V.—*Dissertation on a Peruvian Musical Instrument like the Syrinx of the Ancients.* By THOMAS STEWART TRAILL, M.D., F.R.S.E., Professor of Medical Jurisprudence in the University of Edinburgh.

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The attention which has of late years been paid to the elucidation of the manners and arts of the ancient inhabitants of America, has been productive of the most convincing proofs of the communication between the Eastern and Western Continents at remote but unknown epochs. The learned and highly-interesting researches of HUMBOLDT on the antiquities of the New World, have irresistibly led him to this conclusion, which has farther been strengthened by the researches of later travellers. The comparison of the idioms of the Asiatic and American tongues, has hitherto not afforded very direct proof; because the philologist has not yet been put in possession of a sufficient number of materials to make the comparison with advantage. Our ignorance of the languages and customs of Central Asia is a great bar to such studies, and needs not any other illustration than the fact that a highly-polished nation, with a literature and arts hitherto almost unknown in Europe, should have existed for ages in Central Asia. Our countryman, Dr GERARD, stimulated by the humane desire of extending the blessings of vaccination to Thibet, has been for some time in that country, and has discovered in its language an Encyclopædia in forty-four volumes, of which the medical part alone fills five volumes; and he finds, that the art of *Lithography*, so new in Europe, has been practised from time immemorial in Kinnaour, a principal city in Thibet, where he found it employed to display the anatomy of the human body. Attempts have been made to supply such deficiencies in the knowledge of Asiatic languages, chiefly by the Germans; especially in the first volume of the *Mithridates* by ADELUNG, and in the *Asia Polyglotta* of KLAPROTH. When our acquaintance with Central Asia shall be more extensive, and the American languages more studied, we may be able to trace the origin of the nations of that continent with greater success; and HUMBOLDT does not think it impossible, that traces may yet be discovered in America of tongues and nations that have disappeared from the older hemisphere. It would be curious if future inquirers should discover in America vestiges of those torments of the philologist and antiquary, the Median, Oscan, Phœnician, and Etruscan tongues.

“If language supply,” says HUMBOLDT, “but feeble evidence of communication between the two worlds, this communication is fully proved by the cosmo-

gonies, the monuments, the hieroglyphics, and institutions of the people of America and Asia."

It is impossible to consider the Mexican account of the *Serpent-woman*, *Tonacacihua*, or "Woman of our Flesh," the parent of mankind, with her fall from her state of pristine innocence and happiness; their traditions of a great inundation, in which the human race perished, with the exception of a single family that escaped on a raft; their account of the building of a vast pyramid, which was intended to reach to the sky, and consequent dispersion of the sons of men, and the origin of different languages, caused by the anger of the gods, when they overthrew this monument of human presumption; without perceiving the prototypes of these traditions in the sacred writings of the Hebrews.

The Mexican cosmogony notes *five* epochs of the world; like the people of Thibet, and the Tatar tribes who have retained the ancient religion of the Llama. The first is the age of *earth*; the second that of *fire*; the third the age of *wind* or *air*; the fourth that of *water*; *we* live in the *fifth* epoch. It was in the end of the fourth age that the deluge took place, and that a single family was preserved to repeople the earth. As might be expected, *Coxcox* (the Mexican Noah) is represented as the immediate ancestor of the inhabitants of that country. In the first four epochs we may trace the *four ages* of classical antiquity, with the Tatar addition of a fifth. Like the Chinese and Indians, the Mexicans supposed an enormous duration to our earth in all its cataclysms. The Mexican legends extended the age of the world to upwards of 20,000 years.

In the astronomical cycles of some of the American nations, we find strong analogies with the systems of the inhabitants of Thibet, and the various tribes of the Mantscheou Tatars. The Mexican division of the year into 365 days, distributed into 18 months, of 20 days each; the annual intercalation of five days to complete the year, and still more their curious cycle of 52 years, and great cycle of 104 years, in which they intercalated 25 days, to bring the commencement of the next cycle again to correspond with the winter solstice, shew so exact a determination of the true length of the year, that the celebrated LAPLACE is of opinion it could not have originated among a people in so rude a state of society as the Mexicans at their discovery by the Spaniards. The intercalation "of 25 days in 104 years," says he, "supposes a more exact determination of the tropical year than that of HIPPARCHUS, and, what is very remarkable, almost equal to the year of the astronomers of Al-Mamon. When we consider the difficulty of attaining so exact a determination, we are led to believe that it is not the work of the Mexicans, and that it reached them from the Old Continent."

The vast pyramidal temples, accurately placed to the cardinal points, and constructed, as at Cholula, of *sun-dried bricks*, with interposed layers of clay; and occasionally, as at Papantla, with their successive stages neatly covered with hewn stone, sculptured with hieroglyphics, reminded us of the structures of the

early ages of Babylonian and Egyptian architecture. The great pyramid of Cholula has a basis 1440 feet on each side, or twice as broad as the great pyramid of Giza; but its height is only 164 English feet. It is built in four stages, and had a small temple on its upper platform, while the interior contained sepulchral chambers;—circumstances which still farther connect this American temple with the pyramids of Egypt, and the Chaldean monuments described by RICH and others. The curious and systematic mode of hieroglyphic paintings of the Mexicans, which combined natural and conventional signs, and, according to HUMBOLDT, also *phonetic* characters, bears a striking similarity to the hieroglyphical papyri of Egypt; and it may not be unworthy of notice, that the Mexican MSS. were folded up *zigzag-wise*, or something like a fan,—precisely almost as the Siamese papyri MSS. are folded to this day.

The singular resemblance between the institutions of the Peruvian lawgiver MANCO CAPAC and the systems of Hindostan, are not to be overlooked; the same exaltation of a theocracy, drawing its descent from heaven; the same exaction of passive obedience to the head of this theocracy, who, like the first legislator of India, traced his pedigree to the sun; the same division of the people into *castes*.

The Peruvians, like the Hindoos, were, by such institutions, trained into a patient, laborious, little-intellectual people; and, like their Asiatic prototypes, have left behind astonishing monuments of patient industry in some of their public works.

I have introduced this comparison between the people of both hemispheres, in order to shew that I do not assume too much in supposing an instrument invented by the ancient inhabitants of the eastern hemisphere, the *original* of the subject of this paper,—a *musical instrument* of stone found in a *Huaca*, or sepulchral tumulus, which is said to have covered the body of an Inca of Peru.

It was brought from South America by my friend JOSHUA RAWDON, Esq. He received it from General PAROISSIEN, a native of England of French extraction, who had obtained it as an article of value and great rarity in Peru.

It was customary with the natives of South America to raise large tumuli over distinguished men; and in these were buried domestic utensils in wood, stone, and the precious metals, often with very considerable treasures, especially in Peru. It would seem that the contents of the rich *Huacas* are still known to the Peruvian Indians, either from tradition or from some species of record. They appear to consider it a sacrilegious act for one of themselves to violate the tomb for the sake of its treasures; but there are more than one instance of their rewarding an European for kindness done them by revealing where he may dig with the certainty of obtaining a golden harvest. The vast Huaca near Truxillo, in the Plain of Chimù, was discovered to JUAN GUTIERRES DE TOLEDO, in 1576, by an Indian, and the bars and utensils of gold it yielded to the fortunate Spaniard equalled 46,810 oz. of gold, or upwards of £181,288 sterling. It appears to have

been customary to deposit with the dead the instruments they used, or articles they delighted in ; and we may suppose that the Inca with whom this musical instrument was buried was not ignorant of its use. There is no figure of such an instrument among any of the published remains of an American race, as far as my researches have extended ; nor am I aware that it has been mentioned among the implements found among them by their Spanish conquerors. It therefore must be of considerably anterior date to the Spanish conquest ; as we cannot suppose that since that era, so disastrous to the natives of America, any prince of a native race would have obtained the honours of a *Huaca*, in regions held by the fierce and bigoted conquerors.

Description of the Instrument.

The Peruvian antiquity in question is, in form and principle, similar to the Syrinx of the Greeks and Romans, or Pan's Pipe, well known in England by the somewhat barbarous name of *Pandean Pipes* ; and in the Italo-Helvetian cantons by the appropriate denomination of *Organetto*, a diminutive of *Organo*, of which it is most probably the prototype.

The Peruvian instrument, however, is not constructed of unequal reeds bound together ; but it is cut out of a solid mass of a compact, softish stone, which appears to me to be a variety of Potstone (*Lapis ollaris*). It is cut with great neatness and precision. Its form will be best understood by inspection of the figure. Its sides are not parallel, but they slightly converge toward the upper part of the instrument, for the purpose, apparently, of rendering the orifices of the pieces thin, without endangering the solidity of the whole. The corners of the bottom of the instrument are smoothly and slightly rounded, as if by friction from the hand of the player. The surface seems to have been covered with a brownish shining varnish, similar to the vegetable varnish employed still by the natives on the Essequibo and Orinoco to cover their pottery. It has in part decayed, and in one place bears the impression of cloth of a coarse texture having adhered to it.

The surface, which has evidently been intended for the outside when played, is ornamented with a very regular pattern. The volutes are very neatly executed, and the regular removal of the angular spaces on the right-hand side of the zig-zag lines, shews an attempt at variety not unpleasing. The horizontal band of what we would call *Maltese crosses*, is very well executed.

The extreme breadth of the instrument, including the handle, is 6·2 inches ; its greatest depth 5·3 ; the thickness of the body of the instrument is from 0·7 to 0·5 of an inch. The handle projects 1·1 inch from one end, and is perforated by four holes, two of which appear at its extremity, and one on each of its edges, each of them communicating, in the thickness of the handle, with one of the other

holes. Their obvious use is to receive a cord, for the convenience of holding the instrument more firmly, or of hanging it up.

There are eight pipes or cylindrical tubes scooped out in the thickness of the stone: they have a diameter of about 0·3 inch, and rise in a sort of general neck three-fourths of an inch above the body of the instrument, forming a horizontal connected series of tubes, which, however, have no communication with each other. Their upper edges, on one side, are slightly thinned, which, no less than the ornaments on the side, shew what part of the tube was pressed against the lips.

These circumstances prove that the Peruvian instrument, like the organetto, was held by the player with the longest tubes, or lowest notes, toward his *right hand*. The depth of the tubes was carefully measured, and is as follows:—

No.		Inches.		No.		Inches.
1.	=	4·90		5.	=	2·45
2.	=	4·50		6.	=	2·85
3.	=	4·12		7.	=	2·00
4.	=	3·50		8.	=	1·58

Though these measurements do not seem quite to accord with the usual proportionate length of pipes with regular musical intervals, they seem to have been adjusted from experimental trials by the maker; and I used every precaution in measuring them with a delicate instrument.

In the common organetto, the tubes are portions of the Spanish reed (*Arundo Donax*), of unequal lengths. These are usually 16 in number; and as each pipe differs from the next a note of the ordinary musical scale, the compass of the instrument, with the usual mode of blowing it, is two octaves. These tubes are open at both ends; and the instrument is tuned by the introduction of a piece of cork, which is pushed farther down when the tone of the note is too sharp, and pushed farther up when the tone is too flat. The key-note is first pitched from some other instrument, or by a tuning-fork; and the other pipes are adjusted by the ear from the key-note.

In the Peruvian instrument the tone of the notes appears to have been adjusted with considerable skill, by careful drilling of the stone; and this has been done by means of a circular drill with cutting edges and a hollowed centre, as the bottom of the holes still shews. The truth of the tones shews that this boring has not been done without repeated trials of the effect; and there is no reason to doubt that the Peruvian artist knew also how to amend the tone by *stopping* the bottom of the pipe when necessary.

The Peruvian instrument has eight notes, in the ordinary way of blowing it: but, by contracting the orifice of the mouth, and by pressing the orifice of the tube toward the lip, an octave to the first is obtained from each note, and if the force of the blast be very strong at the same time, a third octave may be obtained: so that, in the hands of an expert performer, the instrument had considerable compass. In this paper, however, we shall confine our notice to what may

be termed the ordinary compass of eight notes, produced by moderate and easy blowing, and producing clear tones.

The Peruvian instrument has a contrivance for giving variety to its notes, which appears to me very ingenious, and which, as far as I can learn, is peculiar to it. Four of its pipes, viz., Nos. 2, 4, 6, and 7, have each a *ventilage*, or small hole perforating its front, about an inch below its top, which must be covered with the fingers of the performer when these pipes are to be sounded. These holes are so near the top of the pipes, that, when open, the sound of the note is quite lost; so that if the performer does not mean to sound that particular note in a rapid movement, it is not necessary to avoid blowing into the pipe, but merely to uncover the ventilage, which effectually destroys its sound. From the peculiar adjustment of the instrument, an harmonious and pleasing *tetrachord* is produced by running up the scale with all the ventilages open.

This description renders it evident that the Peruvian has considerable advantages over the simple Grecian syrinx, which is generally represented in sculpture with *seven* pipes, and occasionally with only *six*. In other respects, the Grecian instrument appears to differ little from the modern organetto; but it is, in some of its modifications, of very high antiquity, and perhaps preceded the invention of the single flute (*μοναυλος*) with numerous ventilages.

LUCRETIVS describes *Pan's* mode of playing to be the same as we now find it among the Italians:

“ Unco sæpe labro calamos percurrit hianteis
Fistula sylvestrem ne cesset fundere Musam.”
Lib. iv., 592.

The ancients ascribed the invention of the syrinx to the disappointed love of the god PAN, amid the hills of his favourite Arcadia.

“ Pan primus calamos cera conjungere plures
Instituit.” *VIRGIL, Ecl. II.*

Both Pan and the pipe, however, had probably an Egyptian origin, long before the groves of Greece were haunted by any deity; and, if I am not mistaken, we may trace the syrinx to an antediluvian patriarch. *Jubal*, the descendant of CAIN, is in Genesis called “the father of all such as handle the harp and *organ*.”

The English translators of the Bible have adopted the interpretation of the Latin Vulgate, in which the Hebrew *יָגַל*, *Yogel*,* is rendered *organum*,—“ipse fuit pater canentium cithera et organo.” This passage, in the Septuagint, and in the famous Alexandrian MS., runs thus: *οὗτος ἦν ὁ καὶ ἀδελφεὺς ψαλτηρίου καὶ κιθάραν*—“He it was who taught the *psaltery* and the harp.”†

* Or. with points, as in WALTON'S Polyglott, *יָגַל*.

† The Hebrew name is derived from the verb *יָגַל*, which, in the Septuagint, is always rendered by *ἐπιτιθημι*, *I join together*; which would seem to indicate that it consisted of reeds or pipes *put together*.

What the *Yogel* was has been disputed; but PARKHURST explains it to be a wind instrument of several pipes. The ψαλτηριον of the Septuagint is, by several commentators, said to be a *wind instrument*, or “sort of flute used in churches;” not the modern *psaltery*, which is a trapezoidal flat box, with 13 pairs of strings mounted on two bridges, and played with two crooked sticks.

The invention of the modern organ is a subject of dispute; for few critics will receive St^a CECILIA as the inventor of that noble instrument, although RAFFAELLO has introduced the syrx in his grand picture of that saint in allusion to this fable. It is of considerable antiquity, however, and it will be sufficient here to remark, that the organ itself is only an adaptation of the more ancient *syrinx* to keys, and an artificial blast of air; and its pipes are tuned on the principle of its venerable prototype.

The ancients seem, however, to have possessed an instrument somewhat in principle resembling the modern organ, in so far as it consisted of several pipes attached to a box, which contained compressed air. In the instrument briefly and obscurely noticed by VITRUVIUS, who lived about the commencement or a little before the Christian era, the air seems to have been compressed by forcing *water* into a brazen box, that communicated with the pipes. The instrument was termed by the inventor, CETESEBIUS of Alexandria, ὑδραυλις; and is attempted to be figured from the description in the Italian translation of VITRUVIUS by BARBATO, Patriarch of Aquileia.

I am indebted to my friend Mr W. CADELL for the notice of a coin of NERO, in the British Museum, on which an ὄργανον, or perhaps ὑδραυλις, is figured. It seems to be the instrument alluded to by SÆTONIUS, in the life of NERO—“*reliquam diei partem per organa hydraulica, novi et ignoti generis circumduxit.*” There is a dissertation on the Hydraulis in the Gottingen Transactions.

The organ or psaltery of the book of Genesis, I believe, then, to have been the syrx; an instrument with which we may reasonably suppose MOSES to have been familiar, as ancient authors generally agree in ascribing the invention of the συργίς, and of the single flute, μοναυλος, to the Egyptians.

Both flute and syrx are mentioned by HOMER as known to the Trojans—

Ἄυλων Συργίτων τ' ἐνοπην ὁμαδὸν τ' ἀνθρώπων;

so that, without doubt, the syrx is an instrument of very great antiquity; and we know that it has been most widely diffused among ancient nations.

Among the Arabs it is in use at the present day. In KÆMPFER'S History of Japan, two forms of a syrx of twelve unequal reeds, used by that people, as also some singular Japanese flutes, are figured in *Tab.* xxxi., A. E. G. J.

From time immemorial, it has been in use among the inhabitants of the Alps; and most of the performers on the *organetto*, who perambulate Europe, bring it from the Italian cantons in the vicinity of the Lake of Como.

That it had been introduced into America, the instrument before you fully proves; and voyagers have discovered a musical instrument very like it in Amsterdam Island, or Tongataboo, in the Pacific Ocean. In a letter which I received from the illustrious HUMBOLDT on this subject, he states, that he had found a rude sort of Pan's pipe among the natives on the banks of the Orinoco.—“ Il est bien remarquable de vois les mêmes formes se reproduire dans les regions les plus éloignées; j'avais déjà été frappé de l'adresse avec laquelle les indigènes de l'Orinoque savoient construire ses *flutes de Pan*, chaque fois que mes canots s'arrêtaient là, où le rivage étoit couvert de roseaux.”

Scale of the Instrument.

The first attempts at obtaining an idea of the scale of the Peruvian instrument were imperfect, owing to my little skill in either the theory or practice of music. By means of BROADWOOD'S C tuning-fork for concert pitch, compared to a piano, I discovered that the lowest note in the Peruvian syrinx was equivalent to E on the first line, and that the next three notes with that formed a tetrachord nearly corresponding to E, F, G, A; that the fifth ascending note was three notes higher than A, or equalled D; that the sixth note was a note *lower* than the preceding; that the seventh was two notes higher than D; and that the eighth was four notes higher than D.

These notes, however, differing from the piano by half a tone, it occurred to me, that, by obtaining the assistance of an accomplished musician on the violincello, the true scale might be ascertained far better than by my unskilful attempts. I employed an expert Italian performer on the organetto to play on the Peruvian instrument, on different evenings, and I was fortunate enough to obtain the assistance of three musical friends, who unite to fine taste great practical skill in music; and to the aid of these gentlemen I am indebted for the following determination of the true scale and powers of the Peruvian syrinx.

The violincello was tuned to the pitch of the Peruvian instrument, and the value of each of its notes was repeatedly tried by this test. The result of these experiments convinced my musical friends, that the maker of that instrument had proceeded on just musical principles in its formation; and that its eight notes were resolvable into two distinct tetrachords, one of which is in a minor, and the other in a major key.

When the ventilages are all *shut*, the following is the

The division of this scale into two tetrachords in different keys is produced by opening the ventilages for the one, and sounding only the notes which were omitted by that process for the other.

Tetrachord in the Key of E Minor.

Tetrachord in the Key of F Major.

The first tetrachord in the minor key is perfect, and is the most easily performed; for it only requires that all the ventilages be left open, and consequently those notes will not sound. This in all probability was the favourite Peruvian key, and must have imparted, as the minor key always does, a plaintive tone to their music.

The second tetrachord in the major key is nearly perfect; but the instrument on this key is half a note above concert pitch, which throws the F $\sharp$ into F $\sharp$, and the C $\sharp$ into C $\sharp$.

It is, however, to be noticed, that, by different modes of ordinary blowing, the tones may be varied nearly half a note; and it is not improbable that the notes now imperfectly pitched, were accurately adjusted by *stuffing*.

The use of the ventilages now becomes very apparent. They enabled the performer to introduce several harmonious modulations, by opening one or more of the holes, without embarrassing him with the attention necessary to avoid the pipes not to be sounded. In this manner considerable variety is given to the succession of sounds, all of which are regulated by the fixed principle of presenting agreeable successions or modulations to the ear. One of my friends was of opinion that some very simple modulations, produced by this means, as an accompaniment to the songs or dances of the Peruvians, was one of the designs of the inventor of the Peruvian syrx.

The Peruvian performers probably used the succession of simple notes, often reiterated; and we might infer that they often delighted in *slurring* them, by sliding the instrument along the lip, instead of blowing each note distinctly *à l'alto staccato*, as is usually done by modern performers on the organetto.

It is worthy of remark, that the scale of the Peruvian instrument is founded on a system of *tetrachords*, as was that of a more refined people,—the ancient Greeks. The lyre, according to DIODORUS, was invented by the Egyptian HERMES, and had originally only three strings,—*λυραν τε εὔρειν, ἣν ποιησαι τριχορδον*. The historian says that a fourth, “ called *μεση*, was added by the Muses; that LINUS added

the fifth string, named λιχανος; that ORPHEUS gave it a sixth, ὑπατη; and that the seventh, παρὺπατη, was the addition of THAMYRIS." Even in this improved state of their musical system, the *fourth* was still a favourite and important interval; for we find that their great musical system, as they termed it, "*extended to two octaves composed of five tetrachords;*" in the same manner that the scale of GUIDO of Arezzo, the inventor of the modern system of musical notation and of *counter-point*, is composed of different *hexachords*.—See *Burney*.

The sagacity and profound investigations of the learned Sir WILLIAM JONES have clearly proved that the same systems of literature and arts, which once gave lustre to Ethiopia and Egypt, prevailed in India; and more recent investigations, especially those of HUMBOLDT, AGLIO, and several American travellers, have shewn, as we have already noticed, that the arts, the cosmogonies, and astronomy, of the Peruvians, the Mexicans, and some of the other tribes of Central America, betray, in some respects, an Asiatic origin.

PERUVIAN SYRING.