of the Tertiary. During the Mesozoic the two sets of axes were strongly displaced and the observed magnetic orientation of the molecules towards the magnetic paleo-poles of the epoch can thus easily be explained, without referring to continental drift. As the poles during that long span of time were provisionally stabilized over different and widely dispersed places the geomagnetic observations sometimes tend to be rather confusing. It may then be advisable to control some of the observations as it may be suspected that some of them have rather been adjusted to fit the theory.

The Quaternary ice-age was interupted by longer sub-stages of warm climate, indeed warmer than the present one (Fig.22). During each of the somewhat shorter cold sub-stages, so much snow and ice was stored as glaciers on the higher mountains and as ice-sheets on Antarctis and the northern parts of Europe and North America that the oceans were deprived of such large quantities of water that the general sea-level sank about 100 meters on average, and during the coldest or Riss Glacial Stage down to about 135 m. (Holmes 1965). When most of the ice again melted during the warm interglacials the surface of the sea rose again. Five or six major cold substages have been recognized in Europe and have been named, beginning from the oldest: Donau, Günz, Mindel, Riss, Würm I and Würm II. Only the four or five last ones are observed in North America where they are labelled: Nebrascan, Kansan, Illinoian and Wisconsin I and II. Some minor cold substages are in addition noticed to have occurred during the interglacials when the climate became somewhat cooler, but not cold enough to produce ice-sheets except possibly in the Far North. On the ma-

rine Pleistocene time-scale by Ericson, Ewing & Wollin (1964), based on oceanic sedimentary cores there is a steady increase of cold-lowing planctonic Foraminifera (Fig.23) occurring between the major cold stages. The ice of the Barent Sea and parts of America and Northern Europe may have never melted completely during the entire ice-age and may even have expanded during minor cold stages enough to produce the observed loess-layers in Central Europe (Bohemia)(Kukla 1968). Wollin et.al.(Nature 1971) states: "higher magnetic intensity seems to indicate colder climate. thus we conclude that magnetism may modulate climate to some degree by the ability of the Earth's magnetic field to provide a shield against solar corpuscular radiation." Minor climatic changes may thus have many different causes.

Climate depends primarily on the quantity of solar heat which the earth receives, and the changes of season depend on the inclination of the earth's axis with respect to the solar rays which fall upon it. The inclination of the earth's axis is not absolutely constant, but changes somewhat although as a rule to a slight extent. The deflections of this movement vary periodically and have been mathematically determined by Milankovitch (1938)(Fig.24). These movements affect the intensity of solar radiation in the outermost layers of the atmosphere. At certain extreme angles of inclination the earth receives much less heat than normally and if these minima in the curve of the angle of inclination are particularly pronounced, then the mean temperature falls greatly, only rising above normal at the maxima of the curve. When such a pronounced minimum occurs the mean temperature of the entire earth drops by 1 or 2 degrees centigrades. If at this juncture the earth's atmosphere is already cooled by superelevated continents and an extremely low sea-level the effect easily becomes catastrophic. A critical situation can arise and the extreme undulations of the earth's axis obtain a trigger influence so that the winter's ice and snow are not able to melt, but survive from year to year. The reflection of solar heat from the expanding snow-fields, viz. the "albedo effect of ice and snow and from clouds" causes the mean temperature to drop by as much as 7° to 8° C. Such a labile siruation existed at the end of the Tertiary.

An important and probably decisive contributory cause to the formation of ice around the North Pole and of the origin of the ice-age was the fact that warm ocean

currents were prevented from carrying heat from equatorial regions to the Northern Polar Sea by a land-bridge extending all the way from Scotland to Greenland over Iceland (Fig.25). This lack of influx of warm water to the Arctic Ocean was established by scientists on board the Russian ice-breaker SADKO in 1935. The existence of this land-bridge is denied by most scientists (Heirtzler & Bryan 1975, p.80) and the Russians are the only ones to date its sinking more definitely, viz. "waters from the Gulf Stream got access to the Arctic Ocean for the first time 10,-12,000 years ago, and this influx increased considerably 3,-5,000 years ago" (during the Climatic Optimum). - However recently Vogt (1972) confirmed the sinking of such a bridge extending from Scotland to Greenland.

In the present author's opinion it is rather difficult to date the breaking up of this land-bridge. Unfortunately the Russian date is only published in a popular journal, PRIRODA (Nature), 1953, p.62, but the statement is confirmed by Zhirov (1964, p.341). The scientific foundation for this statement has to my knowledge not been released, probably because the report may also contain some informations of military value.

The extreme lowering of the general sea-level towards the end of the Tertiary had at length turned the Polar Sea into a land-locked one. Right from the beginning of the isolation of this sea, southerly winds brought great quantities of moisture northwarths and, when these winds were cooled, they deposited their moisture over the Polar Basin in the form of rain and snow. The water must at an early stage have filled the basin or rather basins to the brim. The surplus must have flowed back southwards, to begin with as a mighty river west of Iceland and from the end of the Pliocene also east of Iceland between the present Faeroes and the Shetlands. At these two points are found the two greatest depth in the form of narrow channels in the ocean floor running across the ridge connecting Greenland with Europe.

Ewing, Heezen et al.(1953) communicated the discovery of a submarine canyon (Fig.26) following roughly the trend of the coast-line of Newfoundland and Labradorand extending the full length of the axis of the corresponding ocean basins. This canyon-like depression is 5 to 8 kms broad, box-like in cross-section, with mostly steep to perpendicular sides, with flat bottom and has been traced to a

length of 1,200 miles. To ascribe this canyon to the activity of turbidity currents as postulated is impossible for several reasons. A turbidity current, if attributed any abrasive effect, would have created a broadly U-shaped valley, like valleys sculptured by ice. The canyon breaks through a rather narrow gap in the South East Newfoundland Ridge up on the western slope of the marine basin. This part of the basin consisted of a syncline, depressed during the warm Tertiary and elevated when drained and cooled at the great transgression proposed as the boundary between the Tertiary and the Quaternary. The canyon was accordingly excavated by a river coming from the Arctic Ocean already during the Tertiary and on the then lowest tract of the valley. After the transgression the syncline was contracted and thus elevated owing to the cooling influence of the cold sea-water. The canyon is, therefore, to-day suspended on the western slope of the basin. A canyon excavated under present submarine conditions by turbidity currents, if this could be possible at all, should be situated east of the present canyon along the deepest part of the basin. With the lack of any great river capable of accumulating large quantities of mud only small turbidity currents could be produced, and with long intervals in time and place in between.

The discovered canyon represents certainly only the part of it that was drowned very rapidly at the great transgression just mentioned. The part of the land--bridge that remained above water-level during the entire Quaternary sank only slowly after the transgression owing to marginal constriction. Most of the sides of the canyon up in the Denmark Strait were then obliterated by wave-action during the slow sinking. It could only be possible that from this broad land-bridge an ice-sheet advanced from north-west over Great Britain (The Old Drift) during the oldest Quaternary. Later on an ice-sheet swept over Great Britain from Scandinavia across the North Sea, e. i. from the north-east.

Two other scientists who believe in the former existence of this land-bridge, which they have baptised the Thulean Bridge, are Strauch (1970), during the Tertiary only, and after him Clausson (1972). The latter states on p.151: "It may as a summary be said that the Arctic Ocean has acquired its present geography during the Pleistocene, but during the Pliocene other conditions existed." ...(on p.153) "From oceanographic point of view a pack-ice would have prevailed in the Arctic

during interglacials and interstadials while the Arctic Ocean could have remained open during most of stadials." The migration of oceanic molluscs of cold water species to the North Sea and the North-Eastern Atlantic Basin is given by Strauch as the reason why the breaking up of the land-bridge has been dated to the boundary time between the Tertiary and the Quaternary.

At the close of the Pliocene Harmer (1920) states that in a sea-area around the present Norwich in East England the earlier warm marine fauna under the so--called Coralline Crag was replaced under constantly progressive cooling by a boreal fauna under the Red Crag. A cold-loving fauna had then developed in the combined Arctic Ocean and the North Sea and had also spread to the closed North-East Atlantic Basin. This indicates that the river between Scotland and the Faeroe Islands, in addition to the river west of Iceland, came into existence already in the Pliocene. At the end of the Pliocene arctic marine fossils found in Calabrian raised beaches on the western coasts of Italy and Sicily contain shells of Arctica (Cyprina) islandica L. (Fig.27). The same arctic fossils are also found in raised beaches of the succeeding Quaternary Sicilian Stage of the Donau-Günz(Villafranchian) Interglacial. Pelagic larval forms of arctic species, swimming with the new river, could of course develop to maturity in the synchronausly cold North-East Atlantic Basin. Strauch's dating of the sinking of the land-bridge to Greenland is thus rather poorly founded.

Olausson states that the Arctic Ocean was open and unglaciated during the cold stages of the ice-age. In this respect he is following Donn in Ewing & Donn (1956, 1958, 1966). He claims too that the Arctic Ocean possessed its present geography during the entire Pleistocene and that the Gulf Stream accordingly had free access to it. Owing to the rotation of the earth a warm marine current from the south is bound to turn east and a cold one from the north has to strive westwards. The coasts of New England would thus have been washed by a very cold stream from the north. It is then incomprehensible how New England could have remained unglaciated (comp. p.), squeezed as it was between the immense Labrador-Keewatin inland--ice on the one side and the cold sea on the other side. Once the American inland ice-sheets could get enough precipitation during the Pleistocene to maintain their

oceanographic point of view

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size the coast-land must have got its share too.

A series of raised beaches along the coasts of Eastern Greenland, Spitsbergen (Svalbard) and on the islands of the Barent Sea suggest that these tracts have been elevated rather rapidly. A trunk of drif-wood on one of the highest ones has been radio-carbone dated as 9,000 years old (recalibrated thus 10,000 years old), which indicates that this elevation has occurred in post-glacial time. The bottom of the Barent Sea was elevated after the ice on it had melted away due to the influx of the warm Gulf Stream. The thickness of this gigantic arctic ice makes it doubtful if it could melt during the warm interglacials without access to warm water. Its cooling influence on parts of the northern inland ice-sheets may have made them also survive the interglacials.(Comp. Brooks, p. and also Antarctic ice on p.).

Strong circumstantial evidences indicate thus that the Russian dating is correct and that the Scotland-Greenland land-bridge existed until the end of the ice--age or to about 12,-14,000 years ago. The Arctic Ocean was most probably land-locked until that time. The distribution of Holarctic fresh-water fishes indicates that its surface water was fresh or at the most brackish owing to rain, snow and water from rivers. Salt water was probably restricted to the deepest parts of the ocean. The occurrence of endemic species of Amphipods and Isopods (Crustaceans) at a depth of 2,000-4,000 metres indicate that these deep parts of the ocean have not been frozen to the bottom (Gurianova 1938). The less deep parts of the ocean as the Barent Sea were on the other hand most probably frozen to the bottom. During the colder stages of the ice-age the surface of the Arctic Ocean was most probably covered by ice. That fresh-water ice can remain frozen to the bottom even if washed by cold sea-water is demonstrated in Antarctica. The strait between the Weddel Sea and the Ross Sea is frozen to the bottom despite free access of ocean waters. This strait will remain frozen to the bottom until a warm marine current gets access to it. Without the cooling influence of a partly frozen Arctic Ocean the many layers of loess found in Bohemia by Kukla (in Emiliani 1968) cannot be explained.

According to the constriction theory it was not the great weight of the ice--sheet up to 3 kms thick that pressed down Scandinavia and Canada during the ice-age,

but the cold of it that compelled the earth's crust beneath it to constrict and sink. South of the European inland ice-sheet the land was not depressed during the ice-age but an elevation of the land since the Tertiary kept going although now extremely slowly. The sea-level of the Mediterranean variously sank or rose depending on the climate. During a warm stage when the sea-level was high due to melting of the glaciers the world over elevated shore-lines developed along all coasts. At the next cold stage the sea receded and a new shore-line was built up on a lower level. The colder stages of the ice-age lasted on average 50,000 to 100,000 years each (Fig.22, p.). During such time the land continued kept rising so much that the older shore-linescould not be reached by the sea and a new beach developed somewhat lower than the previous one. A series of six raised shore-lines extend along all coasts of the Mediterranean and French and Spanish Atlantic coasts and the higher they are situated the older they are. From fossils found in these elevated shore--lines we can estimate the climate and the temperature of the sea-water. At the end of the Tertiary and during the older warm interglacials elephants, hippopotamus, apes and other tropical or subtropical animals were common in Southern Europe simultaneously as boreal conches and mussels, now living along the coasts of Iceland and of Northern Norway, occurred in the Mediterranean (Fig.27, p.). The sea-water was accordingly arctic cold.

Almost most scientists regard the Mid-Atlantic Ridge as having always been submarine or possibly to have reached above water-level in the Tertiary or a little earlier. It is an undeniable fact that this Ridge constituted a continent and remained so from the Miocene until many thousand years after the end of the ice-age, which latter ended 10,-12,000 years ago. This mountain range has been used by animals and plants as a migration path between Europe and North America and between Africa and South America (Fig.40, p.).

The present author secured the first geological proof of this physiographical situation from a paper by the American oceanographer, Dr. C.S.Piggot (1938). Dr. Piggot then incented a new kind of bottom lead consisting of a small cannon, which is lowered to the ocean floor with its muzzle directed downwards. When the instrument reaches the bottom it fires a projectile consisting of a long metal tube. The

mud-column thus obtained constitutes a cross-section of the bottom sediments from the surface downwards. Piggot obtained thus a series of bottom sediment samples right across the Atlantic between Newfoundland and Southern England (Fig.29).

One of his sediment cores (Nr.8) came from the top of the Mid-Atlantic Ridge and Nr.7 and 9 came from the sides of the Ridge alternatively only 30 kms from Nr.8. The samples 4 to 7 taken west of the Ridge contained only organic material, viz. calcareous skeletons of almost microscopic pelagic Foraminifera (Fig.23, p.). Some of these layers contained remains of species living in warm water, but alternating layers contained species living in water colder than the present Gulf Stream. The corer had reached down into layers deposited during cold or warm substages of the Würm (Wisconsin) Glacial Stage. While the samples taken west of the Ridge contained almost exclusively organic material, the samples taken immediately east of the Ridge consisted mostly of sand and mud from melting icebergs or drift-ice. All the sediment samples were taken inside the present area of the Gulf Stream and are all covered by an uppermost thin blanket of organic mud indicating that the Gulf Stream could have deposited this mud during the last few thousand years only. The The upper volcanic ash-zone must have been deposited in Post-glacial time. The diagram indicates that the Gulf Stream was prevented from passing the Ridge until many thousand years after the end of the ice-age. The continent or narrow land-strip, that must have prevented the passing of the Gulf Stream, we may name A T L A N T - I S. It must still have been contemporary with the Old Egyptian Empire.

As long as the Mid-Atlantic Ridge reached above water-level the Gulf Stream could not reach Europe, but was forced in an arc westward towards Greenland and the consequently never glaciated coasts of New England. At the same time a cold marine current with floating drift-ice hugged the eastern shores of the Ridge. Ice-carried boulders are thus found on the Azores, but consequently only on their eastern shores. They would be stranded on the north-western shores if coming with the Canary Current. Similar boulders have also been dredged from the summit of a submarine sea-mount as far south as opposite the Canary Islands. From the summit of the same sea-mount was also dredged about a ton of flat pteropode lime-stone cobbles rather recently lithified by subaerial conditions.

"The deeply altered basalt, with discolored margins up to 2 cm thick" dredged from the flanks of the Mid-Atlantic Ridge by T.H.v.Andel, et al. and published in 1965 indicate also that the Ridge had previously remained above water-level during millions of years. Discoloring of basalt by weathering is an extremely slow process. (Compare "Desert Varnish" on p.).

Near the Equator the Swedish Albatross Deep-Sea Expedition obtained a sediment core from the top of the Local Mid-Atlantic Ridge. It turned out to contain a layer with exclusively fresh-water diatom-algae, 18 different species in thousands of individuals (Fig.30 and 31). The corer had apparently happened to hit the bottom of a former fresh-water lake that later was drowned when the Ridge sank beneath the surface of the sea. Beneath the layer with diatoms other layers with marine Foraminifera indicate that the lake originally may have been a marine bay later sealed off and its salt water replaced by fresh-water.

Further north on the western side of the Mid-Atlantic Ridge and opposite Labrador at 56° 16′ North the Russian oceanographic vessel "Michail Lomonosov" succeeded in breaking loose a rock outcrop from a depth of 2,500 m.(Zhirov 1964, p.264). To this rock a white coral was attached. Corals cannot live at greater depth than 60 m. This find shows that the depth at this place about 10,000 years ago had been so shallow that corals could live there and that the water of a formerly ~~first~~ north-east ~~and later~~ then north-directed Gulf Stream there were still tropical warm. The place had apparently sunk rather recently. This also proves land prevented the Gulf Stream from entering the Arctic Ocean.

The marine arctic fossils found in the late Pliocene (Tertiary) Calabrian elevated shore-lines and in the oldest Quaternary, the so called Sicilian raised beaches of the Mediterranean (Fig.27, p.) indicate that the waters outside the Gibraltar Strait had then been arctic cold. The waters of a cold current coming from the north towards the equator have, owing to the rotation of the earth, a trend to drag westward on their journey south, whereas a warm current from the vicinity of the equator flowing towards the poles will drag eastward. The cold water outside Gibraltar must therefore have been hemmed in by land, at least towards the west, viz by the Mid-Atlantic Ridge. A now sunken branch of the Ridge helped to

obstruct the cold water or else may have directed a cold current from the north towards Gibraltar. When this cross-ridge had sunken owing to marginal constriction a warm current from the south brought warmth and moisture to Gibraltar, and Central Europe together with tropical fossils (Fig.32), to the raised beaches of Tyrrhenian and Monasterian age in the Mediterranean from about 1,060,000 to about 115,000 years ago.

When the third or Tyrrhenian raised beaches were developed the marine fossils showed that the temperature of the Mediterranean waters had changed to a tropical one with the arrival of corals and molluscs now living in the Gulf of Guinea (Fig. 33). In the still younger raised beaches the fossils indicate that the temperature of the sea was gradually approaching the present conditions. A curious fact is that the American coasts have the same series of raised beaches, but the local marine fossils show the sea-water was neither arctic cold nor tropical warm. In the literature, there is no explanation to the changes in temperature of the Mediterranean waters. Decisive is apparently the temperature of the water outside the Strait of Gibraltar. The influx of water from the Atlantic is so strong owing to the great evaporation in the Mediterranean Region. That, as an illustration, the Mediterranean sea-level nowadays would drop by about 80 centimeters in a single year without that influx. The different temperatures of the water on the two sides of the Atlantic Ocean indicate that the now submarine Mid-Atlantic Ridge was then above water-level (Fig.34).

Once the Gulf Stream got access to the Arctic Ocean the entire meteorological situation was transformed (Fig.35). The east-wind, blowing along the margin of the frozen ocean died out. Just as the Antarctic east-wind south of the west-wind belt is bringing moisture to the ice-fields of Antarctis, so had the Atlantic east-wind brought precipitation to the North American ice-fields. With the disappearance of this east-wind the ice-sheets of Labrador and Keewatin dwindled away. The Gulf Stream melted the Arctic ice thereby ending the Great Ice Age and bringing warmth to Northern Europe by warming up the climate. With the penetration of the Gulf Stream into the north the labile situation of the ice-age came to an end. Minor cold shifts may occur in the future, but we need not fear any longer a new real ice-age once the Gulf Stream maintains its present direction.

It is most probable that also other now submarine mountain chains, as, for instance, the Carlsberg Ridge and the Mid-Indian Ridge also reached up above water-level even after the end of the ice-age, thus providing a land-bridge for diffusion of terrestrial biological life. The different pigmy tribes, all exclusively bound to tropical virgin forests, cannot have reached their present widely dispersed abodes without a continuous woody connection. They cannot cross even a broad river, not to say a marine channel.

Several additional proofs that the Mid-Atlantic Ridge, i.e. the Continent Atlantis, reached above water-level in post-glacial time may be mentioned (Fig.37, p.).

When the land-bridge between Scotland and Greenland over Iceland had sunk, the Gulf Stream could enter the Arctic Ocean through the Denmark Strait, but was still prevented by the Atlantis Continent to reach the North-Eastern Atlantic Basin (Fig.35). Once the lowest part of this continent had sunk, viz. south of the Reykjanes Ridge but north of the Faraday Hills where Piggot took his samples, the Gulf Stream could enter the Arctic Ocean east of Iceland and was there no longer hampered by the cold stream from the north, on the contrary penetrating constantly further north and with greater volume into the Arctic Ocean (Fig.36).

It may appear absurd to suppose that the Mid-Atlantic Ridge at the place where Piggot took his samples should have sunk to its present depth of nearly 1,300 m in less than 4,000 years. This would amount to more than 30 m per century, or on an average 30 cms (1 ft) per years. We know, however, from Lidén's investgations (1913) of change of level in the Ångermanland Province of Northern Sweden that the elevation of Scandinavia immediately after the melting of the Inland-ice amounted to approximatively 20 m per century at the marine boundary line. The elevation later diminished rapidly according to the curve drawn by Lidén. According to Odhner (1934) this curve may be extrapolated further back in time to the maximum depression and it shows that the land was depressed nearly 1,000 m and further the rate of elevation for the time before Lidén's starting point can be estimated to pretty nearly 30 m per century. The greatest submergence did not take place at the marine boundary line, but at the ice-divide as was shown by Granlund (1936). The

ice-divide presumably lay "along a line which runs roughly along the eastern limit of the mountains, the region of the great lakes at the fault point between the Fenno-Scandian primeval mountain and the Caledonian folded range," the latter possibly having some causal connection with the maximum elevation of the land. The elevation of the land would of course have proceeded much more rapidly on the ice-divide itself than on the later deposited marine boundary line.

The cooling influence of the ice-cold bottom-water on the base of the sinking continent is fully comparable with that of the inland-ice and 30 m per century lies well within the bounds of possibility. We may assume the submergence rate was accelerated once the land had sunk beneath the surface just as the land elevation in Scandinavia diminished once the ice had disappeared.

Once it has been possible to establish beyond reasonable doubt that the Continent Atlantis has existed almost until historical times it seems scientifically tolerable to take up a study of ancient myths and tales about Atlantis. The tales of Plato constitute our original information about Atlantis and were written about 400 years before Christ. These his tales have frequently been regarded as fictional and the product of his imagination. All his statements, that can be perfectly checked, show, on the other hand, that he has strived to give an exact geographical description of a now sunken land and its people. So is, for instance, the finding of the plain on the topographic bottom profile obtained by American oceanographers the strongest possible proof that Plato's description was founded on reality (Fig.38). He could not possibly have known the bottom configuration of the Atlantic Ocean.

Atlantis, this paradisiacal land that once upon a time sank into the sea has attracted the interest of mankind for more than 2,000 years as the cultural centre of prehistory. Plato obtained his informations on Atlantis from Solon. Solon visited the Egyptian town Sais and was there informed by an Egyptian priest about a war during which a Greek army under the leadership of Athen conquered an attacking Atlantean army and thus saved many European peoples from slavery.

Plato states that 9,000 years had elapsed since the Greeks conquered the Atlanteans. If he meant 9,000 solar years, then the battle should have taken place

shortly after the end of the ice-age. At the time both of Plato and of Solon the Greeks used the Assyrian-Babylonian lunar calendar. This calendar was improved by the Greek Kleistratos in the 6th century B.C. and further by Meton in the year 432 B.C. If Plato meant 9,000 months, that is 750 solar years, then his statements become acceptable, but are quite absurd if he was speaking of solar years. The Egyptian priest, who had informed Solon, said he got his informations from very ancient documents kept in his temple. 9,000 years ago there existed no written language even in Egypt, but were in common use some 1,000 or 1,500 years before Solon. To imagine ~~that~~ the fate of a foreign people to be preserved for several thousand years by oral tradition only is ridiculous.

According to Plato Solon translated all names as well as all measurements, e.g.stadium (one stadium = 185 m.). He had never any reason to use but Greek lunar years like all other cultivated persons of his time. In quoting the Egyptian priest about the war between the Hellenes and the Atlanteans he says: "This power came out of the Atlantic Ocean, for in those days the Atlantic was navigable; and there was an island situated in front of the strait which you name the Columns of Heracles; the island was larger than Libya and Asia Minor put together, and was on the way to other islands, and from the islands you might pass through the whole of the facing continent which surrounded the true ocean; for this sea which is within the Strait of Heracles is only a harbour having a narrow entrance, but that other is a real sea, and the surrounding land may be most truly called a continent. Now on the island of Atlantis there was a great and wonderful empire, which had rule over the whole island and several others, as well as over part of the continent; and, besides these, they subjected the parts of Libya within the Columns of Heracles as far as Egypt, and of Europe as far as Tyrrhenia ...".

"The whole country was very lofty and precipitous on the side of the sea, but the country immediately about and surrounding the city was a level plain, itself surrounded by mountains and thus sheltered from the north. The plain was very fertile and of an oblong shape, extending in one direction three thousand stadia, and going up the country from the sea through the centre of the island

two thousand stadia ...." "It was surrounded by a circular ditch. The depth and width and length of this ditch were incredible. ... It was excavated to the depth of a hundred feet, and its breadth was a stadium everywhere; it was carried round the whole of the plain, and was ten thousand stadia in length. It received the streams which came down from the mountains, and winding round the plain, ..." "The plain was subdivided (by canals) into squares of ten stadia each way, and the total number of all the lots was sixty thousand."

The mountains were said to be very rich in metals and other useful minerals and the country brought forth a multitude of fruits and edible vegetables, among them coco-nuts. Plato knew no name for coco-nuts because they did not then occur in the region, so he says "the fruits having a hard rind, affording drinks, and meat, and ointments." Elephants and other animals of every kind both wild and tame were plentiful. From a minor mountain four rivers were flowing in the four principal directions, north, south, east and west to the surrounding ditch, which had been excavated during many generations. The extremely fertile plain was regarded in antiquity as the "Garden of Eden". A sketch of the four rivers to the surrounding ditch served as the emblem of Atlantis. This emblem, an even-armed cross inserted into a circle may be observed on Scandinavian rock-paintings from the Bronze-Age in connection with reproductions of vessels with elevated platforms (Kon-Tiki rafts) (Fig.39). Archeologists have named this cross-wheel the "Sun-Cross", but it indicated apparently the nationality of the vessels.

The snow-clad mountains said by Plato to have sheltered and protected the plain from the north reach even to-day above water-level. They constitute nowadays the Azores with their summits about 5,000 meters above the plain. That no archeological traces of Atlantis have been found on the Azores is rather natural, since buildings are not erected on snow-mountains.

A Danish engineer M.Frandsen explains in a book from 1949 how he on studying a marine chart of the Azores happened to notice a submarine table-land 700 fathoms above the surrounding sea-bottom (Fig.38, p.). The size and shape of this table--land reminded him of the cultivated plain around the capital of Atlantis in the

tales of Plato. He made a sketch of this plainaccording to the description and measurements of Plato and in the scale of the chart. As the agreement in the main was good he became interested. By studying the depth-curves he found the declination of the plateau to be on an average 1:900, it was accordingly question of a real large plain with a size of about 555 by 370 kms or more than 20,000 square kilometers i.e. considerably larger than Wales in England. On the sketch he drew in the contours of the mentioned dividing canals and of the surrounding ditch, which latter should have length of 10,000 stadia or about 1,850 kms, (he counted a stadium = 200 m), but he got it about 40 kms longer. He also computed 700 more square lots than the 60,000 ones given by Plato. These differences are acceptable once the figures of Plato are regarded as round-about. Now Frandsen had for 30 years been working on irrigation in open and closed canals, so he estimated the declination of the water-level in the canals and found it to be 1:1,500. The current in the canals must thus have been too slow to cause any difficulties of navigation for the vessels of the time (Fig.41, p.).

Except for the plain around the capital the entire Atlantis Continent was mountainous and south of the present Azores the climate was tropical or subtropical. Plato states definitely coco-nuts and elephants were common in Atlantis. During the Tertiary and the older quaternary cross-ridges had connected Atlantis both with Africa and South America (the Rio Grande and the Walvis Ridges). It is much more probable that elephants originally reached the American Continent this way rather than over the Bering Strait as postulated. North of the present Azores the climate of Atlantis must have been genial along its western shores as well as along the south coast of the broad cross-ridge from Iceland to Greenland, washed as both were by the Gulf Stream. The numerous findings of mammoth or elephant bones dredged from the bottom of the sea off the New England coasts, indicate that elephants migrated this way between Atlantis and ~~the~~ America and may originally have entered also along this path from Atlantis (Fig.40). The archeological finds in Central America of giant stone-heads of negroid type indicate that from Africa a prehistoric immigration of Negroid peoples parallel to that of white dolichocephalic (long-headed) Olmecs of a Caucasian or Cro Magnon-like people had occurred from Europe to Atlantis.

The west coast of Europe had since the middle of the ice-age, been washed by a warm marine current from West Africa simultaneously as a cold current, at least partly originating from the Baltic, flowed south from the strait between Scotland and the then larger Rockall Island hugging the eastern coasts of Atlantis. Different marine currents had accordingly during the Bronze Age directions such that the Atlantean mariners could always steer their rafts with the help of centre-boards into convenient streams to reach either North Africa, Western Europe to Scandinavia or the American Continent and always return home with the same raft (Fig.36, p.).

G.Haldin (1949 and 1952) had taken up Köster's (1934) suggestion that the representations of vessels on the early Swedish rock-carvings from the Bronze Age depict rafts with raised platforms (Fig.42). The upturned parts of the bow and stern he suggests are prolongations of the central log of the raft carved at their ends into animal- or dragon-heads and having the magical function of frightening away malign sea-spirits and other mythical beings.

It is most likely that Scandinavia during the Bronze Age acquired its bronze almost exclusively from Atlantis in exchange for amber or fur. Visits by Atlantean traders with bronze implements were certainly regarded by the Scandinavian natives to be of enough importance to be memorized by rock-paintings (Fig.39, p.). Rafts with elevated platforms, but with hoisted masts and sails as could be seen from ashore are also depicted on some Swedish stamps.

American oceanographers have dredged large quantities of rock-samples from the Mid-Atlantic Ridge. According to these samples the main part of the magmatic rocks of the Ridge consist of olivine and other ultrabasic minerals (Shand 1949). These minerals are usually extraordinarily rich in metals, both copper, tin, gold and silver. Bronze is an alloy of copper and tin. In the Middle East a copper-arsenic ore was first used, but later the dangerous arsenic was replaced by malachite mixed with a tin-ore cassiterite (Knauth 1974). Bronze may first have been invented in Atlantis? This knowledge could later have reached the peoples of the Eastern Mediterranean by trading connections. Bronze was most probably one of the main export

articles from Atlantis. The richest findings of bronze in the world originate from the south-eastern coasts of the North Sea and from Scandinavia and all this bronze must have been imported since neither copper nor tin then was found there. Archeological finds are always most numerous at the place of origin. Copper and tin are found in Cornwall, but bronze implements are found there only rarely. It is accordingly most unlikely that the oldest North Sea and Scandinavian bronzes came from England. In its original home the Bronze Age must have been preceded by a Copper Age of long duration, but few objects of copper have been found in Western Europe, mostly in Ireland, and even there only in small quantities.

It seems as if the capital, the plain with the surrounding mountains, both the flat-topped and the snow-clad ones, all together suddenly had sunken down to great depth by a giant rift. Geologically this may be explained as a result of the cooling influence of the cold bottom-water on the base of the continent. This cooling had apparently caused a lengthwise shrinking of the mountain range. We know that the Mid-Atlantic Ridge is crossed by numerous transversal cracks and in between two such cracks the entire region must have collapsed. North and south of the sunken region the narrow Atlantis Continent probably remained above water-level for perhaps several hundred years. Rifts of still greater magnitude have frequently occurred in former geological epochs. The collapse of the Alboran High-Land has already been mentioned. According to Holdhaus (1924) the Tyrrhenian Sea originated when the continental block "Tyrrhenis" sank in connection with the upheaval of the Apennines in the Pliocene. A conglomerate of Pliocene age ~~has been~~ was washed down from a former high-land to the west of Italy out at sea and its grains decrease in size inland (Walther 1936, p.37). In the present author's opinion, all oceanic basins are the result of great collapses of continental blocks, mostly in connection with the upheaval of mountain chains.

The ice-transported boulders, found along the eastern shores of the islands of Terceira and Santa Maria in the Azores show that the cold marine current, hugging the eastern coasts of Atlantis, continued to flow for several hundred years after the central part of the continent ~~had sunken~~ sank. The existence of these boulders

near the summit of the former snow-mountains, both below and above the present sea--level, proves that the range north of the sunken territory remained above water--level during that same time and also that the Azores have been somewhat elevated after the warm Gulf Stream had replaced the cold current. Gradually the entire mountain range sank by marginal constriction and nowadays only the highest summits of the former snow-mountains, viz. the Azores, reach above the sea.

The concordant statements of Plato and other ancient authors that the sea outside Gibraltar was "impassable and impenetrable, because there is such a quantity of shallow mud in the way; and this was caused by the subsidence of the islands." This shallow mud consisted certainly of floating pumice. If some of the slowly sinking Atlantis Islands were of the same geological build as the Liparian Islands west of Italy, then this giant supply of pumice, brought by westerly winds towards the European coasts, must have blockaded them for centuries.

The surviving inhabitants in other parts of Atlantis must have noticed the slow but persistent sinking of their country. Some of them may have tried to migrate on their Kon-Tiki rafts, but those who sought to reach Europe got entangled in the pumice and perished. The way to America was known from time to time and other emigrants who had crossed the ocean ~~and they~~ settled in the New World as they took their old culture along. It is evident from the tales of Plato that America was known to the Atlanteans. In order to have such a knowledge about this continent across the ocean navigators must certainly have been there and returned home to tell about their discoveries. This knowledge had probably fallen into oblivion at the time of Plato, especially as the ocean then was regarded as impassable. The Phoenicians had at the time of Plato obtained a monopoly on the trade with places west of the Strait. They kept permanently war-ships at the entrance to prevent passage of non Phoenician ships.

Atlantis had probably an important trading centre somewhere near the mouth of the river Elbe. The rift catastrophe that suddenly caused the sinking of the central part of their country gave certainly rise to immense tsunami waves that may ~~have been rather severially felt on the shallow North Sea~~

have been destructive on the shallow North Sea coast. Those who escaped the tsunami waves fled inland in terror of the deluge and the malignant sea. They were reinforced with fugitives from remaining parts of Atlantis. German tribes were dragged along and a great disordered migration proceeded with devastating effect through Europe towards the Balkan and Asia Minor. They overthrew on their way several dominions , among them the old Hittite Empire in Anatolia, destroying likewise the Mycenean Culture in Greece. This migration has been called the "Dorian Invasion" after a people from Hungary or Tessalia that had been dragged along more or less voluntary. According to ancient Greek myths the Dorians conquered the Mycenean towns and fortresses with the help of the Heraclides. Heracles is considered to have been a king in Atlantis and the Heraclides or Atlanteans his descendants. In Greece the migrating peoples built a mighty fleet of sailing ships and departed southward in the year 1195 B.C. to conquer Egypt, but the Dorians remained behind and settled in the Peleponnesos. In the Nile Delta, the ships apparently met with a calm and lay motionless when attacked by the Egyptians. As the invading warriors were armed with swords, spears and round shields only the Egyptians in canoes and armed withtheir long-bows and arrows could kill their enemies from a safe distance without any losses (Fig.43). the Egyptian victory was most complete and a large quantity of enemy soldiers were enslaved. Most probably the accounts of these slaves constitute the foundation of the tales of Plato.

In present Medinet Habu near Karnak in Egypt the Pharaoh Ramses III erected a temple in memory of this his victory over the Sea-People, According to inscriptions and relief-paintings on the walls of this temple Ramses III then defeated an immence navy and army belonging to a Sea-People who "came from their land in the isles in the midst of the sea" (Egerton & Wilson 1936, p.42) "and their land was destroyed". The contour-paintings show that in some of the sailing ships the crew wear helmets with cow-horns, apparently Germans, while the Atlanteans in other ships have headdresses adorned with feathers like the American Indians, possibly brightly coloured (Fig. 44).

This the first known naval battle was probably more important than a simultaneous land-attack on Egypt by starving Libyans also depicted in the same temple. The

then rather fertile Sahara had suddenly been struck by a severe drought during several years in succession. In despair the autochtonous people turned towards Egypt where they were conquered and enslaved. That Sahara just about this time was reduced to a desert was caused by the sinking of the central part of Atlantis. The coasts of North Africa and of Europe had previously been washed by a warm current from the Equatorial Atlantic Ocean that had brought humidity to both. Later a part of the Gulf Stream as a predecessor to the Canary Current could penetrate through the breached Atlantis Continent fanning out towards the west coast of Africa, thus forcing the warm current away from the latter coast. The Gulf Stream outside Africa is comparatively cold like to-day's more mighty Canary Current. As additional parts of Atlantis sank, more and more of the humidity precipitated as rain out at sea instead of over the Sahara as previously (Fig.45). From the inscriptions on the temple-walls we get a date not only of the naval battle in the year 1,195 B.C., but also of the subsidence of Atlantis and the beginning of desert conditions in North Africa. The Atlantis catastrophe occurred probably 3 to 5 years before the battle, or about 1,200 B.C.

Some fugitives from the sinking Atlantis crossed the Atlantic Ocean. The magic terror of raising seas, the deluge, was apparently deeply rooted among the white colonists of the New World. They settled therefore far away from the malignant sea, on the Mexican High-Land, in Peru and Columbia or in the Missisippi-Misouri Valley (The Mound Builders). In Mexico they built their capital Tenochtitlan on a swamy lake on the same general plan as their old capital in Atlantis, viz.with three circular canals around a central temple. The lake is to-day dried up, but at the time of the Spanish Conquest the Mexican capital Tenochtitlan, now Mexico City, was erected in accordance with Plato's description. This fact not only strengthens the description of Plato and show them to be founded on reality, but also strongly points to the native country of the first white Mexican settlers, those we name Olmecs. The Hawk-nose and other features of the Plain Indians (Sioux, Mandans) show apparently an old inheritance from the Mound Builders.

When the Atlanteans first arrived to America, they brought along certainly weapons and various bronze implements. Not to find tin-ore in the new country despite

the most strenous search must have been most disappointing to them. Soft metals such as gold, silver or copper were however found, copper as far north as on present Royal Island in Lake Superior. For weapons and edged tools they had to return to flint or volcanic glass. Tin was long wanting, but shortly before the arrival of the Spaniards tin was finally found in Peru. Bronze was produced shortly afterwards, probably from very ancient recipe regarding the proportions. Owing to their superior culture the later-coming and rather few Atlanteans and their descendants established themselves as a ruling class over the old established Mongoloid Indians who had arrived in postglacial time from Asia over the Bering Strait.

When the descendants of the white Atlanteans had held sway for more than 1,000 years, one after another the Mongoloid peoples liberated themselves and the Atlanteans finally disappeared. It is no concern to us which later rulers were in power momentarily, all of them took over and carried on with the old culture. From archeological finds alone, it is therefore very hard to decide which people, when and how took over. This old Atlantean culture thus survived until it was annihilated by the Spaniards in the 16th century A.D. The original white bearers of the culture were afterwards always kept in highest esteem by the Indians and were regarded as of divine origin. It is a tragical fact that this old inheritance ended up in the destruction and ruin of the Indians and their old culture. According to old myths the white bearded gods were to return one day when a new Golden Age would would be resumed.

When the bearded white Spaniards disembarked they too were received by the natives as divine beings. The scant number of Spaniards were met by overwhelming armed forces, but these armies remained quiescent and the soldiers even preferred to be slaughtered rather than oppose a resistance to the descendants of their old gods.

As an historical document proving this myth about the return of the former rulers to have played an important part in the conquest, the following passus is quoted from Heyerdahl (1952): "When Cortes had his first meeting with Montezuma, the latter adressed him through the interpreter Marina in very remarkable words

that were recorded for posterity by Cortes himself in his Cronica Mexicana, Carta Segunda, Chap.108 from October 30th 1520: "Having delivered me the presents, he (Montezuma) seated himself next to me and spoke as follows: "We have known for a long time, by the writings handed down by our forefathers, that neither I nor any who inhabitat this land are native of it, but foreigners who came here from remote parts, We also know that we were led here by a ruler, whose subjects we all were, who returned to his country, and after a long time came here again and wished to take his people away. But they had married wives and built houses, and they would neither go with him nor recognize him as their king; therefore he went back. We have ever believed that those that were of his lineage would some time come and claim this land as his, and us as his vassals. From the direction whence you come, which is where the sun rise, and from what you tell me of this great lord who sent you, we believe and think it certain that he is our natural ruler, especially since you say that for a long time he has known about us. Therefore you may feel certain that we shall obey you, and shall respect you as holding the place of the great lord, and in all the land I rule you may give what order you wish, and they shall be obeyed, and everything we have shall be put at your service. And since you are thus in your own heritage and your own house, take your ease and rest from the fatigues of the journey and the wars you have had on the way."

D.G.Brinton (1882, p.140) comments: "Suchwas the extraordinary address with which the Spaniard, with his handful of men, was received by the most powerful war chief of the American Continent. It confessed complete submission, without a struggle. But it was the expression of a general sentiment. When the Spanish ships for the first time reached the Mexican shores the natives kissed their sides and hailed the white and bearded strangers from the east as gods, and brother of Quetzalcoatl, to come back from their celestial home to claim their own on earth and bring again the days of Paradise; a hope the poor Indians soon gave up when they came to feel the acts of their visitors."

It has always remained a mystery to American archeologists wherefrom the Central and South American high-cultures emanated before their sudden appearance

According to Carola Siebert (1974) the Indians of Peru still to-day worship the old God Heifaistos or Vulcan and other old heathen deities. For instance in the Manchay Valley, 20 kms from Lima, many sandy hills are planted with Achupaya cactus drawn in symbols of different pagan emblems. Near the road in that valley she found a column rising from a low hill with a fair sized horse-shoe built of stones on the ground near it. According to her knowledge the horse-shoe is the symbol of Vulcan's Forge or the God of Fire. In the middle of this horse-shoe there was a triangular ledge of stones forming an altar at the foot of which she found the femur of a baby and several tiny bones apparently as offerings to the God. On climbing the rise with the column she discovered with the help of her field glasses the shield of Atlantis (the sun-cross) most artistically outlined in Achupaya cactus on a sandy slope. Planted are not only the horse-shoe of Vulcan and the sun-cross of Atlantis but also the trident of Poseidon, the circle with a central dot of the Egyptian God Ammon, the Crux Ansata or Holy ankh of the old Pharaohs, and many other ancient emblems. The Indian peasants still keep up their ancient religion, only feigning Catholicism for fear of the clergy. Pagan signs, cult places, sacrificial atlars of burnt offerings are found abundantly, mostly on hill-tops, and temples are numerous both in Peru and adjacent countries. There are as many as 70 temples at the "Great Pajoten" in the Departement of San Martin, Peru. The name of the Argentine province Jujui indicates in itself a pagan centre and there are remains of pyramids called "Huacos". In the depth of the valley "Callejon de Huaylas" is located the most ancient ruin of Peru, the "Chavin Castle". In its crypt there is a labyrint and in the middle of the cellar the idol, to which sacrifices were made. It represents Apis, the sacred bull of Ancient Egypt. Depicted on it are also the symbols of Isis, the wife of Osiris.

It is most remarkable to find these undeniable traces of the Old Egyptian religion in far off Peru. This strengthens the assumption of I.Donnelly (1882) that Egypt received its religion from Atlantis. Carola Siebert states that many of the ancient monuments and altars nowadays are demolished. They have been used for road-material, etc. as the local authorities lack all consideration and interest in relics from the past history of their country.

on the American Continent. These high-cultures were preceded by most primitive ones. Every culture developes gradually, but the American high cultures appeared suddenly, fully developed and superior to all contemporary cultures both in Europe and Asia, not to mention Africa. The most fantastic theories have been advanced and seriously discussed. According to one theory a Greek fleet escorted by scientists left the Red Sea after the death of Alexander the Great and sailed eastward to reach finally Central America. Some advanced that the culture may have emanated from Atlantis, but such a suggestion was regarded as absurd since Atlantis was, as everyone knew, the product of Plato's imagination !!!

The Spaniards on their arrival were astonished to find cities larger than any they had at home, with large palaces, temples, pyramids, and a perfect organisation with roads crossing the country to its most distant parts. The knowledge of astronomy and other sciences was far superior over contemporary ones in the Old World. To have stamped out all ancient written documents in their colonies will for ever mark the Spaniards and their church as barbarians and worse than ignorant savages. The calendar of, for instance the Maya People, was not inferior to that of our own modern time. If Heyerdahl in his book "RA" (1970) is to be believed, this old Maya calendar or at least its ciphers and the initial date has now been deciphered. Its initial date is the 12th of August in the year 3,113 B.C., ~~that~~ which is about the year of the foundation of the first dynasty of Pharaohnic Egypt. This astonishing exactitude in date can hardly be a coincidence, and must certainly refer to some important event elsewhere, most probably Atlantis. At that remote time only the most primitive hunters roamed the American Continent, and did so until some 1,500 years later when the first traces of any high-culture turned up, viz. the Atlantean. American archeologists have named these first white cultural bearers Olmecs. From statues, findings of mummies in tombs, pre-Columbian mural paintings (Fig.46) and pottery, the latter in the shape of faces, we know this Caucasian-like people was dolichocephalic (long-headed), had aquiline nose, were bearded, and with hair yellow, red or brown, rarely dark. The main part of the American natives have a light reddish-brown hue, are Mongoloid, brachycephalic (short-headed), have a broad short nose and are beardless.

The frequent occurrence of signs of the heaten deities of ancient Greece, as Vulcan and Poseidon, makes it not impossible that these divinities also originated in Atlantis. Many of the hereoes of pre-historical Greece, as Heracles, are considered to have been Atlantean kings or leaders. The frequent magic representation in South America even until our days of the Atlantean "Sun-Cross" symbolizing the four rivers and the circular ditch of the Atlantis Capital, is a strong indication that Plato was correct when stating that the Atlanteans had colonies in the continent on the other side of the Atlantic Ocean.

Before 1927 it had become an axiom among American archeologists that Man had entered America from Asia, and not earlier then 2-3,000 years prior to Columbus. All finds of artefacts connected with extinct animals such as elephants, giant buffalos, giant ground-sloths, horses, camels, etc. were considered to have been carried down to the skeletons by rodents, etc. and thus left on a misleading interpretation (Fig.47). In 1927 a black cowboy, George McJunkin, when riding along the edge of a deep arroyo near the town of Folsom saw some large bleached bones 20 feet below the surface. He told his employer and ~~this~~ the director of the Colorado Museum, J.D.Figgins of the bones and flint-points. Figgin found a spear-point between the ribs of an extinct buffalo. Another one was later found in the spinal chord, 23 skeletons of this extinct bison were found together and all of them had the tail missing. All had been killed and skinned by Early Man about 10,000 to 11,000 years ago, and the tail in the operation used to go with the skin, already at that time.

The Folsom flint-points have a unique quality in the history of Mankind (Fig.48). The razor-sharp edge at the apex is obtained by flaking away under pressure almost microscopic flakes, but the outstanding feature of the points is that a large, elongate flake has been removed from each of the flat sides from base almost to the apex. They are accordingly grooved or fluted to receive the spear-shaft. Some longer and over a thousand years older spear-points similarly fluted were mainly used by Llanos Man, hunters of mammoths and elephants.

In Sandia Cave, New Mexico, three distinct cultural layers were found, and each sealed off from the next by a sterile layer. The uppermost of these layers contained ~~skeletal~~ remains of Pueblo Indians, the next one of Folsom Man together with bones of buffalos, but no elephants, and the lowermost contained flint-points (Fig.49) similar to points used by the Solutreans from Western Europe together with remains of elephants and giant ground-sloths. This third and oldest layer was tested for carbon-14 isotopes and was found to have been laid down 19,000-20,000 years ago. (After recalibrating (p.) at least 1,000 years older). Archeologists had early observed the similarity between artefacts of Sandia Man and of the Solutreans; both were about contemporary and both were the first to introduce and use the superior pressure flaking technique (Fig.50), but the Atlantic Ocean was regarded as an impassable barrier for people to cross at the time. In the present author's opinion, both people originated in Atlantis, and from Iceland had reached both westward to America and eastward to Europe across and over the then still existing land-bridge.

Sandia Man was certainly not the first inhabitant of America. In Central Mexico artefacts in combination with mammoth bones have been found and dated 20,000 years old. A human skull found in Los Angeles in 1936 is the hitherto oldest dated evidence of Early Man. In 1971 this skull was tested with a method based on the analysis of certain components, called amino acids in bone protein and it indicated that Los Angles Man was 23,600 years old - and possibly older.

Neandertahl Man has not yet been found in America, but artefacts of a most primitive character, which resemble European ones of Mousterian, Acheulean, and still earlier Paleolithic industries, are mostly found on the shores of now dried up Pleistocene lakes in deserts extending from Texas to California.

All the exposed parts of stones in the Californian deserts are coated with a brownish, very thin covering, a so-called "Desert Varnish", the result of weathering during untold millennia. When a Folsom point is found on the surface in the desert it shows only the faintest traces of desert varnish, but all cruder artefacts or other signs of Man's ancient activity, like cleared stone rings around a possible former camp-site or shelter, show just as heavy a coating of desert varnish as

othe r surface stones of the desert. The difference in intensity between the fain traces of desert varnish on the 11,000 years old Folsom points and the intence chocolate-brown varnish on the cruder, typologically earlier tools indicates that these tools have lain undisturbed and exposed to infenitely slow weathering during a length of time which can only be expressed as geological (Carter 1951). This brings us back to interglacial time or perhaps still earlier.

Skeletal remains of prehistoric Man are very rare and those skulls ~~which~~ that have been found in America differ fundamentally from those of the Amerindians. The latter are mostly Mongoloid and brachycephalic (round- or short-headed), whereas the older human skulls in America almost without exceptions are dolichocephalic (long--headed) and more or less Australoid in the features of the cranium. In addition to their length these skulls are distinguished by mostly heavy, almost continuous brow--ridges, keeled vault and protruding jaws. Prehistoric Man in America, also called Paleo-Indian, belongs ~~xx~~ accordingly to a race fundamentally different from the Mongoloid majority of the more recent Amerindians. All skeletal remains of Man found in America belong to "Modern Man"(Homo sapiens) the "Wise Man" as he is called by Linnaeus.

Mongoloid forefathers of the Amerindians are most probably late invaders from Asia and may have crossed the Bering Strait only a few thousand years B.C. or even later. This general statement does not exclude the possibility of a somewhat or even much older immigration.

American archeologists are unanimously convinced that even the oldest immigrants to America came from Asia over present Bering Strait, possibly when this strait was dry land during the Quaternary. This strait was certainly dry land during the cold stages of the ice-age, but in the present author's opinion it was dry land also during the interglacials, and sank later ~~owing~~ in postglacial time to marginal constriction (Comp. p.).

The north-western part of Alaska was not covered by inland-ice during the ice--age, but in Southern Alaska from the Pacific Coastal Range a large ice-sheet reached up the valley of the Mackenzie and was there joined by the immense Laurentian

ice-sheet which reached on the other side to the Atlantic. Ice-free Alaska was thus separated from the rest of the American Continent by a continuous expanse of ice impossible to cross even for flying birds. During the warm, but short Two Creeks Forest Bed/ Interstadial, which was contemporary with the Danish Alleröd Formation of 9,400 B.C., a narrow corridor opened up between the two inland ice-sheets. This date of ~~date of~~ 9,400 years ought after recalibration (p.) probably be readjusted to about 10,400 years old. This corridor, in places only 25 miles wide, was extremely long and is supposed to have been also open sometime before 20,000 years ago, which is somewhat doubtful (Comp.p.). It was along this corridor that American archeologists suppose the first immigrants entered America in pursuit of caribou herds. In the present ~~xxxxxx~~ author's opinion it is most unlikely that roaming hunting parties from Asia or even from the Bering Land-Bridge itself would go very far inland along the southern glaciers upon the permanently frozen ground of Central Alaska in search of game except during the short Arctic summer. Had they reached as far as the entrance to the Cordilleran Corridor, they must have hesitated to venture farther ~~deeper~~ between two immence glaciers drawing dangerously close together. This inhospitable corridor must have appeared endless to them and was most certainly devoid of game.

Migrating herds of caribou and other land-mammals follow generally tracks repeatedly used by them between their winter and summer abodes. Their winter abodes could only have been situated to the west or south-west. To the south-east the continuous ice-sheet had blocked their way during thousands of years. Wild animals, mammals as well as birds, are most conservative and stick stubbornly to their old migrating paths and ways. When the Cordillieran Corridor opened up during the very short Two Creeks Forest Bed Interstadial, a grazing Asiatic herd entering it would not go south through it but return west when the winter-season would approach. Far roaming hunters would hardly pass this corridor during the interstadial either; a deserted tract could have no lure for them.

When the glaciers receded and the corridor fully opened up, its soil had become quite sterile and it took a very long time before any vegetation could cover again its bottom. Seeds cannot be brought there except from the two entrances. An

ice-cold wind decending almost permanently into the corridor from the glaciers on both sides, with a resultant strong wind blowing out from the two entrances. It is thus very difficult for wind-carried seeds to settle in the valley. All kind of willows (Salix) have wind-born seeds and willows are a very important food-plant in the Arctic. The corridor was much too long for most plants to spread by ordinary means. No caribou or other grazing mammal would ever approach, much less pass through such a corridor if they are not lured by luxuriant vegetation along most of its go. This passage may thus have remained deserted during the entire span of the rather short warm stage, or until the passage was again blocked by the advancing ice. Once the Arctic Ocean probably was frozen, at least partly to the bottom, it must have had a cooling influence on the climate of these northern tracts. It is thus most unlikely Early Man entered the American Continent from Asia during the Two Creeks Interstadial.

This warm interstadial was contemporary with the European Alleröd Interstadial, which had a duration of about 200 years. After a longer cold spell the climate in Europe again warmed up during another 200 years. When later the Gulf Stream had penetrated the sinking land-bridge between Iceland and Greenland, the Cordilleran Corridor broadened rappidly, especially as a consequence of the transformed meteorological situation which caused the Laurentian ice-sheet to shrink. Then the hostile conditions in the narrow corridor changed. Vegetation soon covered the broadening territory and game from the south spread over it ~~followed~~ met by herds from Asia. From that time on human hunters from Asia following the migrating herds south trickled uninterruptedly into the American Continent. Nowadays descendants of the Asiatic immigrants constitute the majority of all Amerindians.

The Cordillieran Corridor may have been open and broad during the warm and long interstadial of the Würm(Wisconsin) Glacial Stage, clearly marked on the Pleistocene time-scale of Ericson, Ewing & Wollin (1964) (Fig.22, p.). This interstadial was contemporary with the raised Flandrian beaches in the Mediterranean and the French and Spanish Atlantic coasts. That the corridor however really was open is questionable in view of the fact that the Arctic Ocean then probably was frozen and the east-wind of the North Atlantic at that time brought plenty of precipitation to the Laurentian Ice-Field. According to Brooks (1949, p.256) "Once a large ice-

-sheet has been formed, its persistence is almost independent of the latitude, and it can only be destroyed by the cessation of its suply of snow, by a greater increase of the ablation, or by a subsidence of its bed below sea-level." The climate of Alaska must still have been harsh and it is doubtful whether Man had already refined his capability and resources of enduring the bitter cold of an arctic winter. It is therefore increasingly probable the first immigrants to America arrived from Atlantis rather than from Asia. To Atlantis itself had probably already arrived Homo erectus "the First Man", either from Africa or Europe, since this Homo-species was already established in Europe as far back as the Mindel-Riss Intergalcial (White & Brown 1973)(Fig.22, p.). They are known to have hunted the primitive Wood-Elephant(Elephas /Palaeoloxodon/ antiquus (Fig.51) at the Riviera(Terra Amata, Nice) about 550,000 years ago or when the level of the Mediterranean was 26 m (85 ft) higher than at present, and also in Central Spain (Torralba and Ambrona) during the Riss Glacial or about 400,000 years ago, dated by contemporary traces of permafrost. Artefacts from Californian deserts are partly of Neandertahl(Mousterian) type from Europe.

On the permanently frozen ground of Northern Alaska some fluted points have actually been found. These finds have been interpreted as proof of an Asiatic origin of Llano and Folsom Man, but no finds on the Asiatic side of the Bering Strait support such a view (Maringer 1950, Müller-Beck 1967). Anderson (1968) is uncertain whether these points really are Paleo-Indian. He says on p.33: "The projectile points found in the Arctic could not be dated, but it was speculated that they were as much as 7,000 or 8,000 years old. Such antiquity, of course, added strength to the Paleo-Indian hypothesis. Even before the Onion Portage excavations some contrary evidence had come to light. The Choris Complex is rich in projectiles that are Paleo-Indian in appearance, but the Chorix Complex is firmly dated between 1,500 and 1,000 B.C. .... During the millennia between 7,000 and 3,000 B.C. nothing from any occupation level at Onion Portage show any hints of Paleo-Indian influence. On the contrary, the influence in the earlier part of the interval is Siberian."

Even if the Asiatic hunters had boats at their disposal, it is most unlikely they would try to venture very far south upon a mostly foggy and stormy sea, only

to navigate along the precipitous end of the seemingly endless glaciers and with the great danger of calving ice-bergs in search of unknown lands. Game must have been less abundant than along the unglaciated coast.

After the end of the ice-age a culture named "Cochise" flourished during a moist pluvial climate in the now arid pars of Arizona and California, The Cochise People were less hunters than food-gatherers, and they used in addition to crude choppers and scrapers also milling stones, or querns, for grinding seeds, nuts, and roots although otherwise without any signs of agriculture. They came probably from Asia as their implements resemble such from Asia. Their culture flourished about 6,000 years B.C. As the climate became warmer, the Quaternary mammals disappeared and some very primitive cultures succeeded one another in the Southern States millennium after millennium. The "Basket Makers" lived in the South-West and they were in turn succeeded by different Pueblo Cultures. About a millennium B.C. or perhaps a little earlier a very high Stone-Age culture suddenly appeared fully developed in Central and South America, the Atlantean one.

A multitude of authors have treated the subject of Atlantis and the evocation of this disappeared continent always arouses curiosity and excitement. Both the geographical whereabouts of Atlantis and the time of its existence have been subject of wild guesses. Most authors have located Atlantis in the Azores, but otherwise the bids have been widely divergent. America, Ceylon, Iceland, North Africa, Spain, and many other places have been proposed. The old Swedish scientist Olof Rudbeck claimed in his "Atlantica sue Manheimii" (1679-1702) that Atlantis was Sweden.

Some years ago the German Rev. Jürgen Spanuth (1953) announced that he and his diver had found the capital of Atlantis on the sea-bottom of the North Sea near the island of Heligoland, thereby solving the riddle of Atlantis. Spanuth seems well versed in literature specialized on ancient Egyptian and Greek documents and he equally conducted a close study of archeology, notably of the Bronze Age. It must be admitted that his contribution is by far the most important since the days of

I.Donnelly (1882). He took up a suggestion advanced by Olof Rudbeck (1679-1702)that Plato referred to month-years when he mentioned that 9,000 years had elapsed since the war between the Atlanteans and the Greeks. As we had seen, this reduces to 750 years before the time of Solon's visit to Egypt in 590 B.C., viz. the year 1,340 B.C. About 1,400 B.C. are found records both on papyri, and in the Old Testament (Book of Exodus 2, 23) of a series of severe catastrophes that hit the world, such as volcanic eruptions, ash-rains, droughts, fires and floods (i.e. the Santorini volcanic eruption). In the Old Testament these are mentioned as the nine plagues the Lord inflicted upon Egypt on the departure of the Israelites. There is no doubt but that Plato referred to the catastrophe when the Greek island Stronghyli blew up. The remnants of Stronghyli are to-day named Santorini or Thera in the Cyclades.

Spanuth was the first to relate the Sea-People of Medinet Habu with the Atlanteans, also with the Philistines of the Old Testament. Spanuth named them "The North People". He is frequently quoting Plato, but his translation is mostly altered somewhat to promote his own claim in locating Atlantis and its capital in Germany near Heligoland. Plato states definitely that Atlantis was a mountainous land and the plain with the capital was sheltered from the north by mountains "celebrated for their number and size and beauty, in which they exceeded all that are to be seen anywhere." Plato states further : "Twice in the year they gathered the fruits of the earth". The climate of this "sacred island lying beneath the sun" must thus have been at least subtropical since two crops could be gathered a year, elephants and coco-nuts also occurred there. Nothing comparabel can be proposed for the surroundings of Heligoland, but applies perfectly to a land south of the Azores. Most damaging for Spanuth was his claim to have himself found the town with its walls on the bottom of the North Sea near Heligoland. In order to map this town with its surrounding wall a vessel equipped with echo-sounding devices was later sent out. At a depth of only 20 m, a town-wall of considerable elevation had presumably to stand out clearly, but no traces of any kind of human activity was discovered. The "Stony Shoal" was a naked buff with some minor erratic boulders; and that was all !! Either Spanuth or his diver had invented the "finds". Nevertheless, this shows that such an erudite as Spanuth did not ridicule the idea of Atlantis, which was a rare scholarly attitude!

The great number of bronze implements found in Germany along the coast of the North Sea as well as in Denmark and Scandinavia makes it certain that a most important trading post for amber and fur must have been situated in the vicinity. To claim it to have been the capital of Atlantis is obviously incorrect. Plato was certainly right in placing the capital on the plain south of the Azores. As soon as any author tries to displace the location of Atlantis in respect to Plato's description, or alter Plato's statements in some important respect, it must be feared the the attempt ultimately deviates from the real truth. Regarding more specifically the treatment of Plato's figures and numbers, some tolerance may be alloed in the manipulation of round-about figures, as, for instance, the length of the excavated ditch, stated to be 10,000 stadia, or the chronology of 9,000 years, etc.

The suggested identification of Heligoland with Atlantis applies just as well to Dogger Banks, claimed by N.O.Bergquist (1971) to be the sunken Atlantis. These banks sank early, probably before or just shortly after the end of the ice--age. Once the inland ice-sheet from Scandinavia ceased to advance over the North Sea Territory towards Great Britain the syncline beneath the ice became less cooled, and then after a short emergence as dry land resumed its former expansion and sinking from Tertiary time.

Bergquist's interpretation of the different "sun-plates" of gold, found at Moondorf in Germany, Jaegerborg in Denmark and other places, as compasses used for navigation is most probably correct. It shows that the compass was in use at a much earlier date in Europe than previously was regarded as possible. His location of the place "Svolder" ~~to~~ on the mouth of the river Eider in Schleswig instead of the supposed vicinity of the Rügen Island in the Baltic is also quite acceptable. In the year 1,000 A.D. the fleet of the Norvegian Viking-king Olav Tryggvesson in an attempt to attack and extract a contribution from the merchant places Hedeby and Hollingstedt happend to be lured into an ambush and was defeated by a joint Danish, Norvegian and Swedish fleet. On the now dried up former sea or river bottom near the village Wolde, formerly named "Zum Wolde", abbreviated to "Z'Wolde" or Swolde(r). Bergquist located with a mine-detector 40-50 places on the former marine battle field where iron implements (weapons or armours) were burried beneath the earth's surface.

Ninkovich & Heezen (1965) of the Lamont Geological Observatory may now be added to the number of authors trying to solve the Atlantis riddle. The two joint authors took up an idea of Galanopoulos (1960) and explained the Santorini Islands in the Aegean Sea to have been the Atlantis of Plato. The former island Stronghyli of the Cyclades constituted a dormant volcano that unexpectedly exploded a few years prior to 1,400 B.C. This eruption was of the same nature as that of Krakatau in 1883, but surpassed this latter in violence as well as that of the South Kamchatkan volcano Ksudatch in 1907 or the Alaskan Katmay in 1912. All these volcanos presented otherwise great similarity. The Ksudatch eruption caused no tsunami-waves as the volcano was situated inland, but the ejected dust covered the entire Kamchatkan Peninsula with an ash layer. The tsunamis of Krakatau reached in 1883 a height of 35 meters on the nearby coasts of Java and Sumatra, destroying 295 towns and drowning almost the entire population along the coasts , or 36,000 people. When the former island of Stronghyli of the Cyclades blew up in about 1,400 B.C., pumice rounded by wave action was stranded 250 m above sea-level on the Anaphi Island, 24 kms away. All coastal regions around the Eastern Mediterranean were destroyed by the tsunamis, and on Crete and around the Aegean Sea most towns were destroyed and the major part of the population was killed, either by the waves or by poisoous gases, when not buried under their falling houses. Most of the remaining population on Crete had to migrate to Greece as all cultivations was destroyed by the thick tephra (volcanic ash) layer, wells and streams were choken, starvation spread, and the erupted gases caused toxic disorders.

The two american authors are certainly right in referring to the eruption of Santorini when quoting Plato and the Egyptian priest about the island that was destroyed, and what befell the Greek army after its return from its victorious war against the Atlanteans. Plato describes thus the destruction of Stronghyli and states that a f t e r w a r d s (two hundred years later) Atlantis sank into the sea. The Egyptian priest equally reminded Solon of several deluges, and that Atlantis was not the only island that had sunken into the sea. The tsunamis engendered by the Santorini eruption may well be compared with a deluge, and given that name. The volcanic ash-layer on the bottom of the Mediterranean blown in the direction

of Egypt has not been dated more precisely by Ninkovich & Heezen than to about 1,400 B.C., and so has carbon-14 measurements of wood found beneath the Santorini ash-layer also been dated. (According to Clausson (1971) the marine layers are much older than those from Thera). At the same time the American authors quote Breasted (1951)to the effect that the Egyptian Pharaoh Amenhotep III (1,411-1,375 B.C.) altered his political attitude suddenly in 1,406 B.C. towards all his neighbours from a hostile to a most friendly one. This sudden change may have been caused by the sufferings inflicted upon Egypt by the eruption, viz. the delta-land destroyed by tsunamis, the total darkness during several days, the aereal vibrations, the ominous roar, and the sicknesses and deaths caused by poisonous gases. These acts of supposed displeasure from the Gods made probably a tremendous psychological impact upon all minds in Egypt. This frightened state of mind was used by the Jewish and other leaders to provide liberation to their country-men from Egyptian slavery. It is most doubtful that the sufferings were predicted in advance as stated. When the Old Testement was written several hundred years later it seemed approprite to have predicted them. Had this really been the case, the Egyptians would never have dared allow an army pursue the departing Jews. This could only have been done when tidings arrived of the volcanic eruption and when it became evident that this was not an act of the Gods directed against Egypt only. The eruption we may most probably date to the year 1,406 B.C. ? A dating to 1,470 B.C., mainly founded on pottery from Crete seems less trustworthy. The date 1,500 B.C. in a Greek tourist guide about Santorini is apparently founded on an assumption of one tenth of 9,000 years after Solon's visit to Egypt in 590 B.C.

In order to maintain the view that Plato's Atlantis was Santorini, both Galanopoulos and the two American authors had to deviate from the statements made by Plato in a number of most important ways. The correctness of any hypothesis becomes thereby most questionable. They assert thus that both Solon and Plato had exaggerated by ten times not only the numbers of years, but also the size of the empire and of all other measurements used regarding Atlantis. Can a comparison between the Atlantis ~~Empire~~ Island with Asia Minor and Libya put together be exaggerated ten times ? Thera has at present an areal extent of 29 square miles and the submarine base of this group of islands show that the original Stronghyli was hardly larger than 60

square kms. It could thus not have had a plain (even if) ten times smaller (than stated) and nevertheless more than 2,000 square kms, in addition to the fact that it had to be sheltered by very high mountains. (The submarine plain south of the Azores on the contrary has about the size stated by Plato.) Crete did never sink, so in any case that island could not have been Atlantis. To advance the idea that two small rocks in the Aegean Sea, Tainaron and Maleas may have been the Columns of Heracles and that Atlantis, larger than Libya and Asia Minor put together, was situated in front of a strait between them is ridiculous and a conscious distortion of the text. Plato states certainly rightly elephants were numerous in Atlantis (Comp. p.), but in Europe and the Greek Archipelago they died out in interglacial time about 200,000 years ago and the mammoth suffered the same fate at the end of the ice-age or more than 10,000 years before the Stronghyli eruption (Fig.52). In a Greek tourist guide (1974) it is stated the "fruits having a hard rind, affording d r i n k s, meat, and ointments" refers to walnuts instead of coco-nuts.

It cannot be denied any more that a large continent existed in the Atlantic outside Gibraltar, that it sank about 1,200 B.C., that it had a plain of the stated size and was sheltered from the north by high snow Mountains (the Azores). Now the existence and size of the plain has been confirmed by echo-soundings (Fig.38, p.).

Apparently thanks to such more or less consciously deceptive advertisements, the concept that Santorini or Thera should be the Atlantis of Plato has lately been very much in vogue. The excavations on Thera are in themselves much too important and sensational to need any fraudulent advertisements to lure tourists to Thera. It would be more honest to correctly state that the excavations are of a town from the time of the Illiad and thus about 200 years before the end of Atlantis.

Once all of Plato's geographical statements, that are verifiable, have shown themselves to be correct when referring to the land south of and including the Azores, it can be assumed that also his description of the temples and palaces of Atlantis are truthful and reliable. No doubt, at the time of the sudden rift together with its accompaniment of gigantic waves rushing over the doomed town, much must have been demolished and ruined, but as certainly a lot must still be remaining in

a recognizable shape on the sea-bottom. With modern technique it ought to be possible,not only to localize and study the remains of this forgotten civilisation in situ,but also to salvage some of the drowned riches. With the help of a research ship, similar to the U.S. "Mizar", electronic scanners ought to be able to locate the tremendous metal assemblage in some of the temples. Most probably it ought also to be possible to salvage some of the waste riches in the shape of golden statues or other treasures. Apart from the tremendous scientific value of such findings, the value in pure gold or other precious metals could pay off the entire salvaging enterprise.

After describing the capital with its harbour, partly roofed docks, and its three circular canals, Plato describes the main temple as follows; "Here was Poseidon's own temple, of a stadium in length and half a stadium in width and of proportionate height, having a sort of barabaric splendor. All the outside of the temple, with the exception of the pinacles, they covered with silver, and the pinacles with gold. In the interior of the temple the roof was of ivory, adorned everywhere with gold and silver and orichalcum; all the other parts of the walls and pillars and floor they lined with orichalcum. In the temple they placed statues of gold; there was the god himself in a chariot - the charioteer of six winged horses - and of such size that he touched the roof of the building with his head; around him there were a hundred Nereids riding on dolphins, for such was thought to be the number of them in that day. There were also in the interior of the temple other images which had been dedicated by private individuals. And around the temple on the outside were placed statues of gold of all the ten kings and of their wives: and there were many other great offerings, both of kings and of private individuals, coming both from the city itself and the foreign cities over which they held sway. There was an altar too, which in size and workmanship corresponded to the rest of the work, and there were palaces in like manner which answered to the greatness of the kingdom and the glory of the temple."

With such vast treasures, both scientific and financial, lying without owner on the bottom of the Atlantic Ocean, it is to be hoped that an expedition soon will be undertaken to study and especially try to salvage accessible parts of these treasures . When this is done we may get invaluable knowledge of a lost civilisation

and it may be almost certain that in comparison to the expected finds the treasures of Tutankhamen will fade away in insignificance.

In the opinion of the present author, our scientific understanding of the causes of the movements in the earth's crust has been distorted. The generally accepted theory of continental drift is impaired by serious errors. There are no decisive observations sustaining it. The existing ones are either dubious or may just as well be explained with the constriction theory. Nobody has as yet proved the existence of an acceptable force for moving the continental blocks. Gutenberg (1959, p.186) says about the gravity anomalies: "No tectonic hypothesis can be considered that does not agree with observed gravity anomalies. Their persistence over large areas and their coincidence with belts of shallow earthquakes are most striking facts. On the other hand a hypothesis that starts with the forces and explains the observations would be much more trustworthy." This is exactly what distinguishes the constriction theory and nobody can deny the importance of the earth's internal heat as a factor of the utmost importance.

As a rule it is not difficult to understand the causes of observed movements in the earth's crust once the constriction theory is accepted. A rising anticline must have been subjected to strong lateral pressure, caused by warming, combined with expansion of its molecules both either continuous or resumed after an interruption, the warming in combination with crystallization and release of heat. A sinking or constriction of an anticline may be caused by cooling either by ice or cold water. Within a syncline, cooling will cause a stretching of the sea-bottom, or the raising of a previously depressed vault. An existing crack-formation may be widened and cause earthquakes when rocks in the crack-zone tumble down. A movement that appears mysterious occurs on the other hand in the San Andreas Fault in California. The North Pacific Ocean Bottom outside the adjacent coast is cooled and ought to constrict, thus draging the coast-section of California oceanwards, i.e. away from the rest of the continent with the result that the existing fissure in the crust would become increasingly wider. However the movement does not occur as predicted, since the coastal part is sliding

along the crack in a north-westerly direction without appreciably widening the fissure. It has been suggested that if this trend is continued at the current rate, of about 5 meters in hundred years Los Angeles will lie directly west of San Francisco in ten million years (Time, 1st 9th.1975).

According to Japanese sources (Yabe 1929) two distinct submarine shore-lines exist off the coasts of East Asia. A shallower one at about 150 m depth and a deeper one at about 720 m (Fig.53). Both have been observed from Kamchatka in the north to the Philippines in the south, and they recur in the region around the coasts of California.

In the Atlantic and other oceans beyond the boundary line for maximal glaciation there is found a submarine shore-line at about 100 m corresponding to the level at which the sea stood during the last cold stage of the ice-age. During the colder Riss (Illinoian) Glacial Stage, the sea-level sank to 135 m (Holmes 1965, p.712). These 100 to 135 metres are regarded by geologists as measuring the quantity of sea-water that was abstracted from the oceans and stored in the polar regions and on the higher mountains in the form of ice and snow. According to Norin (in preparation 1976) the entire Tibetan High-Land was during the Würm Glacial Stage covered by an inland ice-sheet. The stagnant lower layer of this ice-sheet reached in Western Tibet a minimal thickness of 700 m. How much ice was lying atop this dead ice is unknown. It may be assumed an equally thick ice-blanket covered the Barent Sea and other parts of the Northern Arctic Ocean which were then frozen to the bottom. During the warm interglacials this Tibetan dead ice melted quickly owing to its proximity to the Equator, which explains the contemporaneous rapid rise of the sea-level at the end of the cold stages.

The submarine shore-line at about 720 m has no counterpart in the other oceans. On the American map of the sea-floor in the Bering Sea the deeper line finds a counterpart in the almost horizontal coast-line of the volcanic island of Bogoslof (Fig.54), which forms the limit of the sculptured part of the [illegible]. Both lines are situated at roughly the same height as on the Japanese maps. We do not know how far south the deeper coast-line extends to the south of California along the American Pacific coast and consequently how far the Northern Pacific Basin ex-

tended. It may well however have reached south to the East Pacific Rise on the latitude of Mexico.

In the present author's opinion the Northern Pacific Basin was separated during the Tertiary from the other oceans and remained so even after the majority of the other basins had their bottom raised and their borders inundated. The rising sea-level caused by overspilling from other basins could not immediately overflow the barrier and fill the North Pacific Basin with cold water. The constriction of its bottom was accordingly considerably delayed.

This probable delay indicates also that the Bering Land-Bridge was dry land during most of the ice-age and thus equally during the interglacials. The East Pacific Rise, which lacks sediments on it, must as a consequence have reached above water-level and together with other now partly or completely submerged tracts of the Central Pacific constituted a barrier from Central America all the way across the Pacific. To begin with, the rising water-level of the South Pacific may have let in some water through straits in the barrier, but the amount of water thus overspilling north was probably not great enough not to be compensated by evaporation inside the tropical Central Pacific. When later marginal constriction had lowered the barrier and the cold water from the other oceans could flood in greater amount northwards, a considerable delay had in the meantime occurred in the contraction of the ocean floor of the Northern Pacific. The 720 m level indicates possibly the height the water reached before the barrier was flooded.

The bottom of the basin north of the Mendocino Escarpment was apparently cooled much earlier than the bottom of the other Pacific basins owing to the action of the cold water melting from the Alaskan Glaciers. The cooling of this basin started probably already at an early stage in the ice-age, thus penetrating earlier to the deeper layers than in the other basins. The extent of constriction in this northerly basin must accordingly have been much greater than in the more southerly ones. This is the overall reason this northern basin can drag the ocean-bottom south of the Escarpment in a north-westerly direction. Consequently that part of the American Continent west of the San Andreas Fault, must follow suit in the same general north-westerly direction.

For the same reason the Mid-Atlantic Ridge has been displaced to the west along the Denmark Strait and to the east north of the Azores and including the latter. During most of the Pliocene, cold water from the Arctic Ocean flowed along a mighty river within the Denmark Strait, and from the end of the same epoch through another river east of the Faeroe Islands. After the great transgression at the beginning of the Quaternary, the bottom of the Denmark Strait like the bottom of the North-East Atlantic Basin (the latter also named the West European Basin), were both strongly cooled and constricted, and at an earlier date than the respective basin on the other side of the Ridge. As a result the northern part of the Ridge, along the Denmark Strait, viz. the Reykjanes Ridge, was dragged westwards and the Ridge south of the Faraday Hills including the Azores was dragged to the east. At the same time the transversal cracks were deepened and more accentuated.

All over tha world, buildings or monuments of remote antiquity are found consisting of megalithic stones incorporated into the said monuments. The largest cut stones are probably those in Baalbek, Lebanon, contained within the foundation terrace of unknown age supporting a Roman temple of Jupiter. Along the sides of the platform are three enormous 1,000 ton stones together with smaller ones incorporated into the terrace. In Western Europe megalithic monuments consist partly of erect standing stones of great size. They are named "menhirs" if single and free--standing. Table stones or roofed structures, "dolmen", are mostly tombs and may up to this day contain bones. Tombs occur frequently either open and exposed to the elements or covered by earth, so called "barrows" or by small stones, "cairns". Many of the dolmens consist of a single room, but some open up with a roofed corridor to them. Sometimes the corridor opens up into smaller chambers along its sides. The chamber tombs were according to Glyn E.Daniels (1950) built by sea-going colonists or traders, perhaps for their chieftains. The inhumed remains of no less than 550 individuals have been recovered from chamber tombs in England and Wales. The people must have been small, with delicately-fashioned bones, and their skulls were dolichocephalic (long-headed). The megalithic monuments are rarely situated more than a few hundred miles from the coast. They occur in Sweden, Denmark, Great Britain, Ireland, France, Spain, Portugal and also in different localities in the western part of the Mediterranean. They are most common in France (Brittany), but they are more differentiated and also very numerous in Britain and Ireland. The monuments may consist of single upright free-standing stones from 2 to 70 feet in height, with a weight of up to 385 tons (Le Grand Menhir Brisé at Locmariaquer in Brittany, France). When originally standing this stone was more than 23 m high. Although many are standing isolated, most of those in Great Britain and Ireland are arrayed in rings, but they may also, as in Carnac, Brittany, be aligned in parallel rows, 10 or more abreast and stretching for miles. If the monuments have some hidden religious meaning, possibly connected with sun-worship, we do not know, but that at least some of them are connected in some way with astronomical observations is almost certain. The construction of some of them reveals that their ancient builders possessed a knowledge of mathematics, geometry and astronomy of rare precision far above what was assigned even to the Classical Greeks. The erection of

these monuments and the transportation of the heavy stones, sometimes for miles, involved a tremendous ammount of work, apparently with the only help of the simplest and crudest instruments in addition to human muscles. To be able to undertake such a large enterprise the combined forces of the entire community were required. It is most questionable if the builders could rely on slaves or prisoners of war who could always manage to escape into the surrounding woods. The architect directing the erection of the buildings must have possessed a tremendous spiritual or religious authority over the people of the community to induce so many able-bodied men to abandon and disrupt their daily occupations to partake in a communal hard labour promising no practical, immediate, or apparent benefits.

The most prominent and mysterious of all these monuments is Stonehenge in Southern England. It was erected in four stages between the years 2,750 and 1,500 Before Christ (Fig.55). The oldest stage consisted of a large circular ditch excavated in the chalk and defined by banks on either side. Just within the inner bank were dug the 56 so called "Aubrey Holes", dug to an average depth of two and a half feet and 30 to 70 inches in diameter. According to a much discussed theory, lunar and solar eclipses could be predicted by moving stones from hole to hole once a year. In later stages circular rows of standing stones mostly covered by horizontal lintels were erected inside the original ditch.

The megalithic stones used in the monuments consisted either of a hard magmatic dolerite or of the equally hard "sarsen" sand-stone. The soft chalk of Southern England had formerly been covered by a protecting layer of sand-stone, but in the course of geological time the chalk had been partly disolved by leaching water and sand-stone blocks are now lying irregularly strewn in the land-scape. Twenty miles from Stonehenge, huge blocks of the sarsen sand-stone were cut into the requisite shape by means of strings of fire and then cooled with water. The enormous blocks with a weight of up to 50 tons were then hauled across the rough country to the Salisbury Plain where they were finally placed upright, to receive atop of them lintels weighing up to seven tons apiece. To lift up the heavy lintels, wooden levers were used inch by inch on a crib of logs to the same level as the standing stones. An indentation in the lintel to receive a tenon on top of the standing stone

kept the lintel in place. All the lintels were slightly excavated on the inner side so that their combined circle appeared smooth. Some of the standing stones are cut with a slight swell towards the top. This architectural device was supposed to have been invented by the ancient Greeks to give a pillar a parallel appearance from bottom to top, but as we may see this knowledge was probably an inheritance from the much older Megalithic Monument Builders.

It is generally agreed that the builders of the megalithic monuments possessed not only great theoretical ingenuity and practical knowledge as engineers but also an unsuspected familarity with such sciences as mathematics and astronomy. In later years an American astronomer, Professor G.Hawkins from Boston and a Scottish professor of mathematics and engineering sciences, A.Thom from Oxford University, have studied in earnest the megalithic circles and alignement rows and both are convinced the buildings are indeed connected in some way with astronoical observations of rare precision. According to A.Thom the ancient builders used a standard unit of measure, 2,72 feet long, named by Thom a Megalithic Yard. To avoid complex fractions wherever possible they tried to measure their lines in round numbers of the megalithic yard, as f.ex. 20 or 40. As a circle is impossible to express in whole numbers of diameter and circumference, they drew their circles ovoid, oval, or flattened on one side, thus avoiding the difficulty. Professor Thom found their geometrical solutions so intricate that we to-day would need a digital computer to work them out. Hawkins was convinced that Stonehenge was an astronomical observatory where the phases of the planets were studied. By moving stones once a year he thought the ancient astronomers could predict lunar and solar eclipses, solstices, and the instant of the rising or setting of these planets. His conclusions have met with criticism, possibly due to errors caused by the ruined condition of Stonehegne?

We may admire the ancient monuments and their skilled builders, but we know tantalizingly little about the people itself. On the one hand they apparently were closely bound to the coasts, but on the other these coasts were so distant from one another, as from Scandinavia to the Iberian Penninsula, that they could hardly be native to any of the localities. Glyn E. Daniel (1950) is probably right in his statement that they were "seafarers from an unknown land". In the Mediterranean