

EARTHQUAKE EFFECTS, EMOTIONAL AND MORAL.

BY JOHN MILNE.

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I.

EFFECTS DUE TO SMALL EARTHQUAKES.

Among the first desires which seize a visitor in an earthquake country, is to experience a shaking. Should he leave the country without the fulfilment of his wish he expresses regret. On the other hand, if he becomes a resident in such a country, after a trembling he will often express pleasure at the sensation he has experienced, and it is seldom that alarm is created. These impressions, however are not permanent, for as the shakings are repeated, rather than sinking into a state of indifference to the disturbances, as many writers state to be the case, a feeling of timidity often arises, until finally he comes to the conclusion of those who have had more experience than himself, that the oftener you feel earthquakes the less they are to be disregarded.

The Rev. H. A. Boys, of Patras, writing on the earthquakes of Greece (see *Meteorolog. Mag.*) says:—"A new comer is usually rather amused by the sensation, but after the first interest has passed a feeling of horror rapidly comes instead, and the more they dread earthquakes." (*Earthquakes in Sussex, F. E. Sawyer, Brighton and Sussex, Nat. His. Soc. 1872.*) This is a result which is contrary to our expectations, but it is certainly a result which is often reached in earthquake coun-

tries. The reason that the mental condition of the new comer becomes changed is possibly the influence of those with whom he is associated, who have gradually impressed him with what *might* be the result of the gentle motions he feels, or perhaps it is an increasing nervousness and fear as he gradually recognizes his utter inability to avert these disturbances or predict their consequences. In this way a whole community by repetitions of small earthquakes may be gradually worked into a state of mental nervousness, and this may be so great that should a shock be experienced, the intensity of which is slightly above the average, many will rush towards their doors and take refuge in the open air. To avoid the danger of a falling roof, some place their reliance in the protective power of strong tables and bedsteads, whilst earthquake lamps which are extinguished if overturned are used as preventatives against the dangers of fire. One gentleman of my acquaintance who had been alarmed by the bricks of his chimney falling through the roof into his room, had his bed furnished with a pent-house like roof, such as is employed by miners when sinking shafts. Often it will happen that those who remain in buildings are seized with feelings of nausea and sickness. Mallet, in one of his reports, gives an instance where an earthquake produced feelings of nausea and vomiting amongst all the pupils of a large school. Of these effects we have had many instances in Japan. A letter from the Honble. Temple, dated December 12th, 1732, describing two shocks at Naples, the first of which was severe, says the second one which was the least terrifying had a great effect upon the nerves. Almost every one was seized with a shaking just as if they had the palsy, the teeth chattering in their head to such a degree that they could hardly speak. Even people who did not feel this second shock were seized in the same way. One gentleman who had for some time been quite cured of convulsive fits was seized with them again. Lastly, everybody complained of headache for some time after the earthquake. (*Phil. Trans. XLIV. 341.*) After the earthquake in London

(1749-50) many complained of "great sickness at the stomach and headache." (*Phil. Trans. XLIV.*) At the time of the Yokohama earthquakes of 1880, and no doubt in all severe shakings, similar feelings of nausea have been the experiences of many. In certain cases the originating cause of these feelings may be the actual motion, like the sickness produced at sea. This will be most noticeable in "slow" or "long period" earthquakes. In most cases, however, the probability is that it is the result of a sudden nervous excitement. The nervous excitement occasioned by small disturbances, such as are felt almost every week at certain seasons in Japan, has been known in the case of persons in delicate health to have resulted in death. Surgeons undoubtedly could give numerous instances where a patient, while undergoing some simple operation, like the lancing of a boil, the removal of a sty, or even vaccination, has been affected with a sudden nervousness resulting in faintness, to remove which, it has been necessary to prescribe a stimulant. Similarly, after an earthquake of moderate severity, stimulants have been drunk by hundreds to restore them to their normal state. May we not ask whether the amount of stimulants drunk by a community on these occasions is not to a certain extent a measure of the nervous excitement which had been produced? An idea of the consternation which a gentle shaking may produce has often been exemplified at a dinner party. No sooner has the motion of the ground become perceptible and the chandeliers commenced to oscillate, and flowers in vases to nod, than the conversation and general clatter cease. Some rise from their seats, others perhaps for example's sake, perhaps from stupefaction, keep their places, but each fixes his gaze upon his neighbour. Merriment has been suddenly congealed and save the creaking of the building and flapping of pictures, a death-like stillness prevails. After the shaking has passed, the topic of conversation which lasts for the next few days, is that of earthquakes. In fact, in a country like Japan, earthquakes are as much talked about as the weather is in

European countries. At the time of a severe shaking half the inhabitants of the district seek refuge outside their houses, and a city which a few minutes before the disturbance was wrapt in slumber suddenly wakes to noise and bustle. On all sides you hear the shouts of people mixed with rattling of the opening doors and shutters. Added to the general uproar you hear the barking of dogs, who, like their masters, appear to be conscious of something unusual. Those who through presence of mind, or perhaps a want of such presence, have remained indoors, listen to the creaking of the timbers in the roofs, the rattling of window frames, and a multitude of other noises, expecting that each successive vibration may be the one to bring the chimneys through the roofs. During this period of terror when seconds seem as minutes, some stagger across their swaying floors towards their doors, whilst others bury their heads beneath their pillows to ward off the effects of expected dangers.

From these remarks we may infer that even small earthquakes are sufficient to gradually develop an increasing terrorism, to give a character to conversation, and to excite nervousness. We may, therefore, conclude that nations which have been subjected to influences like these, may possibly acquire some slight peculiarities, characterizing them from nations which have been free from such influences.

II.

TERROR PRODUCED BY LARGE EARTHQUAKES.

From the tremblings, we may pass on to consider the effect produced by convulsions which have acted as decimators of nations.

On May 20th A.D. 526 it is said that Antioch lost 250,000 persons. In 1868 it is estimated that 40,000 lives were lost in Ecuador, the greatest convulsions being experienced at Arequipa.

On the 5th February, 1783, at 1 p.m. Calabria was convulsed,

and in less than 2 minutes 109 towns and villages were levelled, and 32,000 out of 166,000 inhabitants buried.

Between 1783-1857 or 75 years, the kingdom of Naples lost at least 111,000 inhabitants by the effects of earthquakes, or more than 1,500 per year out of an average population of 6,000,000. (*Am. Jour. Sci. XXXVIII, 1859 p. 210, Earthquakes in Southern Italy, by P. Lacaita*). By these earthquakes mountains were cleft asunder, high cliffs tumbled down, rivers were turned from their beds or dammed, lakes formed, valleys lifted up into hills, chasms opened, the physical aspect of the country was changed, and the distinction of property obliterated. For 20 days a thick pestilential fog set over the desolated country and epidemic fevers broke out in summer. From February to December, 1783, there were not less than 949 shocks.

After the Calabrian shock of 1783, a baby was dug out alive on the 3rd day, and lived. At Montemurro, Maria Antonia Palermo and her two little girls, one of them only 13 months old, were dug out on the 8th day, and lived.

A donkey was found alive on the 15th, 2 mules and a chicken were alive on the 22nd day, and 2 pigs were alive on the 2nd day. (*Am. Jour. Sci. XXXVIII 1869 p. 120 Earthquakes in Southern Italy, by P. Lacaita*).

Mallet makes the estimate that during the last 4,000 years, 13 millions of men have been suddenly swallowed up, together with countless bodies of various animals of every lower class. (*Reports of British Association, 1850 p. 63.*) As examples of the moral consternation which these calamities have produced, we may quote from records of earthquakes of our own times. The first thing we read in telegrams about the Earthquake of Manila, July 18th, 1880, was that "hundreds of people have lost their nerves. We have lived ten years in a minute. In this short space of time our spirits have aged ten years. We see the affectionate mother surrounded by her children, seeking a place in which to save the lives of those dear to her ;

the husband carrying in his arms his terrified wife, friend seeking friend and embracing each other as though they had been separated by a long absence, houses abandoned, all the people in the streets in the hour of insupportable heat—everywhere panic, desolation, and unfortunately death. Great God, behold thy beloved isles with eyes of pity.” (*The Daily Press*, Hongkong, July 24th, 1880.)

Next let us turn to the effects produced by earthquakes which were more severe. The one chosen is that of Chio, which took place on the 3rd of April, 1881. The description was written by a correspondent of the *Levant Herald*:—

“The morning dawned dull and heavy. The heavens were hidden by thick mist, clotted here and there with dark blotches of cloud. The temperature was heavy and oppressive, and the horizon was broken by broad flashes of light that seemed to denote a coming storm. In all this atmospheric disturbance, however, the inhabitants saw nothing extraordinary, and were far from being alarmed by what they fancied would result in a thunderstorm. At ten minutes to two in the afternoon a terrific shock was felt, bringing three-quarters of the houses in the town to the ground, like so many packs of cards, and burying a thousand persons under the falling ruins. Then commenced a fearful scene of horror; the ground rocked and danced, kneading the ruin already formed into an irrecognizable mass of stone. The survivors ran hither and thither, not knowing where to flee to escape the horrible fate that menaced them, and were tossed and flung about by the heaving earth like feathers in a breeze. On every side, the sinister grumblings of the earth, the noise of falling buildings, the tearing asunder of the walls of houses, and the shrieks of the wounded lent a fearful horror to the scene. The unhappy inhabitants rushed aimlessly from place to place, not knowing whither to direct their flight. Even those who gained the open country were by no means safe. The earthquake attacked not only the towns and villages, but worked its ravages in the hills

and mountains of the island. Enormous masses of rock and earth came rushing down the hill-side, carrying all before them, bounding far into the plains and tearing a road in the mountain, such as might have been formed by a torrent a thousand years old. The town presented a pitiable spectacle. In many places whole streets had disappeared, and it was hard to say where different well-known buildings had stood. No one knew where to look for family or friends. The ground still heaved and tossed, bringing fresh buildings to the ground at every moment and hurrying innumerable victims to destruction. People seeking to escape were caught in the staircases of their houses by the falling walls, or were crushed by the entire house falling in on them as they crossed the threshold. Beneath the ruins of the citadel alone, five hundred victims at least must be buried. Among others are forty Turkish women who were engaged in prayer in an oratory situated in the court of the castle. Only one living creature has been rescued from the ruins of the citadel: this was a young girl of eighteen, who was found among the ruins, lying between two corpses. She had lain in that position during thirty hours, and was removed only to die an hour after her rescue. In the country, the effects of the horrible upheaval have been even more terrible than in the town. Here the victims may be counted by thousands instead of by hundreds. The aspect of the plain of Vounaki is heart-rending. Between 40,000 and 50,000 persons of all ages and both sexes are camped here and there in the open ground. There are as yet but few tents to shelter them, and old and young, sick and well, and dead, even in some places, are scattered indiscriminately about the plain. Parents wander from group to group in the crowd, seeking their children, endeavouring to persuade themselves that their darlings will be found among the living. Not a single baking-house in the whole island is left standing, and the entire population was thus without food until aid could arrive from the exterior. What a fearful night was that of the 3rd! Thousands of people were huddled together in the plain without lights, or food, expecting every moment to be

their last. New arrivals continually poured into the ears of the terrified multitude fresh tales of horror. The never-ceasing heavings and tremblings of the earth ; the strange and awful sounds, like the grumbling of distant cannon, that proceeded from under ground ; the groans of the wounded and the dying ; the shrieks and sobs of those who had lost parents or children ; the wailing prayers or wild hysteric laughter of women, some of whom became mad with terror ; the low, fearful murmurings of the whole multitude, rising anon into a wail of anguish as every fresh shock shook the plain ; all these horrors, varied at intervals by the crash of falling buildings or the roar of a landslide wore the long night slowly away. At one moment an entire village, built in the form of an amphitheatre on the side of a hill, broke bodily away from the parent-rock and rushed crashing down into the plain. The shocks are now diminishing ; in all, we have counted 250 since the first three awful upheavals which destroyed the greater part of the island. Of these 250 shocks at least forty were capable of overthrowing a solidly built house. The work of excavation has been commenced, but, alas ! how few of the buried victims shall we be able to extricate from their living tomb ! The scene is sickening ; here a hand makes feeble signs through a crevice, while the unfortunate wretch to whom it belongs is buried beneath thousands of tons of masonry ; here, again, a voice calls for aid from far under ground ; a daughter, sobbing, endeavours to encourage her father who is imprisoned deep below the surface ; and at every turn of the spade or pick some horribly mutilated corpse is brought to light."

As a third example out of hundreds of records from which selections might be made, we take the following few extracts from the accounts of the destruction of the city of Caracas, which happened on Ascension day in 1812.

"The day rose fair and bright. The air was calm, the sky unclouded. Large numbers of the inhabitants were at church in attendance on the services of the day. Suddenly the bells

tolled without the touch of mortal hand. This was the first intimation of the earthquake which almost simultaneously was upon the unhappy people. The movement of the earth, as in the late widespread catastrophe was from north to south, with transverse jerks from east to west. These cross agitations of the surface, occurring with extreme rapidity, instantly prostrated everything animate and inanimate. The inhabitants were unable to crawl to the church doors and these vast churches which are characteristic of all South American cities from the largest to the smallest, descended in ruins around them. Ten thousand persons are said to have been killed in the churches alone. The churches of La Trinidad and Alta Gracia, more than one hundred and fifty feet in height, with naves supported by pilars of twelve and fifteen feet in diameter, were reduced to masses of ruin little more than a man's height. In the barracks a regiment of soldiers had just been drawn up under arms, ready to form part of a procession that was to take place after divine service. Scarcely a man of them was left. And all this was the work of a single minute. From the first tolling of a bell to the falling of the last stone of the city of Caracas one minute only elapsed.

Many thousand persons were wounded, for whom there was no shelter, no medicine, no food, scarcely a drop of water. There were not even implements wherewith to extricate them from the ruins which lay upon them. The survivors dug out with their fingers 2,000 of their crushed fellow citizens who had still some life remaining in them. The shock had broken the pipes conveying water; the falling in of the earth had choked up the springs which supplied them, there were no utensils wherewith to carry water from the river. The wounded and sick were carried to the river's bank and there left under such protection as the foliage afforded. The night we are told rose calm and serene, the round full moon shone over the labours of the survivors. Mothers still carried their dead children about refusing to believe that life had entirely fled. Troops of relatives and friends sought for missing

ones up and down streets, now to be traced only by long lines of ruins. A sterner duty yet remained. Twelve thousand dead bodies lay around, and decomposition within the tropics may be said to begin at the moment of death. There were no means of digging graves; the bodies must be burnt and that at once. Bands of citizens were set apart for this only. Vast piles of timber from the ruins of their houses were raised at frequent intervals; bodies of fathers, husbands, wives, children were laid on them; and soon the whole sky was lighted with these awful flames. This lasted for several days, during which the survivors strictly devoted themselves to religious exercise. Some sang hymns, other confessed crimes, of which they had never been suspected; numbers made what compensation was in their power. [*Japan Gazette*, March 10th, 1880.]

In the above extracts from the accounts of earthquakes each in a different portion of the globe, we see that the results which were brought about were similar. Whole communities suddenly suffered a mental paralysis, which in many cases amounted to madness. The extreme excitement was that produced by a continually approaching and receding death. At every succeeding shock, at the least tremble or even at the noise of a falling stone, survivors must have started and felt that at last their hour had come.

The immediate effect is that which is sometimes produced in children by a sudden fright; it is a complete demoralization.

For years after such a catastrophe every tremble in the earth will produce a panic. The experience and fears of fathers are handed down to their children, and before these terrors have become things of the past, a fresh disaster adds fuel to the fire consuming the moral constitution.

III.

GENERAL MORAL EFFECTS PRODUCED BY EARTHQUAKES.

Not only in savage countries, but also in civilized lands, gods are prayed to for a cessation of earthquakes and the aniver-

saries of these great calamities are solemnly commemorated. Thus, for instance, the second destruction of Lima on the day of the Visitation of Elizabeth, is yet a day for prayer.

In times when superstition was more rife than it is at present, earthquakes, like other great and terrible phenomena, were regarded in the light of divine judgments, and were attributed to some real or imputed delinquency on the part of those who suffered. We read, for instance, that on the 8th of November, 1608, a rather smart shock of earthquake passed over Scotland. In the Southern counties it was looked upon as a result of the extraordinary drought in the summer and winter before. But the more orthodox worthies in the far north took a higher view of it. The Kirk-session of Aberdeen met and accepting the earthquake as "a document that god is angry against this land, and against this city in particular for the manifold sins of the people" appointed a solemn fast for next day. On further reflection, they came to recognize one sin in particular as having doubtless called down the divine judgment. For more than 150 years, in virtue of a bull granted by Pope Nicholas V., the proprietors of the banks of the River Dee had been accustomed to fish salmon on Sunday. These Sabbath breakers were accordingly now summoned before the session and rebuked. "Some plainly refused in any way to forbear."

Again, on 20th October, 1580, an earthquake occurred that particularly affected the house of the master of Gray. The boy King James VI. asking Fergusson, the minister of Dumfermline, "what he thought it could mean, that house alone shake and totter" was grimly answered by the divine, "Sir, why should not the devil rock his ain bairns." (*Nature, Dec. 9th, 1880.*)

After the earthquake which shook England on April 6th, 1580, Dr. Grindal, then Archbishop of Canterbury, drew up a form of Prayer to be used in the Peculiars of London upon Wednesdays and Fridays. This was approved of by the Privy Council and was ordered by them to be read in all other

Dioceses of the Kingdom. Other Bishops and Pastors also drew up forms of their own ("A Chronological and Historical Account of Earthquakes," &c., 1750, p. 13.) The Rev. W. Stukely, M.D., F.R.S., who devoted so much attention to earthquakes, argued that earthquakes were divine judgments because they were directed to great cities and not to bare cliffs and uninhabited beaches. (*Phil. Trans.* XLVI. p. 645.)

Noorthouck, in his History of London, writing on an earthquake felt in London, September 8th, 1691, says that this, coupled with the terrible calamity which had devastated Jamaica, caused those "learned in apocalyptical studies to conjecture that the end of the world was approaching, and the government gave orders now to execute laws against drunkenness and debauchery." But he adds, "such intermittent fits of reformation excited by fear resemble death-bed repentances too much to merit any encomium." In referring to the earthquake on February 8th, 1750, Noorthouck says that the shock was felt all over the cities of London and Westminster and parts adjacent, chairs shaking and pewters rattling. A chimney in Leadenhall Street and several others were thrown down. It was felt at Hampstead and Highgate, and the Counsellors at Westminster expected their building to be demolished. On March 8th there was a strong shock and more chimneys fell.

The Bishop of London took advantage of these disturbances to publish an excellent letter to his clergy "wherein he noticed that it is every man's duty to give attention to all the warnings which God in his mercy affords to a sinful people, and lamented the depravity of the times, the horrid oaths and blasphemies, and the detestable lewdness and impiety, luxury, and love of pleasure that prevailed among us. The representation of the immorality of the people had but too much foundation in truth, whatever may be said of the use to which his lordship converted the earthquakes."

A fanatical crazy life-guardsmen went to greater length than the bishop, and predicted a third earthquake to happen on the

5th of April—"On the evening, therefore, preceding the dreaded 5th of April incredible numbers of people left their houses and passed the night with fearful suspense in the fields or in boats on the river; the roads were so thronged with the carriages of persons of fashion, that lodgings were hardly to be procured even at Windsor. Many are said to have sat during the night in their coaches in Hyde Park,—and as coaches will hold four, scandalous whispers circulated that they dissipated their apprehensions by the help of cards and wax candles."

The moral disturbances which have from time to time been felt in England are interesting as examples of effects which may be produced in a country where earthquakes are exceptional occurrences. In other countries where displays of seismic energy are more frequent, this moral consternation has been greater.

After the great earthquake of A.D. 596, which shook the province of Yamato in Japan, prayer was ordered to be offered to the earthquake god in all parts of the Empire. Other earthquakes and volcanic eruptions have repeatedly produced similar effects (see *The Volcanoes of Japan by Milne; Trans. Seis. Soc.* Vol. IX. Pt. 2.)

In a letter from a merchant at Lisbon referring to the great earthquake of 1756 we read the following:—

"The terror of the people was beyond description, nobody wept; it was beyond tears; they ran hither and thither, delirious with horror and astonishment, beating their faces and breasts, crying 'miseracordia, the world's at an end.' Mothers forgot their children, and ran about loaded with crucifixes and images. Sacraments were exposed in churches. The poor creatures embraced altars and images, processions with pictures of saints paraded the streets. Some who were willing to do a meritorious act seized a young Englishman and christened him by force. People were taught that it was a judgment for having heretics amongst them.

“ On the second night, our Lady of Pentra d’France was fixed on the most conspicuous part of the shattered church which she was protectress of, smartly dressed in a blue petticoat. This was given out as a miraculous appearance and that her prayers had prevailed and there would be no more earthquakes. Dispatches were sent to Court and everywhere about this miracle. On which processions were made, and the presents given on that occurrence were amazing. The good lady, however, was mistaken, for on that day there was another shake. (*Gent. Mag.* XXVI p. 67.)

Some zealous Protestants seem to have regarded the Lisbon earthquake as a divine judgment upon European Idolaters and the false prophets on the coast of Africa, and they expressed their thankfulness for the distinguishing favour which God had shown them. It was a great blow to the Catholics. (*Gent. Mag.* XXVI p. 68.)

The duration of the effect produced by the Lisbon earthquake may be judged of from the fact that, in the following year on the anniversary of the great shock, another disturbance was predicted.

This so alarmed the inhabitants that they were preparing to leave the city when the king sent some regiments of horse to prevent their design. (*Gent. Mag.* XXVI p. 591.)

In the accounts of the Jamaica earthquake of 1692 we read how the terrified inhabitants clung to the clothes of their Minister and begged him to pray with them, which he did, kneeling on a ground heaving like a rolling sea, amidst the tottering and fallen buildings.

(*The Theory and History of Earthquakes, by the Right Rev. Thomas Lord, Archbishop of Canterbury* p. 32-35.)

The inhabitants of Leghorn who escaped the effects of the earthquake of 1742 received such a mental shock that there was a unanimous resolution to observe as a solemn fast for ever the anniversary of their deliverance, with the request to

the Government that the masquerades at the Theatre might for ever be abolished, which request was approved and confirmed by an order from the council of regency at Florence. (*Account of Earthquakes at Leghorn, &c.*, 1750. Rev. Mr. Horton. p. 23.)

Earthquakes like many other great calamities have been regarded as exhibitions of God's vengeance upon an ungodly people. If the ungodliness were suppressed, then the calamities would disappear. Such feelings are clearly illustrated in the following two verses taken from a poem called "The Earthquake," written about the time of the Leghorn shock:—

"What powerful hand, with Force unknown
 Can these repeated tremblings make?
 Or do th'imprison'd vapours groan?
 Or do the shores with fabled tridents shake?
 Ah no! the tread of impious feet
 The conscious earth impatient bears;
 And shuddering with the guilty weight,
 One common grave for her bad race prepares."

(*Account of Earthquakes at Leghorn—&c.*, Rev. Mr. Horton, 1750, p. 23.)

After the destruction of Palermo (Sept. 2nd, 1726) the inhabitants became extremely humble and penitent, forming processions and carrying scourges. The ladies, who dressed themselves in mourning and crowns of thorns, we are told, lashed themselves until the blood flowed. The earthquake was regarded by every one as a special mark of God's vengeance upon an extravagant people, especially so as neighbouring cities had not suffered. (*Chronological and Historical Account of Earthquakes*, p. 35.)

In 1692, when Sicily was so severely shaken by earthquakes, it was observed that Messina received less damage than many other cities. This fact the monks took advantage of, and persuaded the superstitious people that this was due to the intercessions made to the Virgin Mary by a young girl who was her particular favourite. At Catania, however, the intercession of its patroness St. Agatha was not so successful.

When the earthquake commenced many of the people flew to the Cathedral, where one of the canons carried about the relics of the saint, but in spite of both relics and prayers the whole city was overturned.

The Earl of Winchelsea in 1669, writing on this same earthquake, speaks of the religious everywhere appearing "with much devotion, carrying in procession their reliques, especially those of St. Agatha, the famous martyr of Catania, in which they reposed no small confidence, followed by multitudes of people, some of them mortifying themselves with whips."

One solemn procession, consisting of the civil and ecclesiastical authorities and many people, went to Mount St. Sofia, carrying with them their choicest relics which they exposed upon an altar erected in view of Mount Etna, which was then in eruption. Here they celebrated mass and used exorcisms, but all without effect for the mountain bellowed and roared as before. (*"A True and Exact Relation of the late prodigious Earthquake, &c., of Mount Etna,"* by the Earl of Winchelsea. 1669. p. 17-21.)

After the earthquake of June 5th, 1688, which overturned many houses in Naples, the streets were filled with processions of penitents, women, children, old men, ecclesiastics, and others clothed in sackcloth, &c., to atone the wrath of heaven. (*"A Chronological and Historical Account of Earthquakes,"* p. 27.)

Fear created by seismic and volcanic activity has no doubt done much to engender superstition. The vulgar of many nations have regarded volcanoes as the mouths of hell—the bellowings of the volcano have been believed to be the cries of the damned, and its eruptions the effects of the fury and despair of the wretched prisoners. (*The Natural History of Earthquakes,* M. Buffon.)

Even so late as 1807 we find volcanic phenomena exerting a strong influence upon the superstitions of a people. In this year there happened an eruption of Vesuvius; accompanied with shakings and the usual phenomena of a volcanic outburst.

In Naples the magistrates and bishop of the city proclaimed a supplication, and ordered a procession from the city towards the mountain, carrying the relics of St. Januarius. Not long after this, the fury of the eruption commenced to abate and the Neapolitans resolved to perpetuate the memory of the Holy St. Januarius with a gold and silver medal, with the inscription. "To St. Januarius, the deliverer of the city and founder of its quiet." (*Conjectures on the Physical Causes of Earthquakes*, Rev. James Little, p. 18.)

Another example of earthquakes having been commemorated by an annual feast, is the feast which was observed in Alexandria A.D. 365 on account of deliverance from a threatened earthquake.

IV.

EARTHQUAKES REGARDED AS SIGNS.

Very often it has happened that earthquakes have been regarded as signs or warnings of farther calamities or judgments.

In many instances it is not unlikely that these beliefs owe their origin to some of the prophecies of the Bible.

Dr. Thoresby, F.R.S., in a letter on an earthquake felt in England (1704) says that "Famines, pestilences, and earthquakes are enjoined by our Blessed Saviour as portending future calamities, and particularly the destruction of Jerusalem and the Jewish State, if not the end of the world. St. Matthew XXIV. 7. (*Phil. Trans. XXIV.*)

Socrates, in his ecclesiastical history, speaking of the earthquakes of Bithyia, takes them as signs of the convulsions afterwards to follow in the Christian Church.

Thucydides regarded the earthquake which shook Delos as a sign of an approaching bloody war.

In a pamphlet entitled "Practical reflections on Earthquakes" written in 1750, it is observed that when the Pagan Empire was to turn Christian in the time of Constantine the Great, great earthquakes occurred. In 1300 just as the Turkish Em-

pire was increasing, great shakings were felt in Rome. Before Saladin attempted to overthrow Jerusalem in 1172 great earthquakes happened. These, together with many other instances, show that earthquakes have often been regarded as warnings.

Both in Europe and in Asia we find it often remarked that the death of an emperor was ushered in by unusual seismic or volcanic disturbances. When there is an earthquake in Pegu, Valentyn says, "they think that the King will die, or will lose his throne, or will oppress them, or that there will be a famine, or something else!" (*Oldham Catalogue of Indian Earthquakes* p. 25.)

Not only have earthquakes been commemorated by annual fasts but also by medals and *bas relief* carvings depicting the destruction.

The great earthquake of A.D. 17, referred to by Tacitus, Pliny, and other authors, which overthrew 13 cities in Asia Minor, was commemorated by the Roman Emperor Tiberius, who caused a coin to be struck with the inscription, "*Civitas Asiæ restitutis.*" One of these coins, it is said, was found at Colchester.

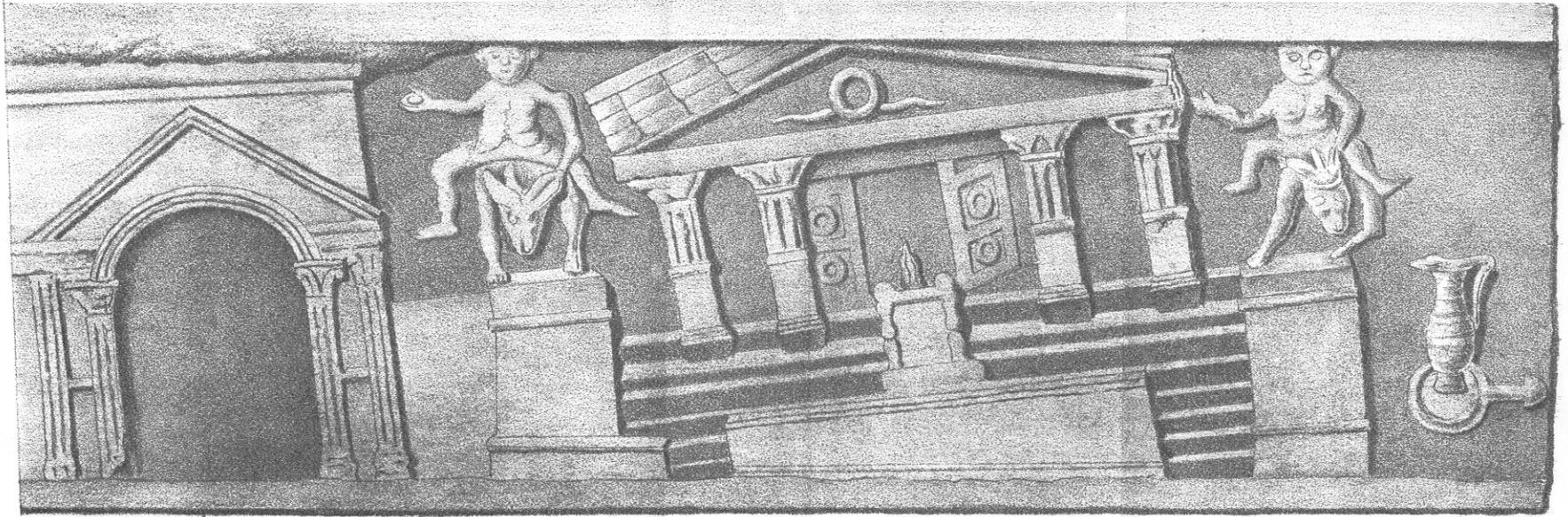
The names and pictures of the 13 cities were carved on the pedestal of a colossal statue of Tiberius standing near Naples. In the ruins of Pompeii, Rossi found an interesting *bas relief*, showing the temple of the forum in the act of falling by the earthquake of A. D. 63. This was above a domestic votive altar dedicated to the penates in memory of this earthquake. (*See plate.*)

V.

CONCLUSION.

With the facts which have been given lying before us, arguments to shew that seismic forces have exerted a vast influence upon the human race are not required.

In all cases fear has been created, resulting sometimes in



10 Centimeters

Bass-relief found in Pompeii representing the town and temple of the
Forum in the act of falling by the Earthquake in A. D. 63 (Rossi)

madness and even in death. The immoral and licentious have received a reprimand, whilst religions have received an impetus or a check.

In both cultured and uncultured races, displays of seismic energy have so far distorted the powers of reason that many nations have created earthquake gods and other superstitions have been begotten. (*See Causes of Earthquakes, by J. Milne, Science Society, Tokio, 1886*). Is it not possible that the volcano gods and the pilgrimages to the summit of volcanoes, which are such striking features in the religious practices of Japan, have an origin in the effects of seismic convulsions? Buckle, who shows how the wonder of a people may be excited with all great natural phenomena, would attribute the art and poetry of countries like Spain and Italy, and we may add Greece, to the development of the imaginative faculties by seismic and volcanic forces.

Not only may seismic forces have stimulated the imagination to the detriment of the reason, but amongst the weaker members of a community, by the creation of feelings of timidity resulting perhaps in mental aberrations like madness or imbecility, the seeds have been sown for a process of selection, by which the weaker members in the ordinary course of racial competition must succumb. The survivors living in a state of insecurity, amidst dangers which could neither be predicted nor averted, passing through periods when annihilation of life and property might occur at any moment, might as in the times of plagues and great dangers, become careless of the morrow. The consequence of this has been that passions have been unbridled and refuge has been sought in mirth and gaiety. Is it not likely that a continuation of these conditions might result in a disregard for the serious affairs of life, and unfit a nation for competition with those living in more favoured regions?

Certainly it may be said that the successful or serious nations of the present day, characterized by their enterprise and com-

merce, are not those whose misfortune it has been to fight against unintelligible terrorisms of nature. As types of those who have been cradled amongst such surroundings, we have the inhabitants of Central and Southern America, Japan, Iceland, and Java.

Let us ask where we can find a light-hearted carelessness, pleasant geniality, and a happy disposition better developed than is to be met within this country? An approach to such characteristics may possibly be found in Naples. The Icelanders, who originated from an energetic stock, after a millenium find solace in legendary lore.

Although it must be acknowledged that the Greeks, the Italians, and the Spaniards have each had their day as leaders of nations, it must also be admitted that throughout their career they have been characterized by their prominence in sculpture, painting, poetry, and a longer continuation of superstitions than is found amongst their equally educated neighbours. In some of these nations a passion for games of chance has a development sufficiently strong to receive government support. In nearly all, we meet with a ceremonial politeness, an apparent geniality, and a cultivation of arts conducive to pleasure.

Although it is probable that the peculiarities we observe amongst the inhabitants of earthquake countries like those just mentioned may have been characteristic of these races before being subject to seismic influences, and also that they may in great measure be the resultant phenomena of a complexity of causes, other than those especially referred to, it must nevertheless be admitted that displays of earthquake and volcanic energy have played a mighty role in moulding the characters of many peoples.

Variations in natural character are usually brought about slowly, but still they are apparent even in our own times. An amelioration in manners and a decrease in the desire for brutal amusements, like prize fighting, appears now to be in progress

in the British Islands. Should the seismic force of South America be transferred to Germany or Britain, as pointed out by Mr. Darwin, the change in natural characters would be sudden, and might result in sinking Germans and Englishmen to the lowest level in the ranks of civilized communities. If from time to time our mountains flowed like water, our cities were levelled with the ground, our coasts inundated, to the destruction of all upon our shores, a feeling of insecurity would arise, commerce would be destroyed, and trust in the future would be annihilated. The nation would be humiliated. Spiritually everything would collapse. From one section of the people we might hear a wail of misery and repentance, and from another the shouts of ribaldry and licentious mirth. The only structures that would be built would be of the most temporary nature, the people would be careless of the morrow, and the idea of permanency be obliterated from the mind.

DISCUSSION.

Prof. B. H. Chamberlain, in paying a tribute to the value and interest of Professor Milne's paper, said there could be no doubt as to the correctness of the Professor's opinion on the subject of mountain-worship having, in this country, received an impetus from the occurrence of seismic and volcanic outbursts. The national histories are there, with their notices of government gifts and officially ordered prayers to the gods of certain volcanoes, to prove that the rulers of Japan laid to heart these awful warnings of nature. The influence of seismic and volcanic phenomena on the Japanese mind is indisputable. But perhaps the most curious aspect of the case is not the existence of this influence, but the narrow limits within which it is confined,—limits whose narrowness is evidently caused by that lesser range of the imaginative faculty, which, for good or for evil, distinguishes the Japanese, and Eastern Asiatics in general, from the nations of European race. The whole early poetry of Japan apparently contains but a single instance of the use of the word "earthquake." To find the

word volcano used in verse, we must come down to the thirteenth century of our era; and even in prose such references are rare. Japanese stylists do not, as might have been expected, draw on these terrible convulsions of nature for images wherewith to awaken feelings of awe and wonder in the minds of the readers. The nation contented itself with prayers and propitiatory gifts to what were believed to be angry deities. How pale is this state of things in comparison with the effect produced in Spain, in Italy, in South America, and even in England, need scarcely be pointed out. The profound divergence between the Japanese and European minds could hardly receive a more striking exemplification.

Prof. Sekiya said that Prof. Milne had at one time written monographs on special earthquakes, next he wrote upon experiments he had made upon artificial disturbances, then he described instruments for measuring earthquakes, and now he takes up the literary portion of the subject; in short he threatens to exhaust all that there is for workers in seismology to investigate. Whenever large earthquakes have occurred in Japan the mental excitement has been great. Relating to the Ansei earthquake of 1855 there are 80 different works, some giving observations of scientific value, while others only tell us about the terror and misery of the people. One work called Ansei Kenbun Roku tells us that at the time of great calamities like the earthquake it describes, the hearts of mankind are shown in their true light. It substantiates this by describing the vices and crimes which were committed at the time of the Ansei earthquake as well as the acts of charity and assistance which were offered to the sufferers.

The Chairman, Dr. C. J. Knott, while thanking Mr. Milne for his paper, trusted that Professor Sekiya's lament that Mr. Milne was leaving but little to be done by other workers might not be realized.

Professor Milne, in reply, was glad that those members of the society who had spoken had confirmed his general conclu-

sions. Professor Chamberlain's remarks relating to the effect upon the religious ceremonies in this country was an example where earthquake effects had been permanent. The instance where people had been roused to acts of charity, although certainly an earthquake effect, was of a more temporary nature. The severe earthquake of 1880 had led to the establishment of the Seismological Society, and he trusted that this particular effect would be very permanent. All great calamities produced mental effects, and with savage nations these were more permanent than with civilized nations. With civilized nations the effect of natural terrorisms die out more rapidly than they do among the uncivilized. Many of our present mental peculiarities are undoubtedly the result of a complexity of causes, and with the exception of those countries where large earthquakes are frequent it is difficult to indicate the results due to earthquakes as distinguished from those due to other phenomena.

NOTE.—Since reading the above paper, Dr. G. Wagener has shown me a large number of interesting pictures relating to myths connected with the mythical earthquake monster which in early times was supposed to reside beneath Japan. This is apparently a case where earthquakes have excited the imagination and produced an effect upon the art productions of a country. The same is no doubt true of other nations.

JOHN MILNE.