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PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY

HELD AT PHILADELPHIA

FOR

PROMOTING USEFUL KNOWLEDGE.

Vol. XXIX.

JANUARY TO DECEMBER, 1891.

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VOL. XXIX. JANUARY TO JUNE, 1891. No. 135.

Vocabularies from the Musquito Coast.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, March 6, 1891.*)

Through the kindness of the Rev. W. Siebärger, a missionary of the United Brethren, now resident on the Musquito coast, I have obtained several new vocabularies from that region, which offer points of interest to the ethnologist.

The most important of these is a list of words from the language of the Ramas tribe, the first and only specimen of their tongue that I have encountered. These people live on a small island in Blewfield lagoon. They number at present about two hundred and fifty souls, all of whom have been converted to Christianity, and all of them are able to speak and read English except a few very old persons. Their native tongue is rapidly disappearing, and in a few years, probably, no one will be left able to use it fluently and correctly.

In physique they are described as large and strongly built; in temperament, submissive and teachable.

Their language has always been reported as wholly different from that of the Musquito Indians, who occupy the adjacent mainland, and this is shown to be correct by the specimen sent me. It bears, in fact, no relation to any other tongue along the Musquito coast. It does not, however, stand alone, constituting an independent stock, but is clearly a branch, not very remote, of a family of languages once spoken near Chiriqui lagoon, and thence across to the Pacific, or nearly that far.

To this stock I have, in my classification of American languages

assigned the name "Changuina," from its principal member, the Changuinas, who resided on the river of that name flowing into Chiriqui lagoon. It is said that some few villages of the stock may still be found about the headwaters of this stream.

My chief source of information about this family is derived from the small work of A. L. Pinart, published in Paris last year, entitled *Vocabulario Castellano-Dorasque, Dialectos Chumulu, Gualaca y Changuina.* M. Pinart knew of no members of the stock north of the Chiriqui lagoon, though Blewfields is more than two hundred miles to the north of it.

The following is the list of the words sent me. The orthography is German.

	Rama.		Rama.
Man,	*nikikna.*	Tongue,	*kup.*
Woman,	*kuma.*	Tooth,	*siik.*
Sun,	*nunik.*	Hand,	*kuik.*
Moon,	*tukan.*	Foot,	*kaat.*
Fire,	*abung.*	House,	*knu.*
Water,	*sii.*	1,	*saiming.*
Head,	*kiing.*	2,	*puk sak.*
Eye,	*up.*	3,	*pang sak.*
Ear,	*kuka.*	4,	*kun kun beiso.*
Mouth,	*kaka.*	5,	*kwik astar.*
Nose,	*taik.*		

Of these the subjoined present more or less distinct Changuina analogies:

	Rama.	Changuina.
Sun,	*nunik,*	*kelik-u.*
Fire,	*abung,*	*kebug-al* (fire-brand).
Water,	*sii,*	*si.*
Head,	*kiing,*	*kin-ununa.*
Ear,	*kuka,*	*kuga.*
Mouth,	*kaka,*	*kaga.*
Nose,	*taik,*	*0akai.*
Tongue,	*kup,*	*kuba.*
Tooth,	*siik,*	*su.*
Hand,	*kuik,*	*kula, kuluk.*
House,	*knu,*	*ku.*
One,	*saiming,*	*umai.*

The words for man and woman, *nik-ikna* and *ku-ma,* may have been borrowed from the Musquito, *wa-ikna* and *ma-iren.*

The numerals in the Changuina stock appear not to have been

well defined, as they differ in all three dialects. The Changuina proper helps itself out with the Spanish: *umai*, one; *umai-dos*, two; *umai-tres*, three. The Gualaca dialect has *ku-e*, one; *ku-mat*, two; *ku-mas*, three. In both, "five" is "*kul-male*," a hand, which corresponds to the Rama *kwik-astar*.

The Rama words for "two" and "three," *puk-sak*, *pang-sak*, belong to a series of numerals which had an extensive adoption by several diverse families in Guatemala and Costa Rica, and probably are of South American origin. They are distinctly traceable to the Cuna or Darien language, in which we have, 2, *pok'-ua*, 3, *pak'-ua*, and these reappear in the Guatuso of Nicaragua. This is evidence that the Ramas reached their island after they had adopted these Cuna words. This was probably after the Conquest. We know that in 1674–81, the Governor of Costa Rica, Don Juan Francisco Saenz Vasquez, marched against the Changuinas on account of their turbulent character, and severely punished them. Perhaps at this time the Ramas entered their canoes and sought refuge along the coast, far to the north of their ancient seats.

My informant adds a few words of the Cuna or San Blas language, picked up by him on the coast, as follows:

	San Blas.		San Blas.
Man,	*tula, siradi.*	Foot,	*naga.*
Woman,	*hoam.*	1,	*kuenohikua.*
Sun,	*tata.*	2,	*pogua.*
Moon,	*nu.*	3,	*pagua.*
Eye,	*ibia.*	4,	*pakawa.*
Ear,	*auar.*	5,	*atali.*
Hand,	*aregena.*		

Comparing this with the *Vocabulario Castellano-Cuna*, of A. L. Pinart (Paris, 1890), it appears to be a tolerably pure dialect of the tongue.

Mr. Siebärger also furnishes a vocabulary from the Twaka Indians. These natives live in a number of scattered hamlets about the headwaters of the Tungla or Princeapula rivers. The latter name is a compound of "Prinzo," the name of a tribe, and the Musquito *auala*, river.

From an inspection of the list, it is clear that they belong to the extensive Ulva stock, as I have assigned them from previous evidence in my classification of "The American Race." *

* *The American Race: A Linguistic Classification and Ethnographic Description of the Native Tribes of North and South America* (New York, 1891).

	Twaka.		Twaka.
Man,	*all.*	Tongue,	*taki.*
Men,	*mui.*	Hand,	*tingki*, or *tingma.*
Woman,	*yall, wana.*	Foot,	*kallni.*
Sun,	*ma.*	House,	*honi.*
Moon,	*waiku.*	Hill,	*assam.*
Star,	*yalla.*	1,	*as.*
Earth,	*sau.*	2,	*bo.*
Sea,	*kuma.*	3,	*bass.*
Fire,	*ku.*	4,	*araunka.*
Water,	*wass.*	5,	*singka.*
Head,	*tunuk.*	6,	*tiesko-as.*
Eye,	*makpa.*	7,	*tiesko-bo.*
Ear,	*tappan.*	8,	*tiesko-bass.*
Nose,	*nangtak.*	9,	*tiesko-araunka.*
Tooth,	*annak.*	10,	*sullap.*
Mouth,	*matikpas.*		

The word *tiesko* in the numerals 6, 7, 8, 9, is explained as a form of *tingki*, "hand." The numeral for "five," *singka*, sounds suspiciously like the Spanish *cinco;* but I find it also in other Ulva dialects. For "twenty" the Twaka expression is *mui aslui*, "the man one time," *i.e.*, all the fingers and toes counted at once.

Their expression of welcome, "How are you?" is *parrasta*, which explains the name of the Parrastahs, a tribe on the Rio Mico, belonging to the Ulva stock.

The plural suffix is *balna.*

Their term for God, or the Supreme Deity, is *Ma papangki*, "Sun-father," which indicates that they are, or were, sun-worshipers.

The Twakas locate the seat of man's life and emotions, not in the heart, as most nations, but in the liver; and they have in common use such expressions as:

issing sawram,	liver split = angry.
issing pini,	liver white = kind.
issing sani,	liver black = unkind.

In this they differ from their neighbors, the Musquitos, who employ in such expressions the word *kupia*, heart.

On a New Species of Atalapha.

By Harrison Allen, M.D.

(*Read before the American Philosophical Society, January 16, 1891.*)

ATALAPHA TELIOTIS, sp. nov.

Ears rounded much smaller than head. The internal basal lobe longer than broad, and without posterior projection. The external basal lobe longer than high, without notch at the base anteriorly. The hem occupying notch is half the height of the auricle and is ample. The tragus is coarsely crenulate on the outer border, slightly narrowed at the tip, which is not turned forward. The external surface is without a trace of ridge, and the notch at the base above the small basal lobe without a tubercle. Snout and lower lip quite as in other species of the genus, except that the chin-plate is somewhat wider.

Skull with groove on centre of face-vertex continuous with the anterior nasal aperture. Sagittal temporal ridge sinuate. The first upper premolar exceedingly minute, scarcely half the size of the corresponding tooth in other species; it can with difficulty be seen even with the aid of a lens. The lower premolars are nearer of a size than is the case in other species, the first being fully half the size of the second. The third lower incisor is rounded, minute, and without cuspules.

The membranes are much as in *A. noveboracensis*, but the terminal phalanx of the fifth finger is longer, and ends with a free end on the margin of the endopatagium. The membranes are attached to the foot at a point midway between ankle and the base of the toes.

The prevalent color of the hair is dark chestnut above, but lighter below. The base on the body is everywhere black, and the shafts buff. No ashy tips are anywhere seen. The ventral half of the side of neck is white. The hair is scanty along the ventral surface of the forearm and the proximal ends of the last three metacarpals. The dorsum of the interfemoral membrane is furred only at the basal third. The remaining characters as in *A. noveboracensis*.

This species is readily distinguished by the shape and small size of the ear and tragus, by the attachment of the wing-membrane to the foot, and by the peculiarities of the premolars in both jaws, as well as those of the third lower incisors. It agrees with a southern variety of *A. noveboracensis* (*A. frankii*) in the partially free dorsal surface of the interfemoral membrane.

The specimen was forwarded to me by Mr. J. G. Cooper, of the California Academy of Natural Science, in a bottle containing an example of *A. noveboracensis*, and it resembles this form so closely in coloration that at first I mistook it for an immature example of the species last named.

The specimen is in poor condition. After decomposition had set in, it had been preserved for a long time in strong alcohol.

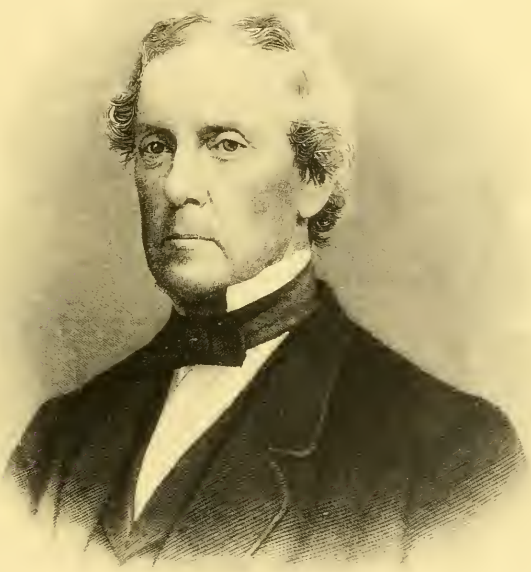
Habitat unknown. but it is probably Southern California.

Measurements.

Head and body (from crown of head to base of tail)	38	mm.
Length of arm	22	"
" forearm	37	"
1st digit .. Length of first metacarpal bone	2	"
1st digit .. " first phalanx	4	"
2d digit... Length of second metacarpal bone	40	"
2d digit... " first phalanx	6	"
3d digit... Length of third metacarpal bone	40	"
3d digit... " first phalanx	14	"
3d digit... " second phalanx	15	"
3d digit... " third phalanx	$2\frac{1}{2}$	"
4th digit.. Length of fourth metacarpal bone	38	"
4th digit.. " first phalanx	10	"
4th digit.. " second phalanx	8	"
5th digit... Length of fifth metacarpal bone	32	"
5th digit... " first phalanx	7	"
5th digit... " second phalanx	7	"
Length of head	12	"
Height of ear from head	4	"
" " base of external lobe to tip	6	"
" tragus	3	"
Length of thigh	14	"
" leg	16	"
" foot	6	"
" tail	39	"
Width 2d interdigital interspace	2	"
" 3d " "	10	"
" 4th " "	28	"
Difference between 3d and 4th interspace	18	"
Length of forearm	37	"

Thus the manal formula is 2–10–28–37, the difference between the third and fourth interdigital interspace 18, and is much the same as in *A. noveboracensis*.

The measurements of the body and of the metacarpals are within the range of these which can be made on specimens of *A. noveboracensis*. The second phalanx of the third finger is longer than the second; the second phalanx of the fourth finger is much shorter than the first; the second phalanx of the fifth finger is of the same length as the first. In these respects the measurements are in contrast with those of *A. novebora-*



Gov. Emerson

censis. The thigh is shorter than the leg, while both are smaller than is the species named. The foot is shorter, while the tail is slightly longer.

Atalapha is the most aberrant of any of the genera of the Vespertilionidæ, as this family is at present defined. It presents features in common with the Emballonuridæ, the Molossi and the Phyllostomidæ. These remarks are appropriate at this place, since in *A. teliotis* the general plan of the ear is as in Emballonuridæ; the shape of the wing, especially as to the strength of the first metacarpal bone, the shortness of the fifth metacarpal bone as compared to others of its series, the rigidity of the phalanges of the fifth digit, the arrangement of the lines in the fourth interdigital space, the flexibility of the lips, the great height of the internal tuberosity and of the length of the epicondyle of the humerus, the reverted distal ulnar rudiment, the posterior deviation of the coracoid process, the presence of a distinct lateral lobe to the cerebellum, the number of the upper incisors (being restricted to two), and the general shape of the wing are as in Molossi; while the complete tympanic bone (forming a ring at the upper margin), the pisiform bone being palmad and articulating with the fifth metacarpal bone, the palmad distinctness of the metacarpal bones, the shapes and relative proportions of the ectoturbinals, the presence of numerous vertical raised muscle-bands on the endopatagium, the angle of the lower jaw not being deflected, but remaining in axial line with that of the horizontal ramus, the genus resemble the true Phyllostomidæ.

Notes on Hebrew Phonetics. By J. Cheston Morris, A.M., M.D.

(Read before the American Philosophical Society, March 6, 1891.)

It might seem extremely rash for one whose acquaintance with Hebrew scarcely extends to a knowledge of its letters to offer any observations upon them in the presence of those who have made an exhaustive study of the subject; yet I do so, as thinking that one who occupies "the room of the unlearned," and is looking at the matter from a distance rather than from the dust-obscured atmosphere of the conflict of opinions, may offer some hints which may prove of value, even though they may not be wholly new.

In commencing the study of Hebrew characters, one is struck with two facts: 1. That there is said to be no character representing a pure vowel sound. This, I believe, is not the case with any other known alphabet. 2. That a change was made during the Babylonian captivity of the Jews, substituting the present square characters for the more ancient form. Let us inquire, first, why this was probably done. At this time the sacred records were subjected to inspection of their conquerors, containing, as they certainly did, many things which would be more or less offensive to them, and calculated to cast ridicule if not bring persecution upon the ex-

iles. What more natural than for those who had charge of these records to endeavor to conceal their contents by such a veil as opportunity afforded, viz., that the ancient phonetic value of the letters had been lost and the meaning of the words so obscured that only those initiated by long study of the Jewish sacred mysteries and traditions could read them? In this way we have accounted for the rise of the school of the Talmudists, the study of the Mishna and Gemara, and the origin of the Kabbala. No word was to be pronounced as written; it had an inscrutable meaning only to be learned by the initiated and transmitted by the use of points added to the letters. Add to this the inherent difficulty of representing the sounds of any people in the vocabulary of another race; as instances of this, take the substitution of "l" for "r" by the Chinese in learning English, or the difficulty a Frenchman or German has in acquiring our "th," or the Greek *θ*; or, as more to the point, the substitution by the uneducated German Jew of "sh" for pure "s." There is something in the physical structure of the vocal organs of each race which is reflected in the vocables used by it. In the Hebrew race as met with to day this ringing nasal character strikes us all forcibly.

After these introductory thoughts, we are struck with the fact that one of their Hebrew letters, the ע, *ngain*, is so variously pronounced as to make one seriously question its true phonetic value. Its place in the order of the alphabet, as compared with the Phœnician and Greek, is that of the Greek *omicron*; its form in Phœnician and in the old Samaritan is o. In many Hebrew dictionaries this value is given it. Take, again, the ו, *vau*, its place that of the Greek F, *digamma*, its phonetic value that of the Latin v, or English ou. May not our double u, *w*, represent this, as well as the German v, *fow?* The sound of ק, *quof*, is lost to Western languages, except so far as represented by *q*, to which we add a *u* to make it vocable to us. The letters ס, *samech*, and ש, *shin*, are represented by the Greek *σ*, *sigma*, and *ξ*, *xi*, but are found in an inverted order in the alphabet. [The confusion between these letters goes back to a far earlier period when we find two of the Hebrew tribes disputing over Shibboleth or Sibboleth.]

But the very first letter is a vocable which in all other alphabets is considered a pure vowel sound, a; the fifth, *he*, is another, ĕ; the sixth, *chayt*, is ē, or ch; the tenth, *yod*, is i, *iota*; and, as above, *vau* = ou, or u (or sometimes f or v), and *ngain* = o. We have thus all our usual vowel sounds except y, which we know in French as *ygrec*, and substitute usually for the Greek *upsilon*. In Hebrew we have two sibilants, *zain* and *tsaddi*, the latter of which occupies the alphabetical position in Greek of *upsilon*. If we now try to substitute in Hebrew, as ordinarily written, the above values for the letters, we shall find we have a perfectly vocable language. The names of men and places are given not very differently from our modern pronunciation of them as elucidated by the pointed Hebrew, when allowance is made for the difference due, as above stated, to racial intonation.

In some instances, two or three consonants are found together, but these may be regarded as familiar abbreviations for well-known words, just as D. L. W. means for us Delaware, Lackawanna and Western R. R., etc. In this way we may find that the Hebrew is really no exception as regards the presence of characters indicating pure vowel sounds; and, indeed, we have the authority of Josephus for the statement that it does. Chief among the words whose pronunciation was to be hidden was the name of the Deity—it was forbidden—and many, long, and bitter have been the controversies as to the true pronunciation of יהוה, *yod, hay, vau, hay.* Josephus says it was composed of four vowels.* He was a priest, and also well versed in Greek and Roman literature, and we may well accept his statement as reflecting the best learning of his times on Jewish matters. It seems to me that this ought to settle the question.

As to the consequences which would follow from such a view, I must leave them to those more competent to follow them out. It seems, however, to me that we would thus have better opportunities of comparing the Hebrew sacred records with those of all other ancient nations, and of clearing up much obscurity in ancient history and geography.

I would therefore suggest the following phonetic values:

א	= α = a	ל	= λ = l
ב	= β = b	מ, ם final	= μ = m
ג	= γ = g	נ, ן final	= ν = n
ד	= δ = d	ס	= σ = s
ה	= ε = ĕ	ע	= ο = o
ו	= *F* = f or vow or ou or u	פ, ף final	= π = p
		צ, ץ final	= υ = y
ז	= ζ = z	ק	= = q
ח	= η = ē or χ = ch?	ר	= ρ = r
ט	= θ = th	ש	= ξ = x
י	= ι = i	ת	= τ = t
כ, ך final	= κ = k		

And illustrate by

AN ATTEMPTED TRANSLITERATION OF GENESIS X.

1. v ale tuldt bni-nē (ch) xm (ch) em v ipt v iuldu lem bnim aēr (ch) embul
Noah Shem Ham Japheth

2. bni ipt gmr v mgug v mdi v (v) iun v tbl v mxk v tirs
Japheth Gomer Magog Madai Javan Tubal Meschech Tiras

* See Josephus, "Wars of the Jews," Book v, Ch. v, 7.

3. v bni gmer axkuz v ript v tgrme
Gomer Ashkenaz Riphath Togarmah

4. v bni iun alixe v trxix ktim v ddnim
Javan Elisha Tarshish Kittim Dodanim

5. male nprdu aii eguim barytm aix llxnu lmxpētm bguiem

6. v bni ēm kux v myrim v puth v knon
Ham Cush Mizraim Phut Canaan

7. v bni kux sba v ēvile v sbte v rome v sbtka v bni rome xba v ddn
Cush Sheba Havilah Sabtah Raamah Sabtechah Raamah Sheba Dedan

8. v kux ild at-nmrd eva eēl leiut gbr bary
Cush Nimrod

9. eva-eie gbr-yid lpni ieve ol-kn iamr knmrd gbur yid lpni ieve
Jehovah Nimrod Jehovah

10. v tei raxit mmlktu bbl v ark v akd v klne bary xnor
Babel Erech Accad Calneh Shinar

11. mn-eary eeva iya axur v ibn at-ninve v at-rēbt oir v at-klē
Asshur Nineveh Rehoboth Calah

12. v at-rsn bin ninve v bin klē eva eoir egdle
Resen Nineveh Calah

13. v myrim ild at-ludim v at-onmim v at-lebim v at-nptēim
Mizraim Ludim Anamim Lehabim Naphtuhim

14. v at-ptrsim v at-kslēim axr iyav mxm plxtim v at-kptrim
Pathrusim Casluhim Philistim Caphtorim

15. v knon ild at-yidn bkru v at-ēt
Canaan Sidon Heth

16. v at-eibusi v at-eamri v at-egrgxi
Jebusite Amorite Girgashite

17. v at-ēvi v at-eorqi v at-esini
Hivite Arkite Sinite

18. v at-earudi v at-eymri v at-eēmti v aēr npyu mxpēut eknoni
Arvadite Zemarite Hamathite Canaanites

19. v iei gbul eknoni myidn bake grre od-oze bake sdme v omre v adme
Canaanite Sidon Gerar Gaza Sodom Gomorrah Admah

v ybim od-lxo
Zeboim Lasha

20. ale bni-ēm lmxpētm llxntm barytm bgviem
Ham

21. v lxm ild gm-eva abi kl-bni obr aēi ipt egdul
Shem Eber Japheth

22. bni xm oilm v axur v arpkxd v lud v arm
Shem Elam Asshur Arphaxad Lud Aram

23. v bni arm ouy v ēul v gtr v mx
Aram Uz Hul Gether Mash

24. v arpkxd ild at-xlē v xlē ild at-obr
Arphaxad Salah Salah Eber

ch
25. vl obr ild xni bnim xm eaēd plg ki bimiv nplge cary v xm aēiv iqthn
Eber Peleg Peleg Joktan

ch
26. v iqthn ild at-almudd v at-xlp v at-cyrmut v at-irē
Joktan Almodad Sheleph Hazarmaveth Jerah

27. v at-edurm v at-auzl v at-dqle
Hadoram Uzal Diklah

28. v at-onbl v at-abimal v at-xba
Obal Abimael Sheba

ch
29. v at-aupr v at-ēvile v at-iubb kl-ale bni iqthn
Ophir Havilah Jobab Joktan

30. v iei miaxbm m-mxa bake spre er eqdm
Mesha Sephar

31. ale bni-xm lmxpētm llxgtm barytm lguiem
Shem

ch ch
32. alc mxpēt bni-nē ltuldtm bguiem umale nprdu eguim bary aēr embul
Noah

ALSO OF JUDGES XII, 6.

ch
v iamru lu amr-na *xblt* v iamr *sblt* v la ikin l dbr bn v iaēzu autu v ix-
Shibboleth Sibboleth

ethuĕu al mobrut eirden v ipl bot ecia maprim arboim v xnim alp.

On the Grapeville Gas-wells. By J. P. Lesley.

(*Read before the American Philosophical Society, March 6, 1891.*)

Mr. John Fulton, General Manager of the Cambria Iron Works, at Johnstown, Cambria county, Pa., has kindly furnished me with the following particulars of one of the most important and significant episodes in the strange story of Petroleum in Pennsylvania :

1. A report to him made October 12, 1888, by Edgar G. Tuttle, then Mining Engineer of the Company. This gives :—(*a*) the number of wells (27 or more) around Grapeville, in Westmoreland county, up to that date sunk and piped by different companies ;—(*b*) the length and sizes of the pipe line to Johnstown ;—(*c*) the pressures of gas at the well, at the 4th, 8th, 12th, 16th, 20th, 24th, 28th, 32d, 36th and 39th mile, and at the Cambria Works terminus.

2. A second report made to him two years later, February 25, 1891, by M. G. Moore, now Mining Engineer of the Company. This gives :—(*a*) the titles of eleven companies owning 85 gas-wells in the Grapeville district ;—(*b*) an account of the drilling especially of the Agnew well ;—(*c*) a table showing the decline of pressure at the Westmoreland and Cambria Companies' wells, from 386 lbs. on April 29, 1889, to 65 lbs. on February 2, 1891 ;—(*d*) a full table of the Co.'s thirteen wells, depths, dates of striking gas, the initial pressure of each, subsequently observed pressure at April 29, 1889, December 15, May 26, November 3, December 1, 1890,

January 5 and February 2, 1891, the first six wells starting with 460 lbs. and ending with 70 and 65 lbs. ;—(*e*) a diagram of the mode of piping the Agnew well ;—(*f*) a map of the country between Pittsburgh and Johnstown, showing location of groups of wells.

Mr. Fulton was prompted to sending me the data described above by his remembrance of my address, some years ago, at Pittsburgh, before the American Institute of Mining Engineers, in which I reiterated my belief on geological grounds in the comparatively speedy extinction of the rock gas industry of the country. He adds : "You will notice that recently one of the wells [at Grapeville] has been deepened to reach the 'Gordon sand,' and that a small supply of gas was found in this second and lower horizon of natural gas, but not enough to warrant any hopefulness of its maintaining the supply. A part of our works are being supplied yet with the natural gas from Grapeville, but it is weakening so fast that we have got to supplement it with artificial gases" (February 26, 1891).

My warrant for publishing in the Proceedings of this Society these most important geological and historical data is found in Mr. Fulton's words : "I do not think that there is anything in this report that is so private or confidential that it should not be made known; and you can therefore use the matter in these reports as you think wise. At the Cambria works we are using the Archer oil gas to take the place of the natural gas, and we are finding this to be a very good substitute. As you know, the Archer process consists in vaporizing fuel oil, and mixing at a very high heat steam with the oil. We have also opened our mines again here and are using coal in a great many sections of the works" (March 13, 1891).

October 12, 1888, the Westmoreland and Cambria Natural Oil Company owned seven (7) wells, located principally along Brush Creek, northeast of Grapeville, Westmoreland county, Pa. Three wells were connected with the pipe line ; the others were held in reserve, two of them being drilled to a thin crust of hard rock (silica) just overlying the gas sand, which served as a hermetical cover to prevent the escape of the gas, even at its high pressure in the gravel-sand rock beneath it.

This fact is important as explanatory of the retention of the gas in the rock for past ages.

The wells are 1100 to 1400 feet deep, according to their locality in the valley or on the hill, the gas rock lying nearly horizontal.

The pipe in the well is of 5 inch diameter.

The two wells, A, A^1, on the map, were turned on full for the pipe to Johnstown, the well R being turned on more or less as a regulator of the supply at the Cambria works.

The pressure at top of well was 335 lbs., as the 10-inch main to Johnstown would not stand a much higher pressure.

There seemed no difference in strength or volume of gas per minute blown off (free) by one of these wells, in Mr. Tuttle's presence, compared with that which he saw two years before at a free blow from a well just north of Grapeville Station.

The gauges were noted often, so as not to permit the pressure to rise much above 335 lbs.; and when this seemed likely to occur well R was shut sufficiently to reduce it again to 335. Formerly a weighted safety-valve, allowing a free blow, was used. Saturday evenings wells A, A^1 were closed, and only R used. "The gas in this field is not being wasted as formerly, or as greatly as it has been in the Murraysville field; and the prospects are that the Grapeville field will last the longer of the two."

"I understand that the flowing pressure in the Murraysville field is now [October 12, 1888] 250 lbs. The Grapeville wells have great volume. When one is blowing off in the air and then is shut quickly, the gauge runs up in fifteen or twenty seconds to 525 lbs. In some districts the wells require a minute, and even longer, to reach their normal of 500 lbs. The weaker or low-pressure wells require days to reach their normal pressure."

As it is impossible to store or tank gas, wells are now drilled to within a few feet of the gas horizon and "held" there. When the supply from other wells weakens, these wells are sunk into the gas rock, one after the other, to keep up the supply.

Wells that have broke through to the gas are restrained by a "packer," a thick, heavy rubber cylinder, 20 inches long, outside diameter $\frac{1}{2}$ inch less than bore of well, fastened at the ends to the pipe going into the well (see cuts). The end of this pipe fits into the end of another pipe, making a "slip joint;" rubber flush with the outer diameter of the pipe; lower joint generally perforated to admit the gas; pipe A lowered into the well (and, if necessary, pressed down) to slip into pipe B, bulging the rubber packer against the sides of the well, and effectually stopping the rise of the gas *outside* the pipes. It can then be controlled by a valve at the top of pipe A, at the well mouth. Before this invention the gas could be held only below a certain pressure, above which it would force its way between the pipe and the sides of the well and blow the whole casing into the air. The economy to a district of the new "packer" is evident.

"At present (October 12, 1888) there appears to be no weakening of the supply, except when unusual and sudden demands are made on the gas. If the supply weakens, or a greater supply is needed, more wells may be added to the line. This may require the laying of more pipe, or the replacing of the present 10-inch main by a larger one. The W. & C. Company own about 20,000 acres, controlling a large part of the gas field."

The companies and wells around Grapeville in 1888 were as follows:

Westmoreland and Cambria, 7 wells, drilled between 1885 and 1888, three of them piped to Johnstown.

Carnegie, 6 wells.

Southwest, 2 or more, piped to Connellsville, etc. (drilling also on Brush Creek).

Greensburg Fuel, 2 wells, piped to Greensburg.

Jeanette Glass Works, 2, piped one mile west to the works.

Philadelphia Co., drilling near New Salem.

Owners unknown, 8 or more wells.

The W. & C. Co. have also seven wells (about 1400′ deep), three miles northwest of Latrobe, on a northeast and southwest line 2½ miles long. The northern three have a 6 inch pipe to Latrobe. The other four have a 10 inch pipe running east by Derry Station, P. R. R., to Laurel Hill, where it feeds into the Grapeville-Johnstown main about ten miles from Johnstown. The flowing pressure of the wells supplying Johnstown is 200 to 275 lbs. per square inch. That of those supplying Latrobe, 90 lbs.

Trial wells east of this field have been unsuccessful, very little gas being found.

Salt water flowed from some of the Latrobe group of wells.

The first and most northern well, the Fowler, was drilled in 1885, the last and southernmost, Miller, No. 3, in 1887. Their volume of gas does not equal that of the Grapeville wells, and requires a much longer time to gauge up to the same normal of 500 lbs.

The proposition at first made to land owners, to pay $40 or $50 for a 50 lb. well, and $1.00 extra for each additional pound, was *not* generally accepted.

Pressures along the main at every four miles (taken in 1886 and 1887) show the *loss of pressure by friction* in a pipe of 10″, increasing to 12″, 16″ and 20″, thus:

For first 20 miles 3250′, *ten* inch pipe of $\frac{3}{8}$ in. wrought iron.
For next 12 miles, *twelve* inch pipe of $\frac{1}{4}$ inch " "
For next $7\frac{3}{4}$ miles, *sixteen* inch pipe of $\frac{5}{16}$ in. cast "
For last $1\frac{3}{4}$ miles, *twenty* inch pipe of (?) " "

In the first column of the following table H. S. means High side. At the 39th mile, the gauge is at "Reducer low side." C. W. means the Cambria Works at Johnstown.

Table of Pressures to Show Loss by Friction.

Distance from well.	Size. of pipe.	1886. ——	1886. Nov. 13.	1887. March.	1887. March 15.
0	10 in.	155 lbs.	200 lbs.	320 lbs.	333 lbs.
4	"	149	182	313	320
8	"	132	170	285	295
12	"	120	148	255	261
16	"	112	129	208	212
20	"	84	100	166	168
24	12 in.	75	85	132	130
28	"	63	70	95	95
32	16 in.	55	58	75	76
36	"	53	51	54	37
H.S.	"	52	50	53	36
39	"	20	—	25	25
C.W.	20 in.	20	—	25	25

Table of Wells and Ownerships, February 25, 1891.

Greensburg Fuel Gas Company	5	wells.
Southwest Natural Gas Company	9	"
Versailles Natural Gas Company	3	"
Youghiogheny Gas Company	3	"
Jeanette Glass Works	4	"
Manor and Irwin Gas Company	2	"
Westmoreland Specialty Company	1	"
Westmoreland and Cambria Natural Gas Company	13	"
Carnegie Brothers & Company	11	"
Philadelphia Natural Gas Company	23	"
National Tube Works	6	"
Total number reported by M. G. Moore	85	

The W. & C. Company's 13 wells are all piped to Johnstown. Their depths and pressures at various dates may be found on a following table. The deeper are on the hilltops. They all get their gas in the Gants sand rock of Washington county. Well No. 12 was deepened with the design to reach a lower gas sand horizon; but the rope was cut by the sharp sand driven up by the gas issuing from the Gants sand. Before the tools could get through it they were lost, and fishing tools also afterwards; so the well was abandoned, and No. 13 (Agnew well) was drilled a short distance south of No. 12.

This new Agnew well reached the Gants sand January 15, 1891, went through it, and was cased with 8-inch pipe; packed just above the top of the sand; supplied with another inner 6-inch pipe; packed again at the bottom of the sand; and the Gants sand gas between the pipes laid into the Johnstown main.

Drilling was resumed through the 6-inch pipe, and stopped, February 21, 1891, at 2700 feet. The "Gordon sand" was found at 175 feet beneath the Gants sand, was 35 feet thick, and gave gas at only 30 lbs. pressure, which, however, in twenty minutes rose to 175 lbs., "when it was necessary to discontinue the test;" why is not explained. "While the *pressure* in the Gordon is now (February 25) very much greater than in the Gants, the *volume* is much *less*, as is clearly shown by comparing the *minute pressures;* that of the Gants being 65, and of the Gordon only 30 lbs." [A diagram of the pipe and packing arrangement for passing through the Gants sand, and drawing off its gas to Johnstown, is appended to Mr. Moore's report.]

Below the Gordon sand, for 1070 feet to the bottom of the well, not a sign of gas or gas rock was observable. [This only bears out all Mr. J. F. Carll's observations, published in his reports on the oil regions, especially his Seventh Report, I 5, just published by the Geological Survey of Pennsylvania.] The failure of the Agnew well to get a good supply from the Gordon sand does not necessarily condemn it over the whole Grape-

ville field, as it may be found in better condition in the central and northern parts of the field. Carnegie Bros. have begun drilling two or three wells to test the Gordon sand a little north of the centre of the Gants field, a mile from No. 10 (Sylvis well).

None of the Latrobe wells are piped to Johnstown.

Grapeville.—Table of Minute Pressures at Various Dates.

No.	Name.	Depth.	Struck Gas.	At First.	Apr. 29, 1889.	Dec. 15, 1889.	May 26, 1890.	Nov. 3, 1890.	Dec. 1, 1890.	Jan. 5, 1891.	Feb. 2, 1891.
1	Klingensmith	1100′	Feb. 13, '86	460	390	250	180	100	95	75	65
2	Henry.....	1133′	June, 1886	"	380	260	170	105	100	"	70
3	Moore.....	1149′	" "	"	390	"	175	100	95	"	65
4	Welker.....	1144′	Oct., "	"	380	"	170	105	100		
5	Brown	1224′	May, 1887	"	390	"	180	100	95	75	65
6	Ferree.....	1312′	Aug., "	"	380	240	170	"	100	"	70
7	Minsinger ...	1466′	Nov. 21, "	410	390	"	"	95	85	55	40
8	Shutts	1468′	Feb. 13, '89	380	"	250	165	100	"	70	60
9	Kipple	1360′	Nov. 30, '89	260		260	"	"	95	75	65
10	Sylvis	1357′	Jan. 13, '90	235			170	105	100	"	75
11	Truxel	1267′	Feb. 20, '90	225			180	100	95	"	"
12	Byers	1350′	Oct., 1890	125							60
13	Agnew.....	1420′	Jan., 1891	75						65	65

The steady decline in minute pressure from 386 lbs. on April 20, 1889, to 65 lbs. on February 2, 1891, predicts a speedy extinction of the use of natural gas at the Cambria Works.

Calculating the average *rate per day of the observed decrease* we find it to be as follows:

From April 29, 1889,	646 days,	321 lbs.	2 lbs.	per day.
From Dec. 16, 1889,	413 "	188 "	2.200	"
From May 26, 1890,	252 "	107 "	2.355	"
From Nov. 3, 1890,	91 "	36 "	2.525	"
From Dec. 1, 1890,	63 "	30 "	2.100	"
From Jan. 5, 1891,	28 "	7 "	4 lbs.	"

I take this opportunity to suggest that we have in the decline of gas pressure in all wells of all gas regions the most cogent of arguments against the theory that *gas pressure* is produced by the *hydrostatic pressure* of the locality. For, it is self-evident that the hydrostatic pressure must remain always the same, and therefore cannot be the *vis a tergo* of a variable oil or gas pressure; otherwise this last should also remain constant to the last drop of oil and the last cubic foot of gas coming from the well. The gradual decline of gas pressure in every well and all wells is proof positive that it represents the gradual exhaustion of an *inherent force of self-expansion* not dependent upon any *hydraulic vis a tergo*.

Notes on Hebrew Etymologies from the Egyptian ANX. Enoch; Anoki; Enos. *By J. P. Lesley.*

(*Read before the American Philosophical Society, March 6, 1891.*)

Forty years ago, in my Lowell lectures on the "Origin of Man," I gave my views of the Arkite symbolism embodied in the crux ansata, or ANX symbol of life. They were not accepted; but I still regard that line of investigation as one entirely germane to modern scientific research, and capable of bearing good fruit, although my application of it to the crux ansata is much less probable than I then thought it; for the latest archæological results are rather in favor of regarding that symbol as a rude drawing of the human figure.

My present purpose is to direct attention to the influence which the universal use of this symbol in all ages of ancient Egyptian history must have exercised over the philology of surrounding races. Its name, ANX, the living, the alive, life, etc., was certainly the most sacred word in the Egyptian language; in general and constant use in their religious literature; on the lips of all their thinkers, and, in fact, of all classes of the population of the valley of the Nile, in all generations; and was embodied as an element in the personal names of pharaohs, nobles, priests, and common people; the evidence of which pervades the monuments and papyri. Every royal cartouche had the *anχ* scrupulously written after it, usually with the *tat*, to mean *the ever-living, the immortal.* *Pa anχ* is an instance of the designation of a pharaoh (Pierret). The use of the *anχ inside* the cartouche was later; for example, in the Ethiopian kingdom, and by Psammeticus II and III. The granddaughter of Pianchi II was named *Anχ-shap-n-ap;* the daughter of Takelot II, *Anχ-karama-t;* a princess of the family of Psammeticus II, *Anχ-ra-nefer-het.* Two places or cities in Egypt are known called *Xafra-anχ* and *Aseska-anχ*, evidently dedicated to the memory of the Kas, or spirits, of those monarchs, one of whom built the second great pyramid of Gizeh. A quarter of the oldest capital of Egypt, Memphis, was known as *Anχ-taui,* the life (or heart) of the two lands, Upper and Lower Egypt.

The word was popularly used, like our word "viands," for food of any kind that supports life. *Anχ-am* was the name of a tree, used as we use the word "live-oak;" and Lepsius quotes a curious sentence of great interest to Hebrew scholars: "Ra, the sun, who makes the tree of life (*am n-anχ*) green, producing things which issue from it," suggesting the "tree of life" (עֵץ הַחַיִּים, more properly *the tree of living things*) of the garden of Eden.

The Egyptians seem to have used *anχu,* also, as the general plural name for all flowers, the plainly living parts of plants.

The Egyptians called a mirror *anχ*, because it represented the living object presented to it. They called the two eyes *anχ ti,* because the life of an animal is best seen in his eyes. But they gave, curiously enough,

the same name to the two ears, and only distinguished the terms apart in writing, by drawing the ideograph of eyes in the one case and of ears in the other. The pharaohs had two high officials, one called "his eyes in the south," and the other called "his ears in the north."

But *anχ* not only meant to live, to be alive, but had another derivative meaning, with a very remarkable application to the story of Enoch, viz., *to lift oneself*, *to rise up* and stand, *resurrection* and *ascension*. This meaning it retains in modern Coptic, as ONK, *extulit*, *assurexit*. An inscription at Edfu uses it for "the sun rising in the east." At Denderah is a picture of a sacred boat, in which stands a lotus flower, from which a snake is rising into the air, with the legend: "The snake ascends (*anχ*) from the lotus of the ship." On the sarcophagus of Besmut, at Luxor, is read, *anχ-f*, etc.: "He ascends like the ten stars." Another inscription reads: "The stars ascend (*anχu*) in heaven." And at Esne: "The stars ascend (*anχu*) to do their duty in the night." At Abydos, an inscription to King Seti I, of the nineteenth dynasty (before the date of the Exodus), addresses him thus: "Thou goest up (*χa-k*) above the earth like the bark of Orion in its season; thou arisest (*anχ-ta*) like the Star Sothis" (see Brugsch's Dict., pp. 198, 199).

The Hebrew tradition that the Hebrews came out of Egypt agrees with the fact that Moses, Aaron, Hur (named together, Exod. xvii, 10), Miriam, Achsaph (Caleb's daughter), Manassah (Joseph's son), and other early legendary personal names, are purely Egyptian. The intercourse of the two peoples was always intimate. The kings Asa, Amon and Manasseh had Egyptian names. Before the exile, the Hebrew colonies in the Delta were important. The Book of Genesis was not necessarily compiled at Jerusalem. The story of Joseph and Potipher's wife was based on the D'Orbigny papyrus. Adam and Seth seem to be the names of the two chief Delta deities Atum and Set. Noah and his wife seem to represent the Egyptian divine duad Nun and Nunt. There is nothing startling, therefore, in finding the *anχ* in the name Enoch, whose legend forms an episode in the antediluvian list.

The occupation of Southern Syria by the Egyptians dates back to the most remote times. The cartouche of Snefru, first king of the fourth dynasty, builder of one of the great pyramids, is cut on the rocks of the Sinaitic peninsula, at the turquoise and copper mines. The Hebrew legend of the *Anakim* of the Hebron country gives Anak three sons with Egyptian names, Ahiman, Sesai, Tolmai, fathers of the three tribes of the Anakim. Whether there was any philological connection or not, the compilers of Exodus seem to have seen the *anχ* in the name *Anak*, and described therefore the people as a giant race, analogous to the ghostly or demoniac Rephidim.

Remembering the large Greek element in the Delta far back in the centuries before Christ, and the Greek tradition that as Cadmus came from Phœnicia and settled Bœotia, so Cecrops came from Sais in Egypt and settled Attica, bringing with him the goddess Neith (Pallas Athéné), we

might confidently expect many Egyptian words and names in Greece. Of these I will only allude to *Inachos* (*anch*), son of Oceanus and Tethys, who founded the Kingdom of Argos; and the sacred rivers *Inachos*, one in Argolis, the other flowing from Mount Pindus.

But to return to proper names in Hebrew; perhaps the most interesting of them all, in an etymological way, is that of *Enos*, the legendary grandson of Adam, in the second account of the creation in the fifth chapter of Genesis, the chapter which contains the name of Enoch. The word Enos is written, whether rightly or wrongly, אנוש, and pointed so as to be pronounced ănosh. The same word, written and pointed in the same way, occurs in the 55th Psalm and Job v, 17, with the meaning *a man*, but usually appears in the Hebrew books with a collective meaning as *mankind*. It occurs in *Son of Man*, Ps. cxliv, 3. Isaiah viii, 1 is directed to write with a *man's stylus*, that is, in the vulgar or common or demotic scrip, so that everybody could comprehend. Like Adam (man) it had no plural. But in later days, as when the Book of Daniel was written, the third letter had been dropped and the word became *ansh*, or emphatically *anshá*, meaning *man, mankind, man as man;* and this gave the common plural *anshim*, *men*. It repeatedly occurs in this book in the phrase "Son of man." A still further contraction of it gave the popular form AIS*h*, איש, *man*, with its feminine *aishé*, *woman* (as the Greek ἑνς, *one*, was contracted into ἑις, with a closer connection between the two languages than Gesenius here suspected).

In the pronunciation of words we must keep in mind that until the age of printing spelling has always been optional, and pronunciation local. Words passed from ear to ear, not from eye to eye. The same word was pronounced gutturally or dentally or lingually by different races and individuals, and written accordingly. Words were clipped, and written accordingly. Every Egyptian, Hebrew or Greek scholar knows this. Whether the *Anch* was spelled with an aleph, heth or áyen, it remained the same word. In one part of Egypt it was pronounced *anχ*, in another part *ansh;* just as the East Germans say *ich*, the North Germans *ik*, and the West Germans *ish*, for the English *I*, which the Greeks and Romans pronounced *eg-o*, the Hebrews *anoki*, the old Egyptians *nuk*, and the Copts *anuk*. By reference to Admiral McCauley's Dictionary, published in our Transactions in 1882, you will see at the top of the first column, on page 22, "*Anχ*, life;" followed by "*Ansh*, to exist, to subsist." Other proofs it is unnecessary to adduce to show the practical identity of the Egyptian *Anχ, life*, and the Hebrew *Anosh, Ish, man, Enos*.

As to the genetic connection of *Anχ* and the Hebrew *Anoki, I*, the first personal pronoun, I would approach the subject with all possible caution. It is a fact that the pronoun was written *Ani*, without the *k*, especially in what Gesenius calls the "silver age of the Hebrew," Eccles. ii, 1. 11, 12, 15. 18, 20; iii, 17; iv, 1, 2, 4, 7; vii, 25. In Gen. xv, 7, and xxiv, 24, it stands alone (including the substantive verb) for *I am*. Schwartze, in his "Coptic Grammar," pp. 340, etc., seems to quite settle the fact that the final

guttural was not a characteristic element of the first personal pronoun. And yet Gesenius seems to feel no hesitation in saying that the Hebrew *Anoki* (ANKI) "is the *primary* and fuller form of *Ani*," being more frequent in the Pentateuch (but in general more rare) than the shorter form *Ani;* and in some of the later books, as the Chronicles and Ecclesiastes, wholly disappearing, just as the guttural of the Saxon has been lost in modern English, and that of the Franks in modern French. He notices that the form *Anoki* occurs on the Phœnician monuments and in the Chinese NGO. The Sanskrit used only the guttural *aha*, like the Greek, Latin, German, etc., while the Aramaic, Arabic, Abyssinian have lost it, and use the shorter nasal form of the pronoun. It seems hardly possible, therefore, to avoid the conclusion that ANK was the primitive form of the first personal pronoun, and that it stood in genetic relationship to the Egyptian symbol of life, the *anχ*. Whether the symbol was constructed from the ideograph for *I* (a man with his arm bent pointing to his mouth) or not, I leave to the judgment of others.

But Gesenius remarks somewhere that *Anoki* is used in some Hebrew passages as an emphatic *I myself*. This would point to the constitution of the pronoun as a dissyllable, with a final KA, the well-known hieroglyph for the dead man's *spirit*.

I should like to draw attention to the identity of *ani*, the pronoun, and *ani*, the Hebrew (and generally Shemitic) word for *vessel*, not only a vase, urn, bucket, etc., for holding water especially, but also a *ship*. The human frame was called a *vessel* (of wrath or righteousness, of mercy, etc., etc.), and may easily have been originally regarded as the *vessel of life* par excellence. Were this idea feasible, it might return us to my former arkite (ship-mountain-water) interpretation of the *crux ansata*.

On an Important Boring Through 2000 Feet of Trias, in Eastern Pennsylvania. By J. P. Lesley.

(*Read before the American Philosophical Society, April 3, 1891.*)

The Eastern Oil Company's trial bore-hole on the Stern farm at Revere (Rufe's Corner), Bucks county, Pa., is 18 miles south of Easton, 16 miles north of Doylestown, 7 miles west of Riegelsville, 5 miles from Kintnersville, 8 miles from Munroe, 10 miles from Durham furnace, 1½ miles from Bucksville, 2½ miles from Ottsville, 4 miles from Ervina, and about 2 miles east of Haycock trap hill.

The following record was written from dictation of Mr. E. C. Rosenzi, 3414 Smedley street, Tioga, Philadelphia, February 25, 1891, Superintendent of the Company.

This is the first deep boring in the Mesozoic belt of Pennsylvania,

known to me. Had my advice been asked I should have dissuaded from a costly attempt to find oil or gas in this formation. The record of the boring, however, is valuable to the geological student as the hole descends through 2076 feet of nearly horizontal strata of gray and brown mostly soft sandstone and shale, with some dark ("black") slate, one stratum of which (called "anthracite coal") produced an excitement in the district, and was extensively published by the newspapers.

It is almost needless to say that a bed of *anthracite* coal in undisturbed strata of Mesozoic age, and at a distance from trap, would be an incredible occurrence. The trap of the Richmond, Va., field only turns the bituminous coal bed to coke.

It is also hardly necessary to explain that a "*nine-foot bed* of anthracite coal" anywhere in the brownstone belt of Bucks and Montgomery counties could hardly conceal itself underground. All the strata crop out to the surface; and such a stratum could not well escape exposure. Even smaller lenticular bituminous coal seams like those on Deep and Dan rivers in North Carolina, ranging in thickness from four feet down to one foot, show somewhere at their outcrops. Even if the well record at this point of it were clearer than it is, the fact of the existence of any considerable coal bed (especially an anthracite bed) would have to be carefully verified, either by several additional trial holes, or by a shaft, before being believed by any geologist versed in the characteristic features of this formation.

Riegelsville is 166′ above tide, and the Revere well mouth is supposed to be about 200 A. T. Its record is as follows:

8′	Alluvion.....From the surface down to	8′
102	Sandstone, brown.....Down to	118
15	Shale, red.....	133
5	Shale, bluish, soft	138
10	Shale, blue, hard	148
56	Sandstone, dark brown; *with coaly specks*.....	204
7	Sandstone, brown, very fine grained	211
2	"*Black slate,*" soft.....	213
4	Shale, blue, hard	217
223	Sandstone, red, very hard	440
	Slate, purplish, very gritty, here.	
4	Sandstone, brown, fine grained.....	444
31	Sandstone, gray, very micaceous	475
10	Sandstone, gray, hard rock.....	485
100	Sandstone, reddish brown	585
5	Sandstone and shale, gray	590
5	"*Black slate,*" soft.....	595
32	Shale, reddish blue, very hard	627
44	Sandstone, reddish brown	671
21	Sandstone, brown, and blue shale, coarse and fine....	692

53	Sandstone, brown, coarse and fine	745
55	Shale, brown	800
77	Sandstone, bluish red, hard; with white clay veins	877
63	Sandstone, brown, fine grained	940
40	Shale, brown, soft. "*Show of petroleum*"	980
30	Sandstone, brown, hard. "*Show of petroleum*"	1010
15	Shale, *grayish black*	1025
	Shale, blue, here.	
55	Sandstone, red-brown, hard	1080
70	Sandstone, red-brown, hard	1150
	Here cased off the fresh surface water.	
5	*No record of this interval*	1155
31	Shale, pink	1186
64	Shale, pink	1250
10	"*Black slate, hard*"	1260
90	Sandstone, red, "like the mass at 1150"	1350
40	"*Black slate, hard*"	1390
	Here, gray sandstone.	
16	Sandstone, gray, hard; with very minute white pebbles as large as pins' heads	1406
3	"*Sand perfectly black and gritty;* boring easy"	1409
31	Shale, light gray, gritty	1440
7	Shale, reddish	
6	Shale, dark blue	
42	Shale, light gray	
12	Shale, reddish, hard and gritty	1506
39	Shale, reddish	1545
15	Sandstone, bluish gray, fine grained rock	1560
9	"COAL, ANTHRACITE"	1569

Here, in answer to my verbal objections to the notes in his well book, Mr. Rosenzi explained that the thickness might be incorrect, owing to the churning of the tools, but that it was in his opinion "certainly 5½ feet;" and that the "coal" came up in fine specks (no larger than the head of a pin) like all the other crushed and ground-up sand pumpings from the well, from top to bottom. No larger pieces were obtained; and no analyses were made. The well was worked in brackish water, which afterwards became salt water. *See below at 1616*, where salt was first noticed on the board walls of the derrick.

10′	"*Black slate rock, very hard*"	1579′
25	Sandstone, gray, fine, softer	1604
6	Sandstone, brown, hard rock	1610
6	Sandstone, gray, fine, softer	1616
	Here cased off the "salt water."	
8	Sandstone, first dark, then light gray	1624
	"Here salt water again and plenty of it."	

I could get no clear idea of this from Mr. Rosenzi's description. He first noticed the salt as a deposit from water splashed on the derrick. The salt taste was decided. He could say nothing about the flow, as the well was always full of water, but I could not learn that any stream issued from the mouth of the well.

16′	"*Black slate*, coarse, mixed with minute specks of COAL, and minute light gray pebbles	1640′
9	Sandstone, coffee-colored	1649
5	Sandstone, brown, very fine	1654
9	Sandstone, brown, very fine	1663
21	Sandstone, brown, very fine	1684
5	Sandstone, brown, dark	1689
10	Sandstone, gray, dark, hard	1699
5	Sandstone, gray, light, sharp	1704
17	Sandstone, brownish red, of usual character	1721
15	"*Black slate*"	1736

"*Cased well against salt water in black slate, at 1736.*"

"The driller remarks that here came in genuine soft black slate, which he recognized as the overlayer of the Oil Sand in Allegheny county, in the Wild Wood district where he worked." Nothing could more forcibly illustrate the ignorance of the well drillers as a class than this astounding statement; which is only exceeded by the ignorance of oil and gas speculators as a class, and the stockholders of the companies which they form, in giving ready credence to such statements from men whose only interest is that of obtaining their daily pay for boring wells.

2′	Sandstone, gray, fine, like 1604	1738′
14	Sandstone, brown, fine, hard	1752
28	Sandstone, brown, coarser	1780
	Cased off salt water successfully at 1782.	
5	Sandstone, brown, fine	1785
5	Shale, gray, hard	1790
30	Shale, grayish black	1820
9	Shale, light gray, bluish, hard	1829
3	"Blue Monday," (a term used by the drillers in Western Pennsylvania)	1832
26	Sandstone, bluish gray	1858
2	Shale, gray, hard	1860
10	Shale, brown, soft	1870
8	Sandstone, gray, sharp	1878
82	Sandstone, brown (or red), hard	1960
35	Shale, pink (or red), soft	1995
89	Sandstone, brown, coarse (February 21, 1891)	2084

I suppose that the boring is to be carried on to greater depth.

Mr. Benjamin Smith Lyman, Assistant on the Geological Survey of the State, whose Report on the Trias Brown Sandstone Belt of Bucks, Montgomery and Chester counties, Pa., is not yet quite ready for publication, informs me that the place assigned to *coal* in the above well record would come about 11,000′ below the top, or 10,000′ above the bottom of his general section of the formation ; the coal-bearing shales of Phœnixville being say 3500′ or 4000′ above the conglomerate base.

His long and exhaustive survey of the district has resulted in giving a combined thickness of more than 21,000 feet to these Mesozoic strata ; in a demonstration of the duplication of its measures along the Delaware river ; and in the discovery of both longitudinal and transverse anticlinal and synclinal flexures of considerable size. The latter system of folds is a very remarkable phenomenon, seeing that the folds lie with their northern ends abutting against (or riding over) the Durham hills, that range of Azoic highlands which extends from Reading into Northern New Jersey.

Mr. B. S. Lyman said :

Although the precise position of the Revere, or Rufe's Corner, well-boring has not been indicated within several hundred feet, it appears that the so-called coal bed is part of a 600 or 800 feet thick series of generally hard green and dark-red shales at something like 11,000 feet below the top of the Mesozoic rocks, mainly red shales, of Bucks and Montgomery counties, and 10,000 feet above the bottom of them, and 6000 feet above the hard blackish shales of the Phœnixville tunnel.

With a sketch he showed the course of the outcrop, a mile or so in width, of the green and dark-red shales, including the so-called coal bed and one or two other blackish shale layers, with generally a gentle northwesterly dip, from the Delaware river near Milford, N. J., along the east, south and west sides of a basin to Rufe's Corner ; thence northwestward, westward and southeastward, round Stony Point and Bucksville, in saddle form, east of the Haycock mountain, nearly to Ottsville ; then in almost a straight line southwestward for a dozen miles, past Perkasie and Sellersville ; and five or six miles further southwest, though bending slightly northward at Tylersport upon the southeastern disappearing end of a rock saddle ; but near Sumneytown bending sharply round a more important saddle so as to reach Harleysville, half a dozen miles to the southeast ; and there with a like decided bend in the opposite direction, but with a wider sweep, turning southwest and then nearly west, passing a little more than a mile south of Shwenksville, and so in a straight course to the Schuylkill, between Linfield and Sanatoga and some three miles below Pottstown.

The course of these comparatively hard beds is marked nearly everywhere by a decided ridge, particularly well defined between Ottsville and Sumneytown, and tunneled through at Perkasie. As the beds are partly green, their course is also indicated by the yellowish or greenish gray

color of the surface of the ground contrasted with the red on either side from the several thousand feet of red shales above and below, except where trap replaces them above for a long distance from the Haycock southwestward. The geological structure is also well shown by very numerous observed dips and strikes.

Here and there among the harder beds, exposures have been observed of a couple of blackish shale layers some three feet thick, perhaps identical with those of the boring. One was seen by the roadside near Rufe's Corner; two in a ravine a mile and a half north of Ottsville, where some digging was done half a dozen years ago in a vain search for coal of any economical value, though small traces of it appear to have been found; another exposure of blackish shales was seen half a mile west of Perkasie; and still another about a mile east of Harleysville.

It is, of course, extremely improbable that the beds with a known outcrop of about sixty miles in length, cut across by numerous streams and roads and by several railroads and even in great part by a tunnel, and familiar throughout every foot of its surface to the highly observant inhabitants of the country, could have a coal bed of any value that should never, until this well, have been discovered through any complete natural exposure or through an occasional very noticeable outcropping or blossom. Indeed, facts observable on the surface, such as measured rock exposures, combined with proper regard to their dips, strikes and relative position and elevation, could no doubt give a very complete section of all the beds pierced by the well; and perhaps that will prove to be possible even with the somewhat rough collection of materials already made. From such observations on the surface, the character and thickness of each bed is to be known far more precisely and thoroughly than could be possible from any boring however careful, and beyond all comparison with the results of an ordinary one. The difficulty of accurate information from such wells is shown by the doubt in the present case whether the so-called coal bed was nine feet in thickness or five and a half.

The well record, in spite of all the imperfections that must be expected, has value as giving for a great thickness of rock beds a connected view that may serve in some degree as a check upon the not very essential errors that might arise in combining surface observations, especially those rough ones hitherto obtained. But the chief importance of the record is perhaps as an illustration of how ready men are to lay out thousands of dollars for such explorations where the same number of hundreds would by a surface survey give fuller and more accurate information.

Possible Sterilization of City Water.

By R. Meade Bache.

(*Read before the American Philosophical Society, April 17, 1891.*)

It is an open question whether the characteristic acidity of the digestive fluids is or is not efficacious in destroying pathogenic germs entering the stomach. But it ought to be evident on both sides that neither extreme can represent the truth, even if the digestive fluids possess that general property. It is certainly, on one side, too much to assume that, not even in a perfectly healthy stomach, are those fluids sometimes capable of eliminating such germs from the system, and, on the other, that they are always, in sickness or in health, capable of performing that task. So little vitalized are micro-organisms in their resting-stages, that it is easily conceivable that, when masked by food and water, and when the human system is in a weak condition, many escape the possibly destructive action of the healthiest digestive secretions.

It would, additionally, be an unwarrantable assumption, even if the healthy stomach were proved to be able always to neutralize the morbific action of pathogenic germs, that they find their inevitable path and exit, with or without vitality impaired or destroyed, dead or alive, through the alimentary canal; for in point of fact we know that one kind, at least partially, takes its disastrous course directly into the lungs. When the infinitesimal size of micro-organisms is considered, and when also is considered how varied is the character of the parts with which they must come into contact upon passing the œsophagus, it will readily be perceived that, even if they escape the sometimes assumed destructiveness of the digestive fluids, they must often be absorbed into the blood by other tissues as well as by those of the lungs.

If so believing, we should perceive at the same time that it is hopeless to contend, except by palliative sanitary measures, against the invasion of pathogenic germs through inhalation; but that, on the other hand, especially as our food cannot be sterilized wholesale, we should deeply consider the possibility of contending with them by means of the wholesale sterilization of water, which enters alone, or as the largest constituent, into our

drink. That this has heretofore not been attempted is all the more remarkable, because it is believed by many persons that some of the worst forms of pathogenic germs reach us through the medium of drinking water. Inasmuch, therefore, as success in sterilizing the drinking water of a large city might be of untold benefit to it, it would be well that certain experiments were tried to that intent, upon the assumption that, be the pathogenic germs in a particular water many or few, they become, when received into the alimentary canal, whether or not large numbers of them are successfully dealt with by the stomach, injurious to the human economy.

Inherent in the Anderson iron process for the purification of water is a danger which, therefore, cannot be eliminated. In all processes there is a danger line which human foresight seeks to avoid by a safety-margin, which, in the long run, and in the nature of things, is a substantial guarantee against harm. But there are processes such, from their character, combined with the chapter of exigencies and the chapter of accidents, that they have but a small margin of safety. I place the Anderson process in this category, as an experience at Berlin, showing the danger that may result from the overworking and freezing, or both, of open filter beds, even if so acted upon and cleansed as they are intended to be by the Anderson process, fully warrants me in doing. Moreover, it should be incidentally mentioned that the process is not applicable to the constitution of all waters, or adapted to climates that have always, or are liable to, severe winter cold. It is said, however, upon excellent authority, based upon the indisputable evidence of microscopic examination, that by the process micro-organisms have, under the limiting conditions hereby implied, been neutralized in the proportion of 50,000 to about 20, virtually in the proportion of 50,000 to 0. But, coincidently with this result, which must obtain under favoring circumstances, there also always exists danger in the process through carelessness and neglect in filter cleansing, and necessity without law of overworking the capacity of a filter. As a finality in the process the ferric hydrate generated, blended with organic matter, is precipitated in a flaky, coagulated condition to the bottom of the water, the sand filter-bed of the settling reservoir, where, resting chiefly on the surface, the filter is therefore more readily than usual cleansed. The process therefore

makes no pretense to destroy the micro-organisms, but merely to neutralize as much as possible their injurious action in the human economy, simply by entrapping them. What I contend, however, is that the best process of sterilization is that which does not seek to entrap micro-organisms, with the inseparable danger of their partial or almost entire escape alive, but that which, with abstention from their purposive arrest, kills, and allows them as free passage as possible to the stomachs of city dwellers. It will probably be thought at this point, with a very usual misconception, as that which we have in the Anderson process has proved quite efficacious, whereas that of which I speak is but an ideal, perhaps impossible of attainment, that I am proposing to accept a shadow for the substance of a thing. I would grant the cogency of the thought, had I ever intended to make denial of the excellence of the Anderson process, and proposed to offer a possibility in exchange for a reality. But, having taken neither of these positions, I do but state the case in the abstract, and the truth of it in that form being admitted (and I do not see how it can be denied), I have but to add before proceeding that, excellent as is the Anderson process, within its acknowledged lines, it would still be well to consider if the ideal one is not capable of accomplishment by the means which I am about to suggest.

About two years ago it occurred to me that before experimenting with bacteria, with reference to killing bacilli established in the human body, and with reference to the sterilization of city drinking water by electricity, I would pass a current through some water containing protozoa, and observe how much is required to kill them. With this purpose in view I took a glass tube of four inches in length and five thirty-seconds of an inch in calibre, and partially filled it with water teeming with protozoa from hay-infusion, which had previously been examined by me under the high power of a one-tenth microscopical objective, commanding a large field with an immersion lens, and depending upon which of two eyepieces was used, magnifying from five hundred and fifty to six hundred and fifty diameters. When both ends of the tube had been plugged up with brass eye-screws wrapped with paper, leaving their ends exposed in the tube, the volume of infusion intervening between the ends of the poles thus formed was only two-thirds of a cubic centimeter, and the

distance between the poles only three inches. The electro-motive force at my disposal in my galvanic battery—only about thirty volts—was too small, and the resistance too high under these conditions for me long to hope to affect the protozoa in the tube by means of the current. The smallness of the volume of fluid in which the electricity could find play, and the liberation of hydrogen which could not escape or recombine, were together the cause of this ; the resistance from the latter cause proceeding by great leaps when a higher current was eventually employed. With the infusion the resistance was far less than with pure water, but still far too great to allow of much current, owing in sum to the small volume of liquid and to the increased liberation of gas in it as compared with that liberated in water. The current was so slight that at this point of time I was satisfied that if I were not able thus to destroy the vitality of the protozoa—and that was proved by microscopical examination—*a fortiori* it was not to be imagined that the vitality of schizomycetes in water could be arrested, because I had assumed that they would be more difficult than the other organisms to destroy, a conclusion which I do not now think warranted by my final investigation upon the basis of experiment. I therefore desisted from experimenting, and did not resume it until the work of Dr. Griffiths on micro-organisms came under my eye, from which I learned that he had killed bacteria with a very small current in media of a fluid character. I then resumed my experiments upon the basis of my previously enlarged experience, that a considerable volume of water is needed for the play of electricity, and that even a slowly increasing bubble of hydrogen in a closed tube, although far from effecting embolism, nevertheless produces rapidly cumulative resistance. Every one who deals with batteries or who is well-read in electricity knows in a general way of these phenomena ; I am merely referring to the exaggerated degree in which they manifest themselves under the specified conditions. I was well aware that for a given ampèrage, a given electro-motive force, a given character of liquid, a given temperature, and a given distance between poles, the resistance to a line of force of electricity is an absolutely fixed quantity. But as my final object, as will eventually be seen, was to charge a large volume of water so that upon being charged the electricity would concentrate with intense energy towards the opposite pole, it became

necessary, even in laboratory experiments, to avoid action where the phenomena appear in an exaggerated adverse form. I therefore next proceeded to deal with small but unconfined volumes of liquid.

With the Wheatstone Bridge, with an electro-motive force of one hundred and ten volts, and one ampère of current, I found the resistance at two inches between the poles, placed vertically in a hay-infusion, in a round glass dish about five inches in diameter, to be 1560 ohms. Making the liquid a little shallower, the other conditions remaining the same, the resistance rose to 2120 ohms. In a very narrow, rectangular receptacle, the other conditions remaining virtually the same, the resistance rose to 3000 ohms. The poles being then placed in water, not in the infusion, in the round glass dish, the other conditions being the same as those in the first experiment, the resistance became 18,400. Slightly increasing the depth of water in the dish, the resistance sank to 13,000 ohms. These rude experiments were followed by a series conducted with two beautifully finished wooden, shellaced boxes, of exactly the same length and depth in the clear, but one of them of only half the width in the clear of the other. Thus was obtained with precision in the larger of the two (but, of course, the same consequence would have ensued with the smaller), by alternately making it exactly one-half full, and then full to the brim, the result that the volume thereby vertically obtained reduces by one-half the resistance of the lesser volume. Thus, also, by filling both boxes to the brim was obtained with precision the result that double the volume of liquid horizontally obtained reduces by one-half the resistance of the lesser volume. Therefore it was demonstrated that resistance in water, as well as in metal, is inversely proportional to volume as determining cross-sectional area, whether increased by vertical or horizontal extension; that is, is inversely proportional to cross-section, as dependent upon volume; and that in whichever of these two directions volume is gained, it introduces, proportionally, freedom of propagation of the electric force in and about the imaginary right-line joining the poles.

The result of a series of experiments, with the poles placed apart at 2, 4, 6, 8, up to 12 inches, showed that the resistance, whatever it may be, varies *directly* as the distance between the poles, a result identical with that in electrically charged wire,

illustrating a law which should have been expected to hold good whatever figure and volume the lines of force between the poles might assume and occupy. The experiments clearly proved, too, that the resistance of water is very much greater than that of an infusion not seemingly dense.

There seems to be with some persons a belief that water is a good conductor, because current electricity so readily discharges itself by means of moistened surfaces. But current electricity so discharges itself through a film of water covering non-conducting surfaces in default of any other conductor whatever; and static electricity, for the same reason, readily vanishes through aqueous vapor, because of the fact that the vapor impairs the resistance of dry air as a dielectric. Yet electricity, in these two manifestations, acts thus, of course, not from choice but from necessity, taking, however imperfect, a path of conduction when there is no other, and the better of two paths when they differ, in proportion to their relative conductivity. Other persons imagine that water is a worse conductor than it really is. Any one who uses a hydro-rheostat well knows the highly resistant property of water to the electric current; but as free and in large volume it is not practically so resistant as it is sometimes thought to be, as any one may prove for himself by the rude experiment of plunging in an ample basin of water the sponge of one reophore of a medical galvanic battery, yielding from thirty to forty volts, while the sponge of the other reophore is placed on the back of the hand submerged in the water at the distance of four or five inches. The hand, the most callous part of the body except the heel, feels the current distinctly in every part, and if it has but the smallest abrasions of the skin in places remote from each other, the electric current makes them sting, finally condensing strongly at the pole on the hand.

After trying the experiments described, I flashed one hundred and ten volts through a glass tube, with half of a cubic centimeter of hay-infusion containing protozoa, with the poles half an inch apart; and also flashed one hundred and ten volts through a looped wire going from top to bottom of a small bottle containing four centimeters of the infusion. In neither case could subsequent microscopical examination detect that the organisms had been affected in the least. The whole of the current, of course, passed through the organisms in the tube. In the case

of those treated with the looped wire it was only the residual force, which the wire did not carry, that they encountered. That under these conditions the wire does not carry all the electricity is shown in the forthcoming description of experiments, in which the work of killing bacteria was successfully accomplished with looped wire passing through fluid media, and carrying only a very small force, but for a considerable time. With so much electro-motive force as I used—one hundred and ten volts—I could not allow the discharge through the micro-organisms to be more than momentary, else they would have been destroyed for certain by the concentrated products of electrolysis.

Two main conclusions seemed to me from the beginning of my experiments to be justifiable. The first of these was that, inasmuch as protozoa have no nervous system, and do not seem to be injuriously affectible by the electric current (barring its action under conditions such as generate heat almost exclusively), we are accustomed to think erroneously of the current as capable of affecting and endangering all sensation and life, solely because of our own possession, and knowledge of the possession among other animals, of a nervous organization upon which stress may be put by the current. It seemed to me that the last experiment proves what is currently believed, that an animal protoplasmic organism has, *ipso facto* of its being protoplasmic, no nervous system. The second conclusion at which I arrived was that, if protozoa of the kind with which I had dealt are not easily killed by the electric current, it would be hopeless to think of destroying schizomycetes, except by a force which, for the practical purposes that I had in view, it is impossible to apply to them, especially as, in the pleomorphic forms assumed by some of them, it is notorious that they possess latent vitality difficult to extirpate.

I am still inclined to hold to the first conclusion, as justifiable from my experiments as far as they have even now gone, that animal micro-organisms, submerged in water or any other liquid, are not susceptible to injury from electric current approaching in force the highest that I used (which may be regarded as prodigious when the minuteness of the organisms attacked by it is taken into consideration), and that perhaps they are not susceptible to injury under those conditions from any current, however high. But, as to my first conclusion, I have since found myself, upon reading the work of Dr. Griffiths, egregiously in error

through the false inference that I had drawn that, because the electric current did not destroy protozoa of the kind with which I was dealing, therefore bacteria would not be destroyed by it, at least within the bounds compatible with human life or well-being. It seems, however, that vegetable protoplasm, at least of the fungus kind, acts differently from animal protoplasm under the influence of the electric current. After reading the results of Dr. Griffiths, I gladly reverted to the intention with which I had set out in my experiments, of being able to suggest means by which bacilli forming a nidus in the human body could be destroyed and water supplied to cities could be sterilized for drinking purposes.

The author to whom I have referred is Dr. A. B. Griffiths, Fellow of the Royal Society of Edinburgh. He remarks that the full details of his experiments with electricity on bacteria are to be found in Volume xv of the Proceedings of the Society. In making the experiments he seems to have had no ulterior object in view but the gaining of information as to what amount of current would destroy certain micro-organisms. The wood-cut which he gives at page 177 of his work, *Micro-organisms*, represents a faradaic, not a galvanic battery, as the generator of the electromotive force used in his experiments. At the beginning of mine I used both the galvanic and the faradaic battery. The receptacles in which Dr. Griffiths placed pure cultures of different bacteria were simple, broad-based, short bottles, in which were fitted from top to bottom of each bottle a single loop of wire in free electric liquid communication with the micro-organisms. He does not in any case give the resistance in ohms of the media employed in the cultures.

The bacillus tuberculosis was killed by 2.16 volts, the bacterium lactis by 2.26 volts, and the bacterium aceti by 3.24 volts. The electric current was allowed to pass for ten minutes, and the temperature of the laboratory during the experiments was 16 C. (60.8 Fah.). In another series of experiments, bacillus tuberculosis was killed by 2.16 volts, bacillus subtilis by 2.72 volts, and bacterium allii by 3.3 volts. The current, as before, was allowed to pass for ten minutes, and the temperature of the laboratory was 17 C. (62.6 Fah.). In the first series of experiments no growths appeared from inoculation in fresh nutritive media, after an incubation of twenty-five days, with the thermometer at

38 C. (100.4 Fah.); and in the second series, similarly treated, no growths appeared after an incubation of twenty days, with the thermometer at 35 C. (95 Fah.). As before incidentally mentioned, all of these experiments were made with wire looped in glass bottles. Consequently all the electricity that attacked the microbes away from the wires was the residuum which the wires did not conduct, necessarily by far the lesser portion; and as the minimum of force was not sought or obtained, what is needed may be a mere fraction of the time and force actually employed. With so small a current as that used, and with the considerable volume of the respective liquids employed—which latter point the wood-cut shows—detriment to the organisms from products of electrolysis may be deemed inappreciable.

It has therefore been demonstrated that certain schizomycetes can be killed in a short time by a low current. Presumably all others can be killed in an equally short time by an equally low current; which was the assumption with which I had set out at the beginning of my own experiments, looking primarily to destroying pathogenic germs in the human body, and secondarily, to rendering them innocuous through the sterilization of water for drinking purposes. I therefore ask myself why, if a very low current, passing for a few minutes, can destroy bacteria in a bottle, should not a much higher one, administered repeatedly for the same time, be sure to destroy them in the human body? Daily, in the course of electro-therapeutic treatment, ten, twenty, twenty-five, and many more volts are administered to patients, avoiding only strong or continuous application of the current to the pneumogastric nerve, on account of the inhibitory action of the heart thereby provoked. But I will not pause just at this moment to speak more fully to this point, but will here confine myself to the main subject of this paper, clearly set forth by its title and the tenor of the preceding remarks. Reverting to the question of the sterilization of water for the use of cities, and with the new light upon the subject, which, as it appears, I might have gained for myself, but for having been diverted from my course by a false inference, I am constrained to ask my hearers, as I have asked myself in this case also, why the attempt should not be made to destroy bacteria wholesale in the drinking water of large cities by the method previously foreshadowed.

The means at our command seem to me ample. It is true that

we cannot electrolize successfully a large reservoir of water, for in that the electricity would be too diffused to be effective. It is true that, in pipes from which water is flowing into or out of the reservoir, its germs would not be subjected to attack for more than a second. It is true that the resistance that we should have to overcome in water would be large. But, on the other hand, it is also true that the electric current that we have at our command is capable of indefinite increase. The electro-motive force of a few thousand volts (there are dynamos that generate ten thousand) thrown athwart a pipe of proper dimensions, would probably paralyze every bacterium in its path, more than compensating by force for slight duration in time as compared with the ten minutes adopted in the experiments of Dr. Griffiths, as to which it is imperative to remember that they did not determine either the amount of current, or of time required, for the destruction of the bacteria experimented upon; and, consequently, it will be observed, both force and time needed are probably very much less than his experiments on their face apparently demonstrate.

If lines of water-delivery as well as those of water-supply were subjected to the attack of the electric current, the severity of it would be more than doubled for the organisms. It would be immeasurably increased in severity; for experiments at the very beginning of bacteriological investigation clearly showed that the best mode of destroying bacteria involves the principle of repeating relatively moderate attacks upon them at intervals such as find them partially recuperated, and assail them in this the period of their least resistant vitality. The method to which I allude is that of repeated boiling of slight duration at moderate intervals of time. That they can bear this apparently severe process at all shows the protective influence for them of any fluid immersion within the chemical character that does not wholly ignore the difference of habits among their different species, and water seems to be a medium inclusive of them all. The principle involved in the mode of attack mentioned is the same as that involved in the mode of destroying bacteria here suggested. Taking it in connection with the facts that a reservoir represents a large volume of water, only a part or a few parts of which are being momently drawn upon for supply, and that many germs are constantly passing through natural phases of relatively less vitality, infinitely below that in which they, if

pathogenic, being received into a favoring host, so vigorously form ptomaïnes, to their self-destruction as well as that of the host, it would seem that, if upon issuing from as well as upon entering a reservoir, the water were attacked in pipes from poles all but encircling them, with an electro-motive force of a few thousand volts, all germs must reach the denizens of cities supplied from such a source, wholly innocuous, because they would be dead.

It need hardly be said that, if the poles were placed opposite to each other on a heavy metal pipe conveying water, the electricity, seeking lines of least resistance, would not pass through the water at all, but around it, through the great mass of the pipe. But it should be obvious that it is easy to adapt to the place of electrical attack of a pipe a simple contrivance consisting of a section of the same diameter as that of the pipe, insulating the poles from each other, and both from the general line of the pipe. A plan that might at the first blush appear to some persons better, as not entailing thus radically breaking the continuity of the main pipe, would be to have two series of metallic insulated screws, representing by position two opposing arcs, the individual screws of which should enter and pass through corresponding holes in the pipe, the ends of the screws being uninsulated. But this plan would not do at all. The experiments described have proved the resistance of water to be so great that a large volume of it is required for electricity to pass easily through it. Consequently, in overcoming the resistance of water in a metal pipe with poles attached, in the form of insulated perforating screws, part of the electricity would, in making large excursions, be received and conducted to the poles by the metal of the pipe, instead of reaching them entirely through the water. But, if the pipe were interrupted by a non-conducting section, of length to be determined by the diameter of the pipe and the electro-motive force to be used, then those excursive lines of force would eventually fall into the determinate direction of the poles entirely through the water. We see this action clearly illustrated in the previous experiment, where, in open vessels, resistance to the current rapidly diminishes as we increase the volume of the liquid. We see the same thing also clearly illustrated in the case of the hand submerged in the ample basin of water, where the remotest abrasions of the skin

sting from the current, finally emerging with condensed force at the pole resting on the submerged hand. In a pipe with a properly calculated non-conducting section, the lines of force would play freely inside of the pipe, occupying and limiting there a rounding imaginary space, varying in figure with every change of force, but always, of course, having its apices at the poles, approaching which, and especially at which, would be concentrated their intensest energy.

If the full significance and legitimate outcome in conclusion from the experiments that have been detailed have been perceived, it will have been realized that, although water acts like wire with reference to conductivity, through length, cross-sectional area, and temperature—exemplifying the law of conduction by and resistance to the electric current, with reference to volume, however disposed—the difference between wire and water, notwithstanding that metal has great conductivity and water very little, is enormous with reference to difference of capacity. We have but to determine, first of all, what electromotive force is needed for the purpose of destroying germs in water, assuming that they are thus destructible, and then, upon that basis, determine what the length and cross-section of non-conducting pipe should be to accumulate and discharge the force required. One could charge a constant stream of water in an insulated pipe as never wire nor any congeries of wires nor any metallic deposit on earth could be charged with electricity: for whereas all these would soon reach their utmost capacity for localized energy, an insulated flowing pipe has back of it all earth ready to receive and effectively return the force transmitted. We, however, need for our purpose at most only a small area of that vast space. But yet it is true, and a striking exemplification of the stated fact that, given a dynamo of far less than infinite power, with poles astride an estuary's living stream, so wide, so deep, that the earth there would not fuse before a fiery blast engendered by resistance, and connected as those waters are with every drop in every brook, the encircling oceans, and the interlying land, it would send its impulse thence over the whole uninsulated globe, and backward, in myriad lines of force, with all but synchronous and omnipresent thrill.

I stated at the beginning of my discourse that it is an open question whether or not the stomach is capable of destroying

pathogenic germs. In that, of course, is involved the other open question, whether or not ordinary drinking-water is the source of disease. I have properly spoken of the questions as open ones, because so many persons are enlisted on opposite sides that I cannot venture without arrogance to decide them authoritatively. The tenor of the preceding remarks, however, must indicate that, personally, I believe drinking-water supply to be ordinarily one of the largest factors in the causation of some zymotic diseases; but lest I may have left it in doubt that I hold that view, I here state it explicitly. I have, I confidently believe, pointed out one way in which the evil may be abated, and perhaps neutralized; and this without disparagement of the efficiency of subsidence basins in their adverse influence upon bacterial dissemination. As to this (with the exception of treatment with iron) the last remaining factor in the production of pure drinking-water, I shall be glad to take a more opportune time than the present occasion, when I have so long engaged the attention of the Society, to prove directly, from my still later experiments and observations, what seems directly proved by the statistics of prevalence of typhoid fever in Philadelphia and elsewhere with reference to areas of different water-supply, that subsidence basins are also an important factor in the health of a city, not only relieving water of impurities in it, represented by alluvial and effete matter in suspension, but also relieving it in a measure of the impurity due to simultaneous deposition of the bacterial bearers of poison to our homes.

As to our ability to destroy the bacillus tuberculosis in the human body, by means of percutaneous administration of the electric current, I hope that I may be allowed to say a final word. I cannot see, as I have already remarked, why, if it can be killed in a bottle with a mere fraction of two volts (as I have shown by the experiments of Dr. Griffiths that it must have been killed), it cannot be killed in the patient suffering from tuberculosis, by the enormously greater electro-motive force that the body is capable of receiving without detriment in a concentrated form. This statement, however, is not intended to imply that the current would be capable of curing a case of tuberculosis which had involved caseous degeneration of the parts. If it did, it would also imply that to my mind electricity is creative. Electricity, however, although not creative, includes

among its manifold and marvelous properties not only dynamic power, but attributes regenerative of vitality, and with these two it is capable, if the experiments of Dr. Griffiths are to be relied upon, of killing the bacillus tuberculosis in the living human body, in case the lesions of the disease have not seriously impaired electric conductivity in the parts morbidly invaded; and capable also of contributing to restore healthy function to them, and thence normal structure. It remains for physicians to make the essay here indicated at no expense or risk whatever. If the treatment prove to have any virtue in it, it would apply to other bacterial diseases besides tuberculosis.

In regard to the essay with reference to the sterilization of drinking-water, experiments could be made at no great labor and expense compared with the vast interests at stake in a large city. Through microscopic tests would soon be set at rest the question as to whether to any, and if to any, to what extent germs could, by the means described, be destroyed in city water, and scrutiny of the health of the city, within the lines especially of certain diseases, through comparison of present with past records, would in successive years have its own independent and conclusive tale to tell. I pledge Philadelphia prospectively in a bumper of pure water more worthy of celebration than the best Falernian wine.

Obituary Notice of P. W. Sheafer. By J. P. Lesley.

(*Read before the American Philosophical Society, April 3, 1891.*)

Peter Wenrich Sheafer was born at Wiconisco, in Dauphin county, Pa., March 31, 1819. His father, Henry Sheafer, was afterwards President of the Lykens Valley Railroad Company, and Superintendent of the Lykens Valley Coal Company, mining the finest quality of anthracite coal, at the west end of the Southern Anthracite Coal field. The discovery of the Lykens valley coal bed in the body of the Pottsville Conglomerate was one of the astonishing incidents of Pennsylvania geology, and enabled the Sheafers, father and son, to establish a great trade in anthracite coal upon the line of the Susquehanna river as far as Baltimore.

Peter Sheafer was engaged at various times in his long professional life in following the outcrop of this interconglomerate coal around the edges

of the Southern and Middle fields, but without finding it in an equally good condition in any other parts of the region. He often expressed to me his hopes and his disappointments regarding it. It was but an episode in his career, for his large fortune was chiefly accumulated by the purchase and exploitation of the Mammoth and other large beds overlying the Conglomerate.

After leaving school, Peter took a full course at Oxford Academy, New York, with the object of a better geological acquaintance with coal and coal mining. But at that early date, the science of geology could hardly be said to exist. In 1835, the New Jersey and Virginia State surveys, and in 1836 the Pennsylvania survey, were begun. Prof. H. D. Rogers' first assistants were Mr. Booth, afterwards the chemist of the United States Mint, and Mr. Frazer, afterwards Professor of Chemistry in the University of Pennsylvania. The following year, Mr. Trego, Mr. McKinney, Dr. Whelpley, and others were appointed assistants on the survey. In 1838, Peter W. Sheafer received his commission, while Dr. Whelpley had charge of the Southern and Middle field, and Mr. McKinley of the Northern field. Henderson and I were the next year Whelpley's aids, and I saw little or nothing at that time of Peter Sheafer, who was busy with his own part of the field work, and was laying the foundation of that accurate knowledge of the order and quality of each coal bed which enabled him afterwards to make himself easily the principal practical mining engineer of the anthracite region. His mind and the training of it was just suited to this work of his life. He had good judgment, inexhaustible liking and ability for work, a retentive memory, a quick eye for money values, a peaceable disposition, great caution in undertaking, and pertinacity in accomplishing the exploitation of properties. He made himself personally acquainted with everybody and everything that happened or was likely to happen in the anthracite world, and kept himself in constant intercourse with owners, investors, speculators, mining prospectors, engineers, and railroad companies; and, what was the key to his fortune, never rode hobbies, or allowed himself to be turned aside into other pursuits; although at various times in his life he traveled far to examine and report upon distant coal fields for those who employed him as a professional adviser. I have known, also, of his reports on iron-ore properties and oil and gas lands. He was also a great collector of statistics, and was the first to conceive the idea of a statistical coal pagoda, with lines drawn across it at regular intervals to represent successive years, the old legendary 365 tons of anthracite sent to market the first year forming the apex of the pagoda, and its successive stories, bulging or being overhung according as the anthracite market received a greater or less addition to its ever-swelling volume of trade. He was for many years the recognized authority for the statistics of the region.

In 1848, he married Miss Harriet Whitcomb, of New England, and set up his home and office in Pottsville, the capital of the anthracite country. For forty-three years this has been his happy, hospitable, and elegant

residence, and here his children, Louise, Arthur, William, and Harry were born and educated, his sons becoming partners in his enterprises, sharing the toils, the responsibilities, and the wealth of their father, and fitted well to maintain the honor of his name.

In 1850 Peter Sheafer took an active and influential part in the effort inaugurated by William Parker Foulke of Philadelphia and other gentlemen to obtain an appropriation from the Legislature for publishing Prof. H. D. Rogers' Final Report on the Geology of the State. Half of the appropriation was to be spent in field work, to bring the Report up to date, especially that part of it which related to the anthracite coal fields. Mr. Rogers formed a corps, consisting of Peter Sheafer and his cousin, John Sheafer, for underground surveys; myself for surface topography; Edward Desor, of Neuchatel, for the study of the surface deposits, and Leo Lesquereux, of Columbus, O., for the study of the coal plants. This work only lasted one year, and this corps was disbanded, but a good deal of special work was done in the following year or two in other parts of the State; and the Report did not appear until 1858.

At the organization of the Second Survey of the State, in 1874, Peter Sheafer's business interests were too exacting and important to permit of his taking an active personal hand in it, but he did all that he could to further the interests of the survey at Harrisburg and elsewhere through the following fifteen years of the continuance of the survey; and I am happy to say that the intimate friendship which he and I formed in 1851 was confirmed and continued with unabated cordiality to the present time. His son Arthur was commissioned as Mr. Ashburner's assistant in the long and difficult survey of McKean, Elk, Cameron, and Forest counties, where he exhibited great abilities for field and office work inherited from his father; and the greatest part of the "Report on Elk County," with its illustrations, is from Arthur Sheafer's own pen.

Peter Sheafer was a genial and lovable man, a religious man, and, what always struck me as very interesting, a man of poetical temperament, and a reader of the poets. But he was never properly trained to express his thoughts in a style of elegant composition. His business writings were unexceptionable. His statements of business facts and contracts were satisfactory, but he was unused to a logical, consecutive, well-systematized and picturesque presentation of a subject. This is, of course, to be ascribed to his lack of youthful classical training. I have often thought of him as that one of my friends whose life career best illustrated the advantages and disadvantages of college discipline. For by not going to college he gained more than he lost, and enjoyed great worldly and social prosperity at the very small cost of missing literary facility. I even doubt that the lack of technical school training in his profession as civil and mining engineer was at any time an obstacle in his path of life. He learned enough to join his experienced father in earlier enterprises; and in after ones his intercourse with business men and technical books and

professional experts supplemented his own experiments and kept his intellectual ability abreast of the public needs of each succeeding year.

My friend Sheafer was a silent man, I should say reticent, always smiling and cheery in conversation, but seldom or never allowing even to his enthusiasm more than a momentary flash of expression. He had the confirmed habits of a good listener; and what he himself had to say was said in the fewest words the theme permitted or the occasion demanded. He was intently sympathetic, and loved to hear others talk; his own contributions being chiefly made in the shape of facts. No man better appreciated those whom he loved or respected, and this he owed to his poetic temperament.

One of the best instances of his ingenuity is his successful device for gobbing up a mine by boring down to its heading from the surface and causing a stream of water to carry down the bore-hole the fine slack or braize coal from a neighboring dust-hill. The coal-mud thus introduced into the abandoned workings is banked back behind loose brattices which let the water flow through but retain the mud, which in some months becomes solid and firm enough to hold up the roof; and then the workings are reopened and the mine is robbed of its pillars. The coal usually lost by the crushing of the pillars is thus saved without danger to the miners; and the country is also saved from caving and settling; which entails a further profit, inasmuch as the coal beds above the one worked out are preserved intact for future mining. Schuylkill county ought to erect a statue to Peter W. Sheafer for this invention alone.

He became a member of the American Philosophical Society, July 17, 1863. He was a member of the Academy of Natural Sciences of Philadelphia, of the Historical Society of Pennsylvania, of the American Institute of Mining Engineers, and of the American Association for the Advancement of Science. His philanthropic feelings induced him to become a member of the American Colonization Society.

His death took place at Brown's Mills, Burlington, N. J., to which he had been taken from Atlantic City in the hope of saving his life, and he was buried at Pottsville, March 31, 1891.

He was six months my senior in age; and now I remain the last one of that old set of the first geological survey of our State. They are all gone—H. D. Rogers, Booth, Frazer, McKinney, Trego, Holl, Boyé, R. E. Rogers, Haldeman, Whelpley, Hodge, Jackson, Henderson, McKinley, Sheafer—not one lives to tell the adventures of those early days of our science, when the very foundation principles of it had to be laid, and the physical constitution of Pennsylvania had to be discovered, without experience and without instruction. The bare outlines of the story have been told; but the individual life of that story will never be told; is, in fact, untellable.

Artesian Well in Lowest Trias at Norristown.

Notes by Prof. O. C. S. Carter.

(*Read before the American Philosophical Society, May 1, 1891.*)

Drilled in the Trias of Norristown, near Stony creek, for water for steam boilers.

15′	Made ground.....to	15′
23	Sandstone, light colored, coarse grained, containing fragments of orthoclase feldspar.....	38
33	Sandstone, dull red, fine grained, with specks of muscovite. Color due to iron oxide.....	71
31	Sandstone, light pink (produced by pink orthoclase), fine grained; quartz grains transparent; fine specks of muscovite mica.....	102

Water was struck every ten feet down to 70; none thence to 90; abundance of water between 70 and 102 (located by the driller at 95, 100 and 102); cased at 18 with 6 inch pipe ($5\frac{5}{8}$ inside). Steam pump furnished 1003 gallons per hour. After pumping 4000 gallons, the level of water in well fell 12 feet; after 7500 gallons, it fell 16 feet and stood.

Analysis of well water gave 11.8 degrees of hardness, as compared with 6 degrees for Schuylkill river water; 14 degrees for English surface New Red water (Wanklyn); and 17 degrees for English deep well, New Red water.

The lime exists mostly as carbonate, with some sulphate, and probably comes from the cement between the sandstone grains.

Another artesian well, situated within a hundred feet of this one, gave water which precipitated in the boilers a fine white powder of carbonate of lime, which did not cake and was easily blown out. This well water is therefore as useful in steam boilers as is Schuylkill river water; and is better, because it holds no mud or sand in suspension. A little soda neutralizes the sulphate of lime. The water also becomes perceptibly softer after continued pumping.

Artesian Well in Lowest Trias, at Norristown.

Well drilled about half a mile from the Trenton limestone, which outcrops at Mogee's Station, on the Schuylkill river, to obtain water for the manufacture of artificial ice.

Cased at 28 feet with 6 inch pipe.

30′	Sandstone, very white and fine grained, containing a little pink orthoclase.....to	30′

5′	Sandstone, white, containing coarse fragments of orthoclase	35′
6	Shale, dark red	41
14	Sandstone, white, containing muscovite mica	55
10	Sandstone, lighter color, more feldspathic	65
3	Sandstone, very white, fine grained	68
6	Sandstone, dark red, coarse, containing much iron oxide and a little mica	74
4	Shale red	78
18	Sandstone, red, fine, micaceous	96
4	Shale red	100

Water was first struck between 35 and 40. More than ten "crevices" [probably water cracks] passed between 35 and 100. The water now rises to within 16 feet of surface. Steam pump delivers 1500 gallons per hour. After ten hours' pumping the water falls only 10 feet in well, the whole fall occurring, however, in the first 45 minutes. With an improved pump 3000 gallons per hour were obtained.

Water Well in Lowest Trias, at Washington Square, Montgomery County.

22′	Sandstone, red, micaceous	to	22′
12	Clay, stiff, red		34
1	Shale, red (*Trias*)		35

Water first struck at 16 feet; a crevice every 3 or 4 feet; stands at 11 feet from the surface, and never falls lower, no matter how much is pumped, at the rate of 1500 gallons per hour.

Artesian Well in Trias, in Worcester Township, Montgomery County, Pa.

Drilled on the Duffield farm, on the north bank of Stony creek, at the crossing of the Stony Creek Railroad, between Custer and Belfry, through New Red (Trias) red shale and clay slates, some of them blackened with coaly matter.

20′	Clay slate, gray, hard; little mica	to	20′
5	Clay slate, *blackened* with coaly matter		25
5	Shale, red		30
5	Clay slate, dark, fine grained		35
5	Clay slate, very *black*, hard, compact		40
3	Shale, red		43
2	"*Quartzite*"		45
3	Clay slate, gray		48
17	Clay slate, compact, hard		65

The *quartzite* was said by the driller to be so hard that he could only drill six inches of it in ten hours.

Water was first struck at 38 ; again at 65 ; nowhere else. Water stands at 15 feet of the surface ; yields 60 gallons per hour ; drops 25 feet after pumping 6 hours.

Evidently the Stony creek water soaks slowly through the bed planes between the clay slates.

Artesian Well in Lower Silurian Limestone, in Montgomery County, Pa.

Drilled on Charles Kunkle's farm, south side of the Valley Green road, east of the Bethlehem pike, north-northeast of Flourtown.

40′	Limestone, not micaceous..... to	40′
20	Limestone, micaceous.....	60

Water first struck at 40′ ; depth of well 60′ ; several small "crevices ;" water stood at 35 feet beneath the surface, and was not lowered by steam pumping 500 gallons per hour.

Artesian Well in Lower Silurian Limestone, at Parkesburg, Pa.

By Prof. J. P. Lesley.

Mr. P. H. Gibbons, Vice-President of the Parkesburg Iron Co., at Parkesburg, Chester county, Pa., was good enough to furnish me by letters dated January 1, February 9 and February 11, 1886, with fragmentary notes of the boring, and forty-five samples for examination, which I have in bottles, the depth in feet recorded on the corks, and finely powdered specimens on glass slides for microscopic use.

Soil, first passed through.....		18′
Limestone struck.....	at	20
Quicksand encountered.....	at	23
Cased quicksand out.....	at	24
Limestone ("bastard"), more dense and solid.....	to	42
Quicksand again.....	at	42
Limestone.....	to	53
Quicksand, with flow of water.....	at	53
Limestone, purer.....	to	92
Sandstone, yellow, fine grained, 7′ thick.....	to	99
Limestone, of varying qualities, sometimes sandy, "then mica, then lime or marble ;" no water.....	to	174
Limestone, of varying nature.....	to	522

Specimens examined under the lens, at the following depths :

27′ Resembles a sandstone, light gray, with white fracture, some quartz crystals and a show of mica.

32 Same as above, with a trace of iron oxide.

34′ Same as above, with an increase of mica.
37 Same as above.
48 Same material, but blackish gray.
60 More carbonate of lime, and some mica ; reddish crystals, peroxide of iron.
69 Large percentage of carbonate of lime.
79 Limestone.
90 Limestone.
95 Quicksand, yellowish white.
99 Same as last.
102 Limestone ; mica and quartz in quantity.
117 Limestone, reddish.
122 Limestone, bluish light gray, mica.
150 Limestone, with yellowish red crystals.
171 Limestone, white, fine grained.
179 Same as last.
194 Same as last.
208 Limestone, grayish white.
227 Same as last.
239 Same as last.
255 Same as last.
268 Same as last.
282 Same as last.
288 Limestone, hard, and fine grained, light gray, white.
302 Same, increasing in hardness.
308 Same as last.
324 Same, gray and white ; show of mica.
332 Same, darker gray ; more mica.
347 Same as last.
360 Same, bluish gray ; coarse granules.
372 Same as last.
387 Same as last.
404 Same, granules finer ; show of mica.
415 Same, grayish white, still finer ; less mica.
422 Same as last.
433 Same, dark gray, mica, iron.
448 Same, more crystalline (rhombohedral); more mica.
455 Same, crystalline, dark gray.
464 Same, crystalline, gray and white.
472 Same, fine crystals, light gray.
486 Same, finer granules, very hard ; with mica.
502 Same, perfectly crystalline ; more mica and feldspar.

One slide prepared to show crystalline forms.

The occasional dissemination of minute flakes of mica and fine grains of feldspar through the limestone is better evidence of the deep-sea

deposition of these Ordovician or Lower Silurian limestone beds than is the silica in quartz form which they contain.

The beds are highly tilted to the south; therefore the vertical hole exaggerates the thickness. The formation is probably "Calciferous" *No. IIa*, but no fossils have been found just here. No record of water obtained.

Artesian Well in Potsdam Sandstone, in Montgomery County, Pa.

Notes by O. C. S. Carter.

Drilled on William Janeas' property, near Williams Station, at the crossroads, south of Lancasterville, and east of Spring Mill, the Plymouth Railroad sweeping around it on the southwest.

64′	Sandstone (*Potsdam No. I*), coarse ..... to	64′
6	Sandstone, fawn colored, micaceous.....	70
10	Sandstone, light brown, fine.....	80
10	Sandstone, coarse, micaceous, transparent quartz.	90
22	Sandstone, fine, micaceous.....	112
6	Sandstone, very coarse, larger fragments of quartz, with red iron stains.	118
4	Sandstone, coarse	122
4	Sandstone, fine, grayish brown.....	126
4	Sandstone, coarse, fawn colored.	130
2	Sandstone, fine, resembling ground ginger.	132

No conglomerate like that of the Willow Grove Potsdam outcrop passed through; beds tightly laid so that water crevices were few and insignificant. No water struck until the drill reached 80. Water rose and stood at 70. Steam pump delivered only 300 gallons per hour; water falling 10 feet after pumping 10 hours.

Artesian Well of Chalybeate Water, in Chester Valley Clays, near King of Prussia, Montgomery County, Pa

Notes (condensed) of Prof. Oscar C. S. Carter.

Drilled on William Thomas' land; 90 feet deep; water, deep brown (cider) color, even after 30,000 gallons had been drawn by a steam pump in three days; bubbles of carbonic acid gas constantly escaping; water not clear after standing several days; precipitate, analyzed, was carbonate of iron; precipitation not complete after a week.

35′	Yellow clay.....to	35′
10	Layer of rounded pebbles of white quartz, resembling those on the sea shore.....	45

10′	Fine white sand and pebbles	55′
10	Blue clay, holding iron balls	65
10	Fine yellow clay, holding iron balls	75
	Thin bed of solid sandstone which seemed to be *Triassic*, perhaps not *in situ*.	
5	feet of Chester Valley limestone (no more limestone)	80
	Struck top of *Potsdam S.S.* at	90

Water first struck at about 40′ down ; at first, muddy ; soon cleared on standing ; supply soon exhausted by the pump ; merely surface water.

No more water until depth of 81′.

Chalybeate water at 81′ ; immediately rose in the dry well to within 32′ of surface. Pumped this water, 60,000 gallons, during 5 days (steam pump). Then iron water exhausted, and clear water took its place. Iron water evidently came from clay beds holding iron balls ; some of which were brought up by the drill. Well cased (6″ iron pipe) to 83′.

Water stratum evidently lies between the clays and the rock floor.

Artesian Well in the Mica Schist of Philadelphia.

Notes by O. C. S. Carter.

Drilled by H. W. Kelsey, of the Oriental Bath Co., 1104 Walnut street, Philadelphia, for the supply of the baths.

Drillings at every 10 feet examined under a lens ; elements arranged below in order of their abundance in the specimen pumping. No rock seen except mica schist and gneiss. Only *traces* of feldspar noticed above 170. Colorless muscovite mica makes all the strata nearly white from 160 to 210. The biotite mica darkens the strata from 210 to 266. *No hornblende seen in any of the pumpings.*

20′	Clay, the Philadelphia brick clay to	20′
46	Gravel (thin layer of clay at bottom)	66
34	Mica schist; milky quartz, biotite mica, occasional speck of muscovite mica, no feldspar	100
20	Mica schist ; muscovite mica and trans. quartz	120
10	Mica schist ; biotite, quartz and muscovite	130
10	Mica schist ; quartz, muscovite, some little biotite	140
10	Mica schist ; biotite, quartz, some little muscovite	150
10	Mica schist ; coarse fragments of quartz and muscovite.	160
10	Gneiss ; coarse fragments of pink orthoclase, muscovite and quartz ; *first appearance of feldspar*	170
10	Gneiss ; quartz, orthoclase feldspar and muscovite	180
10	Gneiss ; muscovite, quartz, biotite, little feldspar	190
10	Gneiss ; muscovite, orthoclase and quartz	200
10	Gneiss ; muscovite, orthoclase and transparent quartz	210

10′	Mica schist; quartz, biotite, muscovite	220′
10	Mica schist; biotite, quartz, muscovite	230
20	Mica schist; biotite and quartz	250
15	Mica schist; biotite, muscovite, quartz	265

Few crevices; strata tightly packed; first rock water struck at 120; rose to 28′ beneath surface; pumped 5 quarts a stroke, 80 strokes a minute, 6000 gallons an hour; level falls 20′ after one hour's pumping.

Water a little hardened by sulphates and some iron.

Artesian Well in Mica Schist, near Radnor, Delaware County, Pa.

Notes by O. C. S. Carter.

Drilled on M. Wheadley's farm, in Chester county, Pa., in the *hydromica schist* of the South Valley Hill belt.

30′	Sharp white quartz fragments	to 30′
58	Schist, very micaceous, silver gray, soapy	88

Water crevices struck at 70 and 85; water rose only 10 feet in the well, and stood at 70 feet below the surface; yield, only 120 gallons per hour; drops 5 feet after pumping five hours.

Feldspar Bed in Laurentian (?) Gneiss.

By Prof. Oscar C. S. Carter.

(*Read before the American Philosophical Society, May 1, 1891.*)

The feldspar quarry is opened on the east bank of the Schuylkill river, between Lafayette Station and Spring Mill, where the Reading Railroad (Norristown branch) and the Pennsylvania Railroad (Schuylkill Valley division) run side by side under the bluff outcrops of syenite and gneiss supposed to be of Laurentian or Archaic age, bordered on the south by C. E. Hall's Chestnut Hill Mica Schist belt of undetermined age.

A small stream cutting down into the Schuylkill just south of the quarry marks the contact of the mica schist and syenite and gneiss belts. About 100 yards north of the quarry is the granite vein described in Prof. H. D. Roger's *Geology of Pennsylvania*, 1858.

The county road runs between the railroad tracks and the bluff, and the feldspar bed is quarried for 35 feet alongside of the road. The feldspar

is also exposed between the road and the railroad for 10 feet more, making the bed at least 45 feet broad; the highest point of rock exposed is 15 feet above the level of the county road.

The dip of the feldspar bed is northward (40°) beneath the gneiss.

The direction of the feldspar bed does not conform to the strike of the belts of gneiss, but, on the contrary, is transverse, *i. e.*, nearly north and south.

The feldspar is orthoclase, of light pink color, with an occasional streak of white granular quartz running through it. Some of the large masses quarried out contain considerable quartz. Large masses of biotite mica are occasionally met with in quarrying; but the occurrence of biotite is not general through the rock.

The quarry was opened in the summer of 1886, and about 30 tons taken out and sold to the potteries at Trenton, etc. It is the only feldspar quarry in Montgomery county. The quarry in Delaware county is described in the Annual Report of the Geological Survey of Pennsylvania for 1886. A few others, in the States of Delaware, New York, Connecticut, Massachusetts and Maine furnish all the feldspar manufactured into pottery in the United States, the total production from all the quarries, from 1882 to 1887, having been 14,000; 14,100; 10,900; 13,600; 14,900; 10,200 tons, valued respectively at $70,000; $71,112; $55,112; $68,000; $74,500; $56,100. The crude feldspar is valued at the Trenton potteries at about $5 the long ton; and the pulverized feldspar at $11; the quartz being carefully separated out.

A Fragment of Objectionable University-Extension Teaching.

By R. Meade Bache.

(*Read before the American Philosophical Society, May 15, 1891.*)

It need hardly be said, and yet, to obviate the possibility of misinterpretation in outside quarters of that which I am about to remark, it becomes necessary formally to declare that I have no intention to depreciate the cause represented by the well-concerted effort of University-Extension teaching to disseminate knowledge heretofore confined to the comparatively few. I could heartily wish that my theme admitted of no mention save of generalities, but thus treated it would not subserve the interest which I would gladly promote, by being brought home to the

minds of my hearers, upon whose individual influence partially rests the benefit which University-Extension teaching is capable of effecting. The attempt to correct incidental error is strictly correlated to endeavor to promulgate the truth, and if it be wise to seek to sow intellectual seed broadcast, then it must also be wise to select it carefully, and to eradicate the tares if any should appear, especially if the soil be virgin, possessing little previous vigorous growth to maintain itself against invasion of injurious crops that haply may be introduced and appear as fruitage of the untried field.

I was present on the evening of the 16th of February l t, at Association Hall, in this city, at the lecture of Prof. Richard G. Moulton, of Cambridge, England, on Dumas' *Monte Cristo* as a companion study to *Prospero*, and there heard his attempt at the demonstration of psychical analogies, similar to those which his Syllabus for other occasions included, between the respectively preternatural and supernatural elements in *Monte Cristo* and *The Tempest*. Yet, although I am a monist, believing that all existences, whether religious, philosophical, or scientific, form one intimately connected and coherent whole in nature, the sole barrier to the just and complete comprehension of which condition lies in the feebleness of the human intellect, I also believe that, perforce of that infirmity, we are constrained to view things in the strictest categories, and that we judge of them only more or less clearly by rigid comparison of their immanent likeness and unlikeness; and hence, although, as was said of Dean Swift by one of his lady-loves, he could write well if he chose to about a broom-stick, it is not, in my view, philosophically permissible to any one to take a broom-stick for a rational flight, and from its suggestion superpose a witch, and with her scale the empyrean, opening up to vision all earthly things below in a maze with relation to themselves and the outspreading heavens.

If by accident, and it was of the purest, for I was invited, and did not go of my own motion to hear Mr. Moulton, some of his teachings have become my text, so much the worse for him, or mayhap for me, if I should meet dissent from my propositions. But I make light of the possible consequences to myself, in view of what I deem the justice of my cause. In the interest of that truth which is said to be mighty and always to prevail, of which, however, I have my serious doubts, I speak frankly in

what I deem the interest of Philadelphia, which I love; of literature, which I also love, and of art generally, which has been my never-ceasing pleasure throughout life. Mr. Moulton's merits are enthusiasm and elocutionary ability, his faults extravagance and defective logical perception. The result is seen in unbridled imagination soaring over the fields of literature, where, however entertaining, he is not a safe guide to dwellers on the average plane of life in mind, thought, training, and all that goes to form the individual as he stands. I proceed, after this necessary preamble, to the discussion of a few statements made by him on the occasion to which I have referred, not relating at all to the point that I have mentioned, but involving what many others as well as myself deem the greatest heresy against tenets fundamental in literature, safely leaving to the sober second-thought and calm review of the literarily educated among his audience the justification of the opinion that I have expressed as to the general tenor and defect of his instruction.

Mr. Moulton opened his lecture with the strange remark that, whereas his own regard is especially reserved for literature in itself, doubtless that of the great majority of his hearers was concentrated upon the author. This was wholly irreconcilable with the fact of the presence of the large audience that greeted him upon that occasion for the ostensible purpose for which it had assembled. Interest in authors, among any portion of the reading public, is always subordinate to interest in literature. That public stands in exactly the same category, if not in exactly the same relation, to literature and authors, as does Mr. Moulton himself. He himself could not, if he would, divest himself of interest in individual authors compatibly with being interested in their works, the one interest with everybody being exactly proportional to the other. He protested too much in his intended exaltation of literature, more than it is human to feel, for there is, upon the assumption of individual love for literature, no other category than one inclusive of the highest teacher and the lowliest scholar, in all that regards the relativeness of literature and the author. If Mr. Moulton's statement were correct, as representing a possible condition of mind, it would be futile to address any mixed audience assembled for literary entertainment and instruction, except by first endeavoring to convert its component individuals from the error of their way of

thinking, that the author is more interesting than his book. But that was evidently not the intention of the lecturer, as set forth in his printed Syllabus of the lecture course, but to make critical study of specimens of the higher literature, upon the assumption of general knowledge of, love for, or at least capacity to learn to appreciate, the productions of master minds in the various provinces of literary art.

A statement in Mr. Moulton's lecture, much more worthy of notice, however, because it involved a dangerous thing to say before a mixed audience, without due qualification to forestall any possible misunderstanding as to the limited reach of the declaration, was contained in his repudiation of all authority for the laws of grammar, clinching the assertion by the remark that in England they do not "set so much store as we in America by Lindley Murray." He declared unreservedly, and proceeded to argue, that so-called laws of grammar are not binding, so repeatedly enforcing the point by using the expression of one of his correspondents, whom he cited as charging that Browning's Caliban "speaks bad grammar," as to impress the listener with the belief that he himself regards that expression as good English. That the sentiment was quite agreeable to some scattered groups among the audience was very evident from the gentle murmur of assent and the incipient stir of applause that arose among them. He went on to say that the popular impression that grammatical law is binding arises from confounding two different senses in which the word is used as defining two diverse things. Now, the idea of law, as everywhere apprehended, however imperfectly formulated as a statement of fact or obligation, however even provisional, has, as a term, but one signification. Relating to physical phenomena, it contains the affirmation of correspondence between cause and effect, authoritative with man. Relating to man, whether as supernally or humanly ruled, it contains the assertion of authority as defining conditions and imposing upon him obedience. Whether, then, the idea is expressed with reference to nature beyond or within man's control, the term corresponds with it, and always relates to that which he regards as authoritative.

Most unfortunate for Mr. Moulton's plea was the distinction which he attempted to draw between legislative laws and the law of custom in language. The essential difference between them,

he affirmed, lies in the fact that legislative laws are imposed by authority under penalty, whereas the so-called laws of grammar, being derived from language, and not it from them, are not of any binding authority whatever. But, just as a general consensus of opinion in a community is by legislative action reflected in the concrete form of legal enactment, so a similar consensus of opinion in a community as to language is reflected concretely in the forms in accepted general usage in speech. Back of all laws of language, as well as of all legislative laws, are mandate and penalty, none the less in the first because they are not there formally expressed. Human laws, whether legislative or otherwise, are, in a word, the expression of the will of the community. The laws of speech, as existing in a particular community, are therefore in their sphere as mandatory as are those of a legislature; nor is their infraction possible without incurring and suffering penalty. Attached to their infraction is the penalty resulting from less comprehensibility in written and oral speech, less ability to secure the widest audience, less possibility of communion with one's fellow-men, and at the lower depths, the absolute impossibility of maintaining the best social status. Because all peoples themselves make language, they cannot be bound by that which they create, is an untenable proposition, seeing that in the evolution of human affairs practice comes first, and then custom, and then the formulation of custom in the unwritten law of precedent, if not in the shape of written law. It is the individual that is bound by the law of grammar as well as other law, not the community creative of correspondent language, and failure to discriminate between the essentially different agencies as, on the one hand, representing authority, and on the other obedience, leads from specious view to specious statement. It may be frankly admitted that Caliban has a right to a grammar of his own, without at the same time admitting that there is no law of grammar, when it is considered that we find all men, up to their individual capacity, using speech with recognition of law incorporate in every individual tongue.

Another unfortunate statement made by Mr. Moulton in the lecture referred to, was when he answered certain criticisms upon Browning, that no matter how he varies his theme, he is generally obscure and ever identifiable through his mask. Mr. Moulton asserted as to these strictures, that every great author

necessarily has his medium through which he must address his world, and it is for his world, if it incline to love him, to study to become familiar with the medium in which the message of the seer is at first enshrouded. But even undeniable greatness in literature, and such is Browning's, does not depend upon obscurity, but must needs be lessened, not increased by obscurity. Neither does personality, inseparable from utterance, enhance, but, on the contrary, it limits literary greatness. Unless we are to renounce existing standards, obscurity cannot be admitted as a merit, but must be recognized as a defect. Mr. Moulton mentioned *The Ring and the Book* as perhaps the greatest of all poems, and therefore, inferentially, Browning as perhaps the greatest of all poets. The work is marvelously fine, despite fitful, but by no means continuous obscurity, despite portions in which its style is too Hudibrastic to suit the graveness of the theme, and most notably of all (because it might so easily have been otherwise by a halt in time), despite the lameness of its ending. Browning himself says, in the very first line of the superfluous last part of the poem, "Here were the end, had anything an end;" yet relentlessly goes on to reflections of the late actors on the scene, now tame and uninteresting, with even mention that Guido died penitent (with short shrift it must have been, an hour or so at most, including the procession to the place of execution); for which the reader cares not a jot, such terrorized reconciliation of life with death being the common end of darkest criminality in face of unexpected retribution. Fearful is the anticlimax, with its additional Byronic looking towards and mention of the "British Public," when, merely by omission, the grandest possible climax lay just before the author, where the doomed miscreant, Guido, renouncing on the instant his mock heroics and blatant atheism, as he hears his executioners at his cell's door, every shred of pretense falling from his naked hideousness, cries, "Abate,—Cardinal,—Christ,—Maria,—God, ... Pompilia, will you let them murder me?" The tale is told. There is a natural ending, beyond which extension is but injury: even the epilogue is out of date. But such things apart, can it possibly be thought as worthy of existence as the first part of Faust, which, if men remain as men now are, must endure until earth, grown cold and lifeless, still rolls on through space. To address his world, a limited world, a less

than the greatest type of author may be obscure and must be personal through his writings, but to address the whole world, to be greatest in literary art, one must so dominate it in clearness and impersonality as though behind the Olympian clouds, where almost alone stands Shakespeare. The grand epic traits of Homer, all but his equal among the immortals, admit of no direct comparison between them, but speaking broadly, there is nothing to choose between them on the score of clearness and impersonality.

It is recognized that what is superlatively great in art is known as such by all orders of men: the fact is thus determined. Before such works no veil of obscurity hangs, but supreme greatness in them is revealed, if not equally, at least as a presence to all men. This law of perception, however, does not exist for science and the highest scientific men. Herbert Spencer has toiled through a long life generally unknown, and wholly unremunerated with this world's goods, although, with well-poised brain and feet firmly set on logical procedure, he has made a march of progress, barring his agnosticism, joined by thousands who have taken fire from his torch to millions beyond unaware of whence came the light. But art is for all the world, by the simple avenues of sense, with much or little intellect, while science, the possession of the few, must ever remain beyond the ken of the multitude save in diluted forms of knowledge. Yet, in entire forgetfulness of the present civilized standpoint in science, Mr. Moulton declared that the savage's knowledge of nature far exceeds that of the civilized man. The ground taken for the assertion was the savage's recognized capacity in woodcraft, following trails, and other skillfulness of the most primitive sort, forced upon him by his daily needs, and not to be spoken of in the same breath with the larger acquaintance with nature possessed by civilized man for centuries, especially that represented by the late wondrous civilized advance through study of the highest physical laws.

The *omne admirari* is as pernicious a phase of the human intelligence as is that of the *nil admirari* attitude of mind. To be catholic in taste is not to embrace all creeds and proselytize to every faith. To enjoy truly, with exalted sense, is to discriminate. To have the highest æsthetic enjoyment throughout life depends upon holding one's self in the attitude of receptivity for

all that may appeal to one within the present accepted canons of good taste, and beyond, even if it be unfamiliar, for genius is ever enlarging the bounds of taste. The canons of good taste at a given moment of time represent but the evolutionary point of general human advance, beyond which one cannot proceed sanely by leaps, but led by genius, may enter untrodden space beyond. Except the fundamental, there are no absolutely fixed canons of good taste in art but the academical, and they are constantly invaded, for the grand jury of the world is always in session to decide upon works of art, and its decision is final. The life of the individual artist may pass away unrecognized and unrequited, but the span that the longest life compasses is short in comparison with that which may be for all time. To attempt to defend the greatest author at every point, to find no blemish even in obscurity, to make human imperfection flawless, is mistaken zeal. One of the most conspicuous marks of genius is the inequality of its productions. Look for confirmation anywhere, amid many cases that might be cited, to Goethe, to Victor Hugo. In a single work, *Wilhelm Meister*, are to be met palaces and huts, jostling each other. What a great gulf divides *L'Homme qui Rit* from *Nôtre Dame de Paris*. Compare George Eliot's *Romola*, gem of the purest water, with *Daniel Deronda*, and thence descend in our survey to the depths of ineffable dullness in *The Impressions of Theophrastus Such*. Truly, there is difference in kind between these, making intimate comparison between them impossible; but it is purely between degree as limited by kind as kind that I am instituting the comparison. Is each production of these authors as good of its kind as is another by the same author of a different kind, within its kind; and is not one wholly unworthy of another? that is a fair consideration. Within the very same kind, however (let us put the question to a crucial test), shall we, out of love for Shakespeare, say that even he is always equal to himself? Instance any men and women of genius, and it can easily be shown, if they produced much, that side by side with great performance lies what was beneath their greatness to produce, if it go no further (but it does go much further) than such lapse where even Homer nods. Vainly, because we love an author, would we claim for him equality in all his creation. If so attempting, we really seek to strip him of one of the characteristics that shed, not lustre, but a side-light, on the title to his fame.

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Mankind is subject to epidemic crazes of anticipation, admiration and repudiation. The Mississippi Scheme and the South-Sea Bubble, blown to hugest dimensions by the breath of millions, sailed upward until burst by continued puffs of praise. Within a very short period Brown-Séquard, who did not even claim that which the public attributed to him, was raised heavenward, then dropped to earth. Koch was most wisely moderate in statement; all to no purpose when the imagination of the public set sense aflame. Even tulips, two centuries ago, and orchids, but yesterday, have each had with the proverbial dog their little exalted day; that of the dog, as no longer individual, but collective in popular admiration, reigning at present throughout the whole Anglo-Saxon world. In what an unæsthetic general atmosphere of judgment of excellence we live we must perceive upon reflection that, through jaqueminots, la France, and other types, it took fashion at last to find out, and that but lately, the beauty of the rose. But this especially modern development of factitious rapture is not in the real interest of anything good, least of all in that of cultivating popular taste for art. The best interests of that cultivation lie in appreciative recognition of greatness, though careful discrimination and frankest acknowledgment of imperfections as well as merits in a work of art, while at bottom thankfulness is felt for the gift that has been added to the sum of blessings. It is not ennobling to kiss with equal fervor the clay feet and the golden brow of our idol. Gladly let us welcome him among our household gods; remembering, however, that after all, he is human, but all the more lovable for being so. Let us avoid lauding his imperfections, as did Mr. Moulton, when he claimed merit even for the obscurity of Browning, because, as he said, it arises "from excessive sight." The defense is inadmissible; for art depends upon perspective, upon rigid selection, involving therefore exclusion, converging upon finest limitation, resulting in ideal form evolved from void. He who in literature strives at any time to include, or does inadvertently include, in the treatment of a theme, more in quantity or in quality than its development can symmetrically combine, has not then successfully raised the sleeping angel from the block of marble. Virgil, with excessive requirement of his own exquisite skill, well understood the demands of the highest art, when he willed that at his death the work which he had not yet published should perish; for he

as well as others of the ancients knew well, as the French of modern times know and strive to practice, that it is in perfection of form that literary as well as all other art chiefly and almost wholly resides; and in literature, unlike other art, which is limited, form includes color, and even the "concord of sweet sounds," and all else that, from delicacy to robustness, through human strength and weakness, appeals to the wide range of affections in the responsive heart of man.

Whoso likes, in poetry or prose, unformed, elusive idea, that sparkles evanescently with promise but half-redeemed in uncoördinated thought, either enjoys the contemplation of his own profundity, not the author's work, or else is himself so much poet or reasoner that, from fitful gleams of light, as one may think out a whole heaven, inspired by the droning from a stupid pulpit, he shapes to suit his fantasy what, not the bard nor other writer, but his unconscious self lends to the satisfaction of his soul. In either case is self-analysis wanting, which would prove to such misguided beings that works which so inspire are not of art, but of art's inchoate suggestion; a pleasant sketch perchance, but not the finished picture, in which they themselves complete the task; for although in literature the delicately, not the mathematically expressed idea, combines the finest finish with its form, it is also true that in it all should ever tend from airy nothing, not thither to revert, or never issue. Admirably Browning says:

> "Fancy with fact is just one fact the more;
> To wit, that fancy has informed, transpierced,
> Thridded and so thrown fast the facts else free,
> As right through ring and ring runs the djerid
> And binds the loose, one bar without a break."

But, just as in all literary art the djerid, *fancy*, is needed truly to bind fact together in all-inclusive bond, so also in all literary art is needed the first of facts, the djerid, *form*, to "bind the loose," in parts and whole, as one "without a break."

A Sketch of the Life of Dr. Gouverneur Emerson.

By W. S. W. Ruschenberger, M.D.

(*Read before the American Philosophical Society, May 15, 1891.*)

Descriptions of the peculiar attainments of members of the American Philosophical Society, and of their labors to increase and diffuse knowledge of truth of any kind, are interesting features in the Society's annals. For such reason it has long been a practice to have prepared a suitable notice or memoir of every resident member soon after his death.

At the close of his life Dr. Emerson had been a member of the Society more than forty-one years. He was warmly interested in its welfare, and took a more or less active part in its proceedings. Notwithstanding his worthiness of it, a tribute to his memory in the Society has not been recorded.

Just after his death, in 1874, it was suggested that I should prepare a notice of him. Inquiry at the time led to the belief that materials for a suitable memoir could not be easily obtained. Even among his intimate friends, Dr. Emerson was notably reticent about himself, never indulged in reminiscences of his past experience: in fact, his associates knew nothing of his life or career.

Recently, however, his near kinsmen have kindly opened sources of information, and now, after long delay, a sketch of his life and work, in sufficient detail for estimation of his character and measurement of his usefulness while living, is respectfully submitted.

Emerson is an ancient English surname and probably not hereditary.

The Emersons of Delaware sprang from a respectable English parentage, and were among the early colonists of Penn's province. They were all farmers, and proprietors of their farms.

The grandfather of the subject of the following sketch, Gouverneur—familiarly called Govey—Emerson, his wife Sarah, born Manlove, and their six children, were received into membership of the Duck Creek Meeting of the Society of Friends in 1757.* His youngest son, Jonathan, born July 17, 1764, married Ann Bell in 1794.† They had seven children,

* Records of Duck Creek Meeting, Kent county, Del.

† *Genealogical Note.*—Gouverneur Emerson married Sarah Manlove, 1746.
Issue—Jacob, b. 1751; m. Sarah Stout.
Manlove, b. 1759; m. Susan Blundell.
Jonathan, b. 1764; m. Ann Bell.

Robert Bell m. Mary O'Brien of Ireland.
Issue—Henry, Robert, Thomas, John, Mary, Agnes, Lucy.
Henry, m. Elizabeth Lewis.
John, m. Mary Lewis; issue—Ann, Margaret, Mary, Lucy, Eliza L., Stephen.
Ann (Bell) m. Jonathan Emerson. Issue—Gouverneur, Sarah (died), Mary, Susan B., Manlove (died) and Ann Eliza.

two sons and five daughters, the youngest of whom is the sole survivor. The eldest of them, Gouverneur Emerson, was born August 4, 1795, near Dover, Kent county, Del. In after-life he remembered with pleasure that when little more than seven years old he was permitted to roam in the woods with a gun.

At an early age he was sent to the Westtown School, a famous boarding school under the direction of the Society of Friends, which was opened May, 1799, in Westtown township, Chester county, Pa. He returned to Dover in 1810, and was for a short time at a boarding school in Smyrna. Thence he was transferred to a classical school at Dover, the principal of which was the Rev. Stephen Sykes.

With the preliminary education acquired at those schools, and prompted by his mother, he began to study medicine at the age of sixteen, 1811, under the preceptorship of Dr. James Sykes, a prominent surgeon and eminent citizen, who was a first cousin of his mother. Dr. Sykes was once Governor of the State of Delaware, and during many years presided in its Senate.*

His father, Jonathan Emerson, died in 1812, leaving his family an ample real estate, consisting of farms and improvements thereon.

Gouverneur continued his study and went to Philadelphia, probably in the autumn of 1813, to attend medical lectures.

His mother, in 1814, married Manlove Hayes, who had children by two previous wives. He was born in 1769 and died in 1849, aged eighty years. The children of his third marriage were Harriet Sykes, Manlove and Charles P., all of whom are living. Their mother, a lady endowed with excellent womanly qualities and a strong character, so managed her family that her children and those of her husband were never aware of any difference or preference of kinship, and were affectionate friends during their lives.

Having attended three complete courses of lectures and submitted an inaugural thesis on *Hereditary Diseases*, the University of Pennsylvania granted Gouverneur Emerson, March, 1816, the degree of Doctor of Medicine. He was a member of the Philadelphia Medical Society from 1813, and was elected its Secretary in 1816.

Prior to his graduation he was a private pupil of Dr. Thomas Chalkley James, an eminent practitioner, who was professor of midwifery, the first

Ann m. (second time) Manlove Hayes, Esq., of York seat, near Dover, Del. His great-grandfather, Richard Hayes, the first *American* ancestor of the family, settled in Delaware in 1698, at the age of 20, and m. Dolly Manlove.

Issue—Harriet Sykes, Manlove, Charles P.

Mary m. 1st Jones, 2d Francis, 3d Edgar.

Agnes m. James Sykes (a delegate to the First American Congress).

Issue—James, Nancy (who m. Commodore Jacob Jones, U. S. Navy), Matilda, John, Harriet.

Lucy m. Rev. William Magaw, D.D., Rector of St. Paul's P. E. Church, Philadelphia. Buried under the church.

*Biographical Memoir of Dr. James Sykes. By Gouverneur Emerson, M.D. Journal of the Medical and Physical Sciences, February, 1823.

ever appointed, in the University. During this association a warm and enduring regard sprang up between them.

Dr. Robert Hutchinson Rose had purchased, in 1809, a hundred thousand acres of wild land,* which included the township of Silver Lake, near Montrose, the capital of Susquehanna county, Pa., and was endeavoring to attract settlers upon it. He and Prof. James were cordial friends. Possibly influenced by the Professor's good opinion of his young friend, Dr. Rose invited Dr. Emerson to be his family physician, to become a member of his household, and practise medicine in the neighborhood. Prof. James advised him to accept the offer, suggesting in support of his advice, that a settled occupation in the country would fortify his health, which at that time was slightly impaired.

Dr. Emerson arrived at Silver Lake about the end of September or beginning of October, 1816. He was a tall, slender man just past the twenty-first anniversary of his birth, and was, no doubt, hopefully forecasting the future of his career. Before he received Dr. Rose's invitation he had designed an excursion to the Northern States. After a survey of the position he was to occupy, he determined to delay beginning his work until after he had made his projected journey.

In a letter of seven closely-written foolscap pages, dated Silver Lake, Dec. 5, 1816, and addressed to his friend at home, Alexander L. Hayes,† he gives a full summary of his observations during his excursion.

He started alone on horseback from Silver Lake, October 15, 1816, and at the close of the next day reached Unadilla, a New York village, not very many miles beyond the northern boundary of Pennsylvania. There he was not a little surprised to learn that a Philadelphia banknote for $100, with which he had supplied himself to pay his traveling expenses, would be received only at a discount. He was obliged to give that note for ninety dollars in notes of New York banks. Travelers of the present time are not taxed in such manner, because our paper money has the same value everywhere in the United States.

He visited Schoharie, Schenectady, the Balstown Spa, Saratoga, and, passing over the Hudson river at Fish Neck, entered Vermont. From Rutland he crossed the Green Mountains to Montpellier and Danville; passed several days in Southern Canada, traversed New Hampshire and the province of Maine, and returned by the way of Waterford, Troy and Albany, to Silver Lake, after a ride of about 2000 miles.

Having been born and bred in the country, he naturally devotes a large part of his letter to descriptions of the soil and the agricultural value of lands which he saw on his way.

* Precisely, 99,200 acres. History of Susquehanna County, Pa. By Emily C. Blackman. Claxton, Remsen & Haffelfinger, Philadelphia, 1873.

† Alexander L. Hayes, son of Manlove Hayes by his first wife, was born in Sussex county, Del., March 7, 1793, and was President Judge of the Court of Common Pleas in Lancaster, Pa., from 1833 to 1849, when he resigned, and was again elected 1864 and died in office, 1873.

See, Biographical Encyclopedia of Pennsylvania. Philada., 1874.

In reference to the people he says : "The Yankees have a great deal of frankness about them. If they are very desirous of knowing your circumstances, and of course, inquisitive, they are willing to tell you their own. Knowledge, religion, civility and money are more equally diffused in New England than in the Middle and Southern States ; but there are not as many men of brilliant talents or true piety—more common civility but less polish, and few opulent men, and girls of course. * * * They have a fondness for title and distinction. The most respectable men by far are the tavern-keepers. * * * You will hear that Judge ——— keeps there, and that General ——— five miles this side, and that they are *nice* men ; a *nice* man and a fine Yankee are equivalent terms. * * * They call all kinds of vegetables sauce."

Dr. Emerson, who was probably the first physician settled there, practised his profession at Silver Lake nearly two years.

At the instance of a friend, Mr. Andrew Hodge, he was appointed, November, 1818, surgeon of a merchant ship, called the *Superior*, Captain John Hamilton, bound to China.

He joined the vessel, which had already dropped down the river, December 7, 1818. The weather was stormy and the wind adverse. The *Superior* did not get to sea till the 12th.

The cabin mess, composed of the officers of the ship and three passengers, counted eleven persons, a number quite sufficient to shield them from a sense of weariness or solitude.

Dr. Emerson kept a journal. A brief notice of the nature of sea-sickness is recorded the first day at sea.

On the 13th, out of sight of land, a brig from Prince's Island, coast of Africa, bound to Rhode Island, was spoken. She had been seventy days at sea and was short of water. As the quarantine laws were then very rigidly observed at Marseilles, the port to which the *Superior* was bound, to avoid risk of vitiating her clean bill of health which might be consequent upon direct personal communication with any vessel or place before reaching Marseilles, casks of water were thrown overboard and picked up by the brig.

On the 14th, being then in the Gulf stream, the Doctor notes in his journal the use of the thermometer in navigation.

January 26, 1819, the *Superior* arrived at Marseilles, thirty-five days from the Capes of the Delaware.

As soon as the ship entered the mole, the captain went to the Health Office, but was required to remain in his boat outside of the grate, and to throw his papers into a tub of vinegar presented to him, the object being to destroy any contagious matter they might contain. Letters brought for persons on shore, after being cut through in several places to give easy access to the vinegar, were treated in the same manner. Every vessel arriving was required to undergo quarantine. No person was permitted to land, and none to visit her from the shore. A guard was stationed on board to enforce observance of the rules. At the time the plague prevailed in the Barbary States.

A celebrated Dutch physician, Boerhaave, recommended distilled vinegar as an efficient remedy against putrid diseases. Vinegar was supposed to be antiseptic and therefore protective against all contagions. The hands of those who had to do with contagion were moistened with it, and their clothing and other objects were exposed to its vapors. During the plague of 1720, at Marseilles, it is said that four convicted thieves, who were employed in caring for the sick, protected themselves from the contagion by the use of vinegar, and were granted their lives on condition that they would reveal the means they used to shield themselves in their perilous work. And hence, perhaps, came the preparation called "Thieves' vinegar."

But since modern studies of the processes of fermentation and putrefaction have led to the belief that they, as well as all contagions, are due to the presence of microscopic organisms, vegetal or animal, called mycroderms, bacilli, microbes, etc., vinegar has lost its antiseptic reputation.

Early on the morning of February 4, the Harbormaster came alongside of the *Superior*. Learning from the guard that no one on the ship was sick, he came on board; and, after disinfecting the officers and passengers in the cabin and the sailors in the forecastle, by exposing them to the pungent fumes of oxymuriatic acid gas (chlorine), he granted *pratique, i.e.*, liberty of the port. Then the ship was moved to the vicinity of the Custom House, and the gentlemen found quarters at the Hotel des Ambassadeurs.

After a sojourn of two months at Marseilles the *Superior* sailed April 5, and on the 15th anchored in Gibraltar bay; and was detained some time in quarantine, and afterwards many days waiting for a favorable wind. Before daybreak, May 6, 1819, the anchor was weighed and on the 7th the ship was fairly at sea.

August 1, the ship was anchored at Angier, Java, and on the 3d proceeded on her way. The anchor was let go again, Aug. 20, off Macao, where merchant ships bound to Canton were detained twenty-four hours. In the afternoon of the 21st a passport to proceed up the river was granted and a pilot sent on board. The ship started about half-past three o'clock P.M., and anchored in the Bocca Tigris sometime after midnight. The pilot landed the next morning to exhibit at the fort there the "chop" or permit to go up the river, and brought back two pilots and two Mandarins to remain on board till the ship reached Whampoa, the common anchorage of foreign ships trading at Canton. It is sixteen miles below the city. The *Superior* anchored in the evening of the 23d, and on the 26th, Dr. Emerson and fellow-voyagers were lodged in Swedes Factory at Canton.

In a letter to his mother, dated November 5, 1819, Dr. Emerson says: "After the first impressions of the abundant novelties wore off, the dull uniformity which followed became tedious, and time now appears to fly slowly."

He relates that in consequence of drinking Samshoo, a liquor prepared from rice, which in excess produces a fierce, maniacal intoxication, the crew of the *Superior* mutinied, and, in the absence of the captain, endeavored to kill the officers and take possession of the ship. Officers of other vessels lying near, immediately joined in the conflict. Some of the crew were knocked down and others stabbed. Eight of the ringleaders were put in irons, and fed on bread and water for ten days ; and under such treatment became as subordinate as they always had been.

He gives account of an accident to himself which might have been serious, as follows :

"I went on board a ship where they kept a Spanish bloodhound. He was tied before I went on deck ; but while sitting in conversation with some of my friends, he broke loose and sneaking alongside leaped into my face. The damage I sustained was a wound through the left lower eyelid, a deep cut on the temple, and one under my shoulder, together with a very black and inflamed eye, from all of which, I am happy to inform you, I have recovered. The dog is the most savage of his species. I escaped *very well considering*. He has injured others more seriously."

Referring to mosquitoes, he says : "I sleep under a net which lets the air circulate, but keeps out every kind of insect. You will be pleased to see it. I think the plan so ingenious and good that it will be adopted by many of our friends."

A plain implication from the Doctor's remark is that the mosquito net was a novelty to him in 1819, and not known in the neighborhood of his native place. Are we indebted to the Chinese for this invention ?

The party finally left Canton for Whampoa, Nov. 22. The ship had been moved below the common anchorage when they reached her about noon. She arrived at Lintin on the 23d, and there found the U. S. frigate *Congress*, Capt. John D. Henley, said to have been the first American man-of-war to visit China. She anchored here Nov. 3, with many of the crew suffering from dysentery, ascribed to the water taken on board at Angier. Her presence aroused the suspicion of the Chinese authorities that it meant no good, and therefore they would not allow provisions to be furnished to her from Canton. The *Superior* brought several barrels of bread for her use, and other American merchantmen conveyed to her barrels of beef and pork.

On the 26th Nov. the *Superior* sailed from Lintin homeward bound.

On Saturday, Jan. 16, 1820, then in the Indian ocean, she was boarded from a Patriot privateer, said to be two months out from Buenos Ayres. She was armed with sixteen guns and had a crew of two hundred men.

Dr. Emerson, in his journal, says : "We first discovered her on Friday morning, about three miles off our starboard quarter, standing on the same course. The wind was light and unfavorable ; a high head-swell further impeded our progress. Towards night the strange sail had gained upon us. We thought she showed a desire to speak. Every precaution seemed to have been taken to disguise her real character, by carrying

little sail, but we still suspected her of foul intentions. The night was dark, but she kept close to us and always in sight. In the morning, being off our weather quarter, within gunshot, she ran up a Spanish flag and fired a gun to bring us to. When close to us she backed her topsails, hauled down the Spanish and ran up the Patriot colors, at the same time opened all her weather ports, ran out her guns and brought her whole broadside of eight guns to bear upon us. The star-spangled banner floated over our quarterdeck.

"We now thought ourselves in a rather unpleasant situation. Although no declared enemy, still the many outrages and piracies under what was called the Patriot flag made us fear we might not fare better than others under similar circumstances.

"Her boat, rowed by a set of cutthroat-looking fellows, came alongside. The officer, apparently of inferior rank, wore a belt full of pistols and daggers. He was without a coat and barefooted. A renegade American attended him as interpreter. Having noted the ship's name, the latitude and longitude, etc., this accomplished officer directed his attention to our breakfast table, at which we had just intended to sit down. After refreshing himself and companions, the work of plunder began. They robbed us of many barrels of beef, pork, bread, butter, tea, silk, canvas, iron kettles, live stock, etc. The villains seemed to think themselves as fairly entitled to what they took as if they were purchasers. Whenever they came across anything they fancied, they said with all effrontery imaginable, 'Half for us and half for you,' adding from time to time, by way of consolation, 'We don't want to do you any harm.'

"They stated that they had a great deal of sickness on their ship and were throwing men overboard every day. They tried to induce me to join them, offering any rate of wages I might ask. They had a surgeon, but he was so indifferent that if in my way they would throw him overboard, and so get rid of him. His pay was a hundred dollars a month, but they would allow me any price I asked. Having consulted among themselves aside, they said that they had agreed not to force me to go with them against my will, although they were so much in want of medical assistance. According to their account the prevailing diseases on board were scurvy, dysentery, fever and ague, which had reduced what remained of the crew to a deplorable condition. Receiving a decidedly negative answer from me to their invitation, they next demanded a supply of medicines. I gave them some of a common kind, such as I thought might be useful to the wretches. The suspicious rascally officer took some of each one on the point of a dagger and thrust it into my mouth, watching me intently all the while, not satisfied till he had seen it on my tongue. This experience reminded me of a ludicrous scene in the "Honeymoon," where the doctor is forced to take his own medicine or be thrown out of the window.

"Though they robbed us in this unwarrantable manner, we were not treated as badly as we had expected. A strong breeze sprang up which

prevented their small boats from passing between the two vessels. They permitted us to make sail, but followed in our wake. The breeze stiffened to a gale. Night came, dark and stormy. We changed our course. On the following morning, to our great joy, nothing was seen of our piratical friend."

March 20, the *Superior* was boarded by a Delaware pilot, and in the evening of the 23d reached Chester, 117 days from Lintin. The ship had been absent from Philadelphia sixteen months.

His journal during the voyage contains testimony of industrious study and intelligent observation of all things at sea or on shore that impressed their images on his mind. Marine animals and aquatic birds, wherever they appeared were described. Drawings of some were made. These and original sketches of places seen, and maps of ports visited, with now and then an apt quotation from some poet, illustrate his pages.

He gives detailed accounts of what he saw at Marseilles and on his way to it. Whatever was new to the young traveler seemed to be charming. Appearances of people and things, famous localities with their historical associations combine to quicken curiosity and impart a glow of interest to his record of pageants viewed, of visits to hospitals, public buildings, theatres, museums, etc. Days were passed at Aix, St. Remy, Nimes, Avignon and Vaucluse. Many pages are given to descriptions of the remains of ancient Roman buildings, and of whatever interested him in those places.

He gives interesting accounts of Gibraltar, and describes a visit with a companion on horseback to Algeçiras, a port of Andalusia, six miles west of the famous fortress.

At Angier, in the Straits of Sunda, he tells of the many canoes and boats which came to the ship with fowls, fruits in great variety, vegetables, Java doves and Java sparrows in little bamboo cages, monkeys, paroquets, sea shells, and animals of the deer kind not taller than our domestic cat, and all being at moderate prices found ready sale among strangers. The natural, corporal characteristics of the Malays, seen here, their costume, language, as well as the appearance of their dwellings on shore, the mountain scenery, tropic vegetation, and political condition are sketched and commented upon.

Macao, Whampao, Canton, Lintin ; pagodas, scenery and Chinese boat population along the river are in like manner noticed in detail.

The instruction derived from his observation and study, and the formative influence of his experiences during those months of separation from home, may not be definitely measured, but possibly to his alert mind they were as effective as the training of a college course.

With such preparation for work, on the 4th of August, 1820, the twenty-fifth anniversary of his birth, Dr. Emerson settled himself at No. 37 Chestnut street, Philadelphia, ready to give professional attention to any who might ask it. Possibly the time might have been opportune to introduce a young physician to business. Thirteen deaths from yellow

fever in the city had been reported during the season of 1819. The circumstance had created a vague apprehension of its recurrence, and may have induced people to appreciate practitioners of medicine more highly than when there was no prospect of needing them ; and consequently, new candidates for practice might be more promptly noticed. The apprehension was realized to some extent ; during the autumn of 1820, seventy-three persons died of the disease in the city.

Dr. Emerson was appointed an attending physician of the Philadelphia Dispensary, September 19, 1820, and resigned the office, May 21, 1822.

The City's Councils elected him a member of the Board of Health, March 12, 1823 ; and the Board appointed him its Secretary the same day. It is conjectured that he resigned three years later.

Prevention of the introduction and spread of smallpox in the city at that period attracted attention. Between January, 1818, and December, 1822, five years, only nine deaths from smallpox in the city had been reported. Fear that the disease might again enter the city was no longer manifest. For this reason it was supposed that vaccination had been generally neglected in the community.

The Board of Health was without authority to enforce measures to prevent the spread of the disease, then present, and for this reason its members were not willing to act ; but at the instigation of Dr. Emerson the Board announced in the daily newspapers, three times, that smallpox was in the city and recommended all unprotected persons to be vaccinated without delay. The same year, November 15, 1823, the Board again warned the public of its danger, saying, "And as it is believed that there does exist among some an unjust prejudice against the practice of vaccination, the Board conceives it a duty to declare that the evidence afforded by our city in its long exemption from smallpox, together with the happy results which have followed the introduction of vaccination in all parts of the world, ought to be sufficient to convince the most incredulous of the salutary influence of this inestimable preventive."

Dr. Emerson submitted to the Board for approval and transmission to the Legislature a draft of a law and memorial on the subject. The proposed law in substance provided that vessels having smallpox on board should be quarantined on arrival in the same manner as those affected with other contagious diseases ; that inoculation of smallpox should not be practised in any case without the sanction of the Board ; and that authority already conferred on the Board of Health to deal with contagious diseases specified should be extended to smallpox.

After debating the subject at several meetings, the Board approved the memorial and draft of the proposed law, January 28, 1824, and transmitted them to the Legislature then in session. Although 160 deaths from smallpox had occurred in the city during 1823, a member of the House of Representatives retarded its action on the bill after it had passed the Senate by securing a seemingly innocent amendment to it, but which in fact provided that appointment to offices connected with the Board of Health

might be so made as to reward political and partisan services without regard to fitness of the candidate.

Mr. William Binder and Dr. Emerson were sent to Harrisburg to point out the effect of the amendment, and at the end of four days' work they secured its rejection and the enactment of the original bill. A copy of the act was duly delivered to the Board of Health, April 7, 1824.

His work as a member of the Board of Health, and his communications to the newspapers pointing out the risk of permitting those affected with smallpox to freely mingle with citizens, bear witness to Dr. Emerson's disinterested benevolence.

During 1824, deaths from smallpox in the city numbered 325. They were reduced to six in 1825, and to three in 1826. But these facts are not conclusive that the measures taken by the Board of Health during this period contributed to abate the prevalence of the disease, because, both prior and subsequent to this time, the rate of mortality from smallpox in the city, between 1807 and 1840, fluctuated in the same striking manner, as Dr. Emerson shows in his papers on *Medical and Vital Statistics*, published in "The American Journal of the Medical Sciences," November, 1827, November, 1831, and July, 1848.*

Dr. Emerson published in "The Journal of the Medical and Physical Sciences," February, 1823, a brief and interesting memoir of Dr. James Sykes, who was his first preceptor in medicine; and a charming biographical memoir of Dr. Samuel Powel Griffitts, in the "North American Medical and Surgical Journal," in 1827.

July 6, 1832, Dr. Emerson, accompanied by Dr. Isaac Hays, visited the first case of "spasmodic cholera" that occurred in the city, his original description of which is in his commonplace book.

The disease became epidemic. Deaths from it numbered 1021. Dr. Emerson had charge of the Hospital for Orphans. As a token of appreciation of his service during the epidemic, a silver pitcher was presented to him, upon which is inscribed:

To
Gouverneur Emerson, M.D.,
The City of Philadelphia,
Grateful for his disinterested and intrepid exertions,
In a period of public calamity.

——:o:——

Transeat in exemplum.

He lectured in the Franklin Institute of Pennsylvania in 1833, on meteorology, and in 1834, he delivered another course on heat, electricity and galvanism, in connection with the subject.

* Mr. Pliny E. Chase reported at a meeting of the American Philosophical Society, February 5, 1869, and subsequently published, his *Comparative Statement of Mortality in the Society of Friends and that of the General Population of the City of Philadelphia from* 1800 *to* 1869, which, he states, was compiled largely from Dr. Emerson's papers.

Dr. Emerson was chosen to be a member of the American Philosophical Society, April 19, 1833. At stated meetings he made many brief communications on many subjects, which are recorded in Vol. i to Vol. xvi of the published Proceedings.*

He was one of the Councilors of the Society during ten years, from 1837 till the end of 1846.

He delivered a lecture *On the Advantages Derived from Cultivating the Arts and Sciences*, before the Philadelphia Mercantile Library Association, in the hall of the Musical Fund Society, December 8, 1839.

Among other points of interest, he states that the first successful attempt to cross the Atlantic in a vessel propelled by steam was made in a steamship called the *Savannah*, commanded by Moses Rogers, a native of Connecticut, but long a resident of Philadelphia. He sailed from New York, March 28, 1819, and arrived at Savannah, Ga., April 6, whence, after some delay, he crossed the ocean and arrived at Liverpool, June 20, having used steam or sails, as the wind permitted. From Liverpool the *Savannah* went to Elsineur, Stockholm, Cronstadt, St. Petersburg and Copenhagen. She then returned to Savannah, Ga., and thence went to Washington, D. C. Thus the practicability of crossing the Atlantic in a vessel propelled by steam was first demonstrated by an American.

In this connection he relates how Thomas Godfrey, an obscure citizen of Philadelphia, from a casual observation of the reflection of light, perceived the principle upon which he constructed, in 1730, the mariner's quadrant, and how he was robbed of the credit of his invention, and claims that Godfrey is entitled to "the lasting gratitude of all concerned, either directly or indirectly, in nautical pursuits, by inventing the only instrument that can securely guide the ship when far from land," and they should not permit only "a fragment of the most perishable stone" "to mark but for a few years longer the grave of Godfrey."

This appeal induced members of the Mercantile Association and others to construct a suitable monument to Godfrey's memory.

* The subjects upon which he made oral or written communications are as follows:

The production of electricity from the animal body; the production of electricity from steam; observations on Mower's paper on meteorology; excessive mortality of male children; effects of hot weather on infants; causes operative in changing the proportions of the sexes at birth; importance of phosphoric acid in agrieulture; phosphorescent light produced in the diamond by friction; the compound action of the mental and optical faculties concerned in vision; cultivation of cotton in the Northern States; cleaning flax-fibre for market; extent of propagation of atmospheric vibrations produced by explosions of powder; manufacture of the sugar and syrup of sorghum; imphæ, or African sugar cane and cultivation of sorghum; improvements in Whitney's cotton gin; Robbini's process for preserving wood from decay by injecting into it vapor of coal tar; remarks on the part taken by the American Philosophical Society in connection with the Franklin Institute, to establish stations for metcorological observations; earthquake of October 20, 1870, reported November 4, 1870, as to expanse over which shocks were noted; lunar influence on wet and dry weather; ascription of the gradual translation of the peach-tree belt southward on the Atlantic coast to the progressive removal of the forests, causing exposure of the fruit trees to severe climatic fluctuations.

The closing paragraph of this interesting lecture is here cited as a fair sample of its style and tone.

"I hope I have said enough to prove that for prosperity and security, nations are mainly dependent upon the intellectual capacities and acquirements of their citizens. We have never known or heard of one that has not experienced its days of trial, and it cannot be supposed that our own country, whose hills and valleys now rejoice in the possession of peace and abundance, can always be exempt from calamity. If ever driven by adverse fortune to fearful extremity, happy will it be for her, if, in that day, like France at the crisis referred to, or like England—sustained during her long and dreadful conflicts by the resources furnished through her Watt—be rescued by her philosophers! Let us, therefore, like France, and the mighty people from whom we chiefly spring, use all our efforts to foster and diffuse the arts and sciences, and to banish the word *impossibility* from our vocabulary."

Dr. Emerson delivered an address, June 1, 1843, at Laurel Hill Cemetery on the completion of an unostentatious monument erected to the memory of Thomas Godfrey.

The reason for this tribute is stated in the address, substantially as follows:

One day while an ingenious young man, Thomas Godfrey, a glazier, was replacing a pane in a window on the north side of Arch street, opposite to a pump, a girl after filling her pail placed it on the sidewalk. Turning towards it he saw that the image of the sun was reflected from the window into the bucket of water, and from it back to his eye.* This simple observation led him to study the law of the reflection of light, and to invent a quadrant with speculums to take the distances of stars which he supposed might be of service at sea. The same year, 1730, he had made his reflecting instrument.† One was taken to the West Indies and used during the voyage to ascertain the latitude. It was brought back to Philadelphia before the end of February, 1731. The practical value of the instrument was thus demonstrated.

Although James Logan, in May, 1732, described the mariner's quadrant constructed by Godfrey in a letter to the celebrated mathematician, Dr. Edmund Halley, then President of the Royal Society of London, he did not obtain credit for his invention. It is believed that Dr. Halley

*John F. Watson, in his "Annals of Philadelphia," states this incident somewhat differently. According to his account, which seems to be accurate, Godfrey was glazing at Stenton, the residence of James Logan, and noticed the reflection of the sun's image from the window to a piece of fallen glass and from it to his eye. He immediately went into Mr. Logan's library and took from the shelf a volume of Newton's works to consult. Mr. Logan entered almost at the same time, and asked him the object of his search, and was much pleased with Godfrey's ingenuity, and from that time became his zealous friend.

In those days glazing was done by soldering the panes into the frame work. Glaziers were also plumbers, and did not paint.

† He lent one to Joshua Fisher for trial in his surveys of the Delaware. See Watson's "Annals of Philadelphia."

suppressed Mr. Logan's letter, and communicated the description of Godfrey's quadrant to Hadley, a mathematical instrument maker in London, who, after making slight mechanical changes in the instrument, obtained a patent for it. In this way Godfrey's invention came to be unjustly called Hadley's quadrant.

Dr. Emerson establishes Godfrey's right to priority of invention on the testimony of James Logan, Benjamin Franklin, Peter Collinson and others.

Thomas Godfrey was born in Bristol township, near Germantown, on his father's farm of 150 acres, in 1704, and died in 1749, and was buried there.* He was fairly educated, and was a member of Franklin's famous Junto. He taught himself to read Latin.

Mr. John F. Watson, the annalist, convinced of the wrong done to Godfrey, sought his grave, ascertained the inscription which had become illegible on the gravestone, and in 1838, at his own expense, had the remains with those of his wife, father and mother transferred to Laurel Hill Cemetery.

The Mercantile Library Association and certain inhabitants of Germantown jointly contributed means to erect a monument to Godfrey, the completion of which was the occasion of Dr. Emerson's address.

Possession of several hundred patrimonial acres in Kent county, Del., accounts for his attention to agricultural affairs. He made numerous and extensive experiments to ascertain the comparative value of different fertilizers. He erected a building on Frankford creek, Philadelphia, in which was manufactured, under the direct management of a Frenchman named Jourdan, a fertilizer called Jourdan's phosphate. This product was extensively used during several years. In 1844 or '45, two tons of Peruvian guano were brought to Philadelphia as a sample. At his suggestion he and his friend, Mr. D. B. Cummins, purchased each a ton and introduced it to the farmers of Delaware. On one of his farms he constructed a mill for crushing bones by horse power. The work was imperfectly done; but by treating the crushed bones with sulphuric acid and mingling the product with ashes and fine earth a fertilizer was produced which proved to be a good substitute for Peruvian guano, and cost much less. By observation and experiment he ascertained, in 1849, that the delightful and peculiar flavor of our so-called grass butter is due to the sweet-scented vernal grass—*Anthoxanthum odoratum*—which flourishes in pasture fields till about the end of May, and upon which the cows feed. He obtained from this sweet vernal grass an essential oil, and ascertained that it contains *benzoic acid*, upon which its flavor depends; and that a small quantity of benzoic acid administered to a cow imparted to the butter made from her milk the same flavor it has while sweet vernal grass forms part of her feed.† He delivered appropriate addresses before horticultural and agri-

* Watson's "Annals of Philadelphia."

† See, Letter, Oct. 31, 1849, from Dr. Emerson to the Commissioner of Patents. Report of the Commissioner of Patents for the year 1849, Part ii—Agriculture—pp. 372–75.

cultural societies at several places in Delaware and Pennsylvania, and published a pamphlet on the cultivation of cotton in the Middle States. He edited *The Farmer's Encyclopedia and Dictionary of Rural Affairs*, an octavo volume of 1173 pages, illustrated by seventeen plates, which was published by Carey & Hart, in 1841. In adapting it to American use, Dr. Emerson added to the original English text about thirty per cent. of the volume.

Although attentive to whatever related to agricultural improvements, he was seriously interested in medical affairs.

In 1845 the New York State Medical Society invited the medical institutions of the country to appoint delegates to meet in the city of New York on the first Tuesday of May, 1846, and form a National Medical Convention to devise measures to promote the common interests of the medical profession and improve medical education. Many prominent physicians, representing medical bodies in different parts of the United States, were present. Dr. Emerson, one of the delegates from the Philadelphia Medical Society, was with them.

On organizing the meeting it was found that 133 delegates from medical societies in sixteen of the twenty-nine States were duly accredited, and that seventy-five of them were from New York. This partial and unequal representation led a delegate to propose that the Convention should at once adjourn *sine die*. His proposition was not accepted. After due deliberation officers were elected, and committees were appointed to prepare a plan of organization, etc., and among them a committee to prepare a code of medical ethics to govern the medical profession of the United States. Dr. Emerson was appointed a member of it.

The several committees were instructed to report at a meeting of the Convention to be held on the first Wednesday of May, 1847, in Philadelphia.

The National Medical Convention met at the appointed time, May 5. Of 239 delegates elected to it from twenty-two States, including the District of Columbia, 175 were present.

The committees appointed in New York presented their reports, which were duly considered.

The Convention, by a resolution adopted May 7, became the American Medical Association. The new organization elected officers, appointed standing committees and adjourned to meet in Baltimore on the first Tuesday of May, 1848.

Dr. Emerson participated in the creation of the American Medical Association. In a note written by him on the cover of a copy of it, he claims that the Code of Medical Ethics was compiled exclusively by Dr. Isaac Hays and himself. The Association still holds its annual meetings, always to the advantage of the medical profession, and is recognized as authority on questions of medical policy in the United States.

Dr. Emerson was a member of its first Committee on Publication, 1847, and served on till 1853; of the Committee on Medical Sciences, and con-

tributed to its report of 1850, Vol. iii, pp. 91–94, "Observations on Vital Statistics;" of the Committee on Hygiene, 1851; and of the Committee of Arrangements, 1855.

Dr. Emerson was elected a fellow of the College of Physicians of Philadelphia, February, 1847. He never contributed to its Transactions. He was elected a delegate from the College to the American Medical Association in 1849, and in 1858; and to the National Quarantine and Sanitary Convention in 1857, and 1858.

He was a member of the Academy of Natural Sciences of Philadelphia from August, 1853; of the Philadelphia County Medical Society from 1857, of which he was President; and of the Medical Society of the State of Pennsylvania.

Dr. Emerson's medical practice from about 1828 to 1840 was lucrative and extensive. His interest in agricultural affairs, always notable, gradually increased with the lapse of time, and his interest in medical affairs gradually abated till he relinquished the practice about the year 1857.

Dr. Emerson, by invitation, began to live with Mr. Henry Seybert, at No. 926 Walnut street, in May, 1856. Apartments in the house were assigned to each proportionately. Dr. Emerson was the caterer, though they did not mess at the same table, and kept a detailed account of the household expenses which were periodically and equally shared. They lived together in perfect harmony eighteen years—till Dr. Emerson died.

Mr. Henry Seybert and Dr. Emerson were warm friends. Their close association is notable because their pursuits and aims in life were wide apart. Their mental characteristics were quite different. They were alike in condition. Both were unmarried, and both in easy circumstances. In some respects their tastes and ways were the same, simple, economical.

Dr. Emerson had a working knowledge of botany, mineralogy, geology and physics. Mr. Seybert had been educated in Paris, and trained in the School of Mines to be a chemist and mineralogist, and after his return home did some good work. In these scientific paths they were congenial. But Mr. Seybert was deeply imbued with religious sentiment.

While he was in Paris mesmerism attracted public attention, and he became interested in spiritualism.

He had read that "it is easier for a camel to pass through the eye of a needle than for a rich man to enter the kingdom of heaven." His construction of this sentence made him unhappy. He was so much tormented by the thought that all his attempts to lead a good life were useless as regards *future* existence because *he was rich*, that he consulted pious men on the subject, and among them the Archbishop of Rouen. By them he was assured that the sentence was addressed to the *sinful* rich *only*, and not to those who gave of their goods liberally to the poor.* Whether his many charities were prompted more by disinterested consideration for others than by this assurance is conjectural. Be this as it may,

* Obituary Notice of Henry Seybert, by Moncure Robinson. Read before the American Philosophical Society, Oct. 5, 1883.

Mr. Seybert was known for his charity and public spirit,* but most distinguished by his deep interest in a supposition or doctrine that after death and disintegration of his body by natural decay or cremation, a man's soul, wearing the carnal appearance of himself, may, at any time, be made manifest to the living through the medium of specially endowed persons, and in this manner communication with the world of spirits may be held. In this modern spiritualism he was a staunch believer. Shortly before his death he gave to the University of Pennsylvania $60,000 to found a chair of philosophy, on condition that the University should appoint a commission to investigate "all systems of morals, religion or philosophy which assume to represent the truth, and particularly of modern spiritualism." †

While Mr. Seybert was engaged in the study of spiritualism, Dr. Emerson, who had no respect for his friend's belief, was occupied in endeavoring to improve agricultural methods and in cultivating his several farms in Delaware.

His mother, Mrs. Ann Hayes, died in 1862, aged 86 years. Her long life was exemplary in every sense, unselfish and continuously kind and charitable. The positions occupied by her children are significant of the mother's attention and care for their welfare. To her Dr. Emerson late in life ascribed his first love for the British classical writers.

Society in Philadelphia was discordant at the outbreak of the great Rebellion, because the interests and affiliations of many of its residents were in the South and with the rebels. Those persons were openly defiant, threatening and at times belligerent. To determine if possible who were and who were not to be trusted, a few loyal men held midnight conclaves

* Among acts which may be ascribed to his public spirit was Mr. Seybert's unsolicited gift to the city. He substituted a new for a good old clock and bell which had long well served to ring out the hours, joyful news as well as alarms, from the State House steeple to very far-off dwellers in the city. Unexpectedly the sound of the Seybert bell is comparatively very feeble, scarcely audible more than 500 feet in any direction during the busy hours of the day, or at any time when there is a moderate breeze.

In the following humerous stanza, its author makes use of this circumstance to contrast the "clash and jingle" of St. Mark's chime of bells which greatly disturbed the neighbors at the time:

"There's a bell whose swinging gives out no ringing,
And I hear no dinging in the State House yard;
And where its rolling looks like tolling
I stand and tremble lest my hearing's hard;
For, with steeple rocking and hammer knocking,
And people mocking,
I hear no more
The low dull mutter
Those dumb lips utter
Than the stone Washington before the door."

† Preliminary Report of the Commission appointed by the University of Pennsylvania to Investigate Modern Spiritualism, in accordance with the bequest of the late Henry Seybert (page 5). J. B. Lippincott Company, Phila., 1887.

Henry Seybert died March 3, 1883, aged 82 years.

which ultimately resulted in the organization of the Union League of Philadelphia, December 27, 1862, the members of which were pledged to "unqualified loyalty to the government of the United States and unwavering support of its efforts for the suppression of Rebellion." *

Dr. Emerson, who was elected a member February 16, 1863, daily visited the Union League and participated in its proceedings till the end of his life.

Dr. Emerson did not devote his time and thought exclusively to the practice of medicine and agriculture. He was interested in questions of political economy, social science. He translated the second edition of Le Play's "Organization of Labor," a learned and valuable contribution to the literature of the subject. This work, the last from his pen, was published in 1872.

He died very suddenly in his office, July 2, 1874, near the end of the 79th year of age. His grave is next to that of Thomas Godfrey, Laurel Hill Cemetery.

He bequeathed his ample estate, including several farms, which together contain more than a thousand acres of arable land in Delaware, to his kinsmen.

His long life was virtuously spent, and so far he was above the bulk of mankind. Seemingly always under the influence of his early Quaker training by his mother, never manifesting the least pretension to piety, or solicitude about his future existence, his daily conduct was shaped in obedience to the precepts of the Decalogue and of Christianity. Naturally modest and considerate of the rights of others, he was never aggressive. A dignified and courteous demeanor, varied attainments and the easy flow of his conversation made him a welcome and frequent guest in the society of good and cultivated people.

A genius for persistent labor never permitted his talents, which were far above the average, to be idle. His career was marked by habitual industry and useful work rather than by special achievement in any of his pursuits. Though not a discoverer, or a great leader in science, his exemplary conduct and benevolent labors entitle him to general approbation, and his memory to our kindly respect.

Appendix.

A list of Dr. Gouverneur Emerson's publications :

"A Biographical Memoir of Dr. James Sykes, February, 1823." "Chapman's Journal of the Medical and Physical Sciences."

"Biographical Memoir of Dr. Samuel Powel Griffitts, 1827." "The North American Medical and Surgical Journal."

"Medical Statistics, being a Series of Tables showing the Mortality in

* Twenty-fifth Anniversary of the Organization of the Union League of Philadelphia, December 27, 1887. Press of J. B. Lippincott Company, Philadelphia, 1888.

Philadelphia and its Causes." "The American Journal of the Medical Sciences," November, 1827.

"Medical Statistics, consisting of Estimates relating to the Population of Philadelphia, with its Changes as Influenced by the Deaths and Births during Ten Years, viz., from 1821 to 1830 inclusive." "The American Journal of the Medical Sciences," November, 1831.

"Vital Statistics of Philadelphia for the Decennial Period from 1830 to 1840." "The American Journal of the Medical Sciences," July, 1848.

"Lecture on the Advantages Derived from Cultivating the Arts and Sciences." By G. Emerson, M.D. Delivered before the Philadelphia Mercantile Library Association, in the hall of the Musical Fund Society, December 8, 1839. Printed by A. Waldie, Philadelphia, 1840.

"An Address delivered at Laurel Hill Cemetery on the Completion of a Monument Erected to the Memory of Thomas Godfrey, June 1, 1843." By G. Emerson, M.D.

"The Farmer's Encyclopedia and Dictionary of Rural Affairs; embracing all the most recent discoveries in agricultural chemistry, adapted to the comprehension of unscientific readers, illustrated by numerous engravings of animals, implements and other subjects interesting to the agriculturist." By Cuthbert W. Johnson, Esq., F.R.S., Barrister-at Law; Editor of the "Farmer's Almanac;" corresponding member of the Agricultural Society of Edinburgh; the Horticultural Society of Maryland, etc. Adapted to the United States, by Gouverneur Emerson. 8vo, pp. 1173. Carey & Hart, Philadelphia, 1844.

"Address delivered before the Society for Promoting Agriculture of the County of Philadelphia, at their Annual Exhibition, at the Rising Sun Tavern, October 6, 1848." By Gouverneur Emerson, M.D. Henry C. Clark, Printer, Philadelphia, 1849.

"An Address delivered before the Delaware Horticultural Society at Wilmington, on the 24th of September, 1851." By Gouverneur Emerson, M.D.

"Report on the Agency of the Refrigeration Produced by Upward Radiation of Heat as an Exciting Cause of Disease." "Transactions of the American Medical Association," Vol. vi, 1853, pp. 139-152.

"An Address delivered before the Agricultural Society of Chester County, Pa., September 17, 1853." By Gouverneur Emerson, M.D.

"An Address delivered before the Agricultural Society of New Castle County, Del., at the Annual Exhibition held in Wilmington, September 12, 1855." By G. Emerson, M.D.

"An Address delivered before the Agricultural Society of Kent County, Del., October 15, 1857." By G. Emerson, M.D., of Philadelphia.

"Results of Extensive Experiments in the Use of Superphosphate of Lime, etc., communicated to the Agricultural Society of Kent County, Del." By Dr. G. Emerson, February 2, 1859.

"Jourdan's Ammoniated Superphosphate of Lime; its Nature and Uses;

with directions to farmers for applying it to their crops, and observations which cannot fail to impart much useful practical information."

[There is conclusive evidence that this pamphlet was written by Dr. Emerson.]

"Cotton in the Middle States; with Directions for its Easy Culture." By G. Emerson, M.D. Author of the "Farmer's and Planter's Encyclopedia," Philadelphia, 1862.

"Land Drainage." An address delivered before the Farmer's Club of Kent County, Del., at Dover, January, 1872. By G. Emerson, M.D., of Philadelphia. [Illustrated by a topographical sketch map of Kent county, Del.]

"The Organization of Labor, in accordance with Custom and the Law of the Decalogue; with a summary of comparative observations upon good and evil in the regime of labor, the causes of evil existing in the present time, and the means required to effect reform; with objections and answers, difficulties and solutions." By F. Le Play, Senator (of France), Inspector-General of Mines, Commissioner-General to the Universal Exposition (in Paris), of 1855, 1862 and 1867. Author of *Des Ouvriers Européens* and *La Reforme Sociale.*

"Les politiques veulent en un état bien règlé, plus des maitres des arts mechaniques, que de maitres des arts liberéaux." Richelieu (*Testament Polito*).

Translated by Gouverneur Emerson, M.D., member of the American Philosophical Society. From the French of the second revised and corrected edition published at Tours, in 1870. Claxton, Remsen & Haffelfinger, Philadelphia, 1872. 12mo, pp. 417.

Stated Meeting, Januarg 2, 1891.

Present, 17 members.

Mr. DUDLEY in the Chair.

Correspondence was submitted and accessions to the Library were announced.

A letter was received from Mr. L. Vossion, dated Philadelphia, December 20, 1890, accepting membership.

A circular was received in regard to the celebration of the seventieth birthday of Prof. Rudolph Virchow, from the Committee on the same in Berlin.

The report of the judges and clerks of the annual election was submitted, and the following members were declared the Officers and Council of the Society for the year 1891:

President.

Frederick Fraley.

Vice-Presidents.

E. Otis Kendall, Dr. Ruschenberger, J. P. Lesley.

Secretaries.

George F. Barker, Daniel G. Brinton, Henry Phillips, Jr., George H. Horn.

Curators.

Patterson Du Bois, J. Cheston Morris, Richard Meade Bache.

Treasurer.

J. Sergeant Price.

Councilors (for three years).

Aubrey H. Smith, George R. Morehouse, Samuel Wagner, William C. Cattell.

Councilor for two years, in place of Dr. Daniel R. Goodwin, deceased.

Dr. Charles S. Wurts.

Nominations for Librarian being in order, Mr. William P. Tatham nominated Mr. Henry Phillips, Jr.; Prof. E. D. Cope nominated Mr. Benjamin Smith Lyman.

The Secretaries presented a paper by Dr. J. Lindhal on a skull of a Megalonyx leidii, n. sp., for the Transactions. On motion, the communication was referred to a Committee of three members, to be appointed by the President, to examine and report upon.

(The President subsequently appointed Profs. Leidy, Lesley, and Heilprin as such Committee.)

Dr. J. Cheston Morris called the attention of the Society again to the subject of Vital Molecular Vibrations:

Force is not motion, as Dr. McLaughlin puts it, but that which causes motion or change in matter. While its true nature is unknown, the phenomena of the various physical forces correspond so completely with undulations or vibrations that they are recognized as such, the results of impulses brought to bear upon matter capable of atomic vibration; and the tendency of modern thought is more and more towards considering light, heat, electricity, chemical affinity and mechanic force as all of them essentially only modifications of one and the same force. But when we come to consider the phenomena of life, while we find that living bodies are all composed of material atoms similar to those of the inorganic world, another force or impulse seems to be at work suspending or reversing the ordinary action of the physical forces. It is characterized by acting, as they do, only under special conditions, viz., the presence of plasma or organizable matter, heat, oxygen, light, and a germ, itself the product of previous life. Withdraw any of these—the ordinary phenomena of inorganic matter present themselves. But whenever they are present, an organized form results which tends to follow the type of its parent forms. Fresh particles of matter are taken up and others are discharged; in other words, we have the phenomena of growth, development, secretion, excretion and of reproduction; all the physical laws and properties of matter are retained and followed, but they are subordinated to or coördinated with those of another force, which we call vital, organic or germ force, with its own laws as distinctly defined as those of chemistry or heat. It is just as unreasonable to deny the existence of the former as of the latter.

Hitherto the vibratory theory has only been applied to explaining physical phenomena. It remained for Dr. McLaughlin to extend its application to vital phenomena, by showing how completely it explains the phenomena of immunity from, and prevention of, infectious and contagious diseases by the law of *interference*. I wish to call your attention to a similar explanation of the phenomena of germ force and heredity by the law of *transference*. If two weights are suspended at proper distances from a cord fastened transversely between two pillars, and a third weight is similarly suspended between them, and motions imparted perpendicularly to each other to the two outer weights, these motions will be so transferred to the third weight as to cause it to describe a series of curves resulting from the impulses transmitted; or if a powder be dusted over a square tin plate, and the edge of the latter be touched at certain nodal points, the powder will arrange itself in certain lines and geometric figures. Is not this precisely what happens when the germ-cell and sperm-cell, the molecules of each vibrating in accordance with the impulses impressed upon it, unite in the production of the new germ, which in turn vibrates in accordance with these impulses, and proceeds accordingly to arrange and develop fresh molecules, forms and figures similar to its

antecedents? In this way we have the explanation of the germ resulting only as the harmonic product of suitable vibrations—of the hereditary transmission of qualities—and of the variations from type which occasionally occur. We have also the explanation of the cessation when life vibrations shall have been exhausted or transmuted into other forms of life itself, or so-called death. We have also the explanation of the periodicity of many, if not all, of the functions of living bodies, both in health and disease. Likewise, we have an explanation of the effects of drugs on certain organs and functions. To say "that opium produces sleep on account of its somniferous tendency" is to veil our ignorance very thinly. But, if we suppose that nerve tissue has a certain vibration, so differing in period from that of the morphia molecule which we introduce into the blood, that until the latter is eliminated or changed the nerve vibrations are modified or suspended, we can form a much more rational conception of the effect of opium. So also with the selection of appropriate food from a common plasma by different organisms, and also from the blood by the various organs and structures of the body. In fact, a new field is opened to biologists, naturalists, physiologists and physicians whose limits are at present far beyond our ken.

New nomination No. 1217 was read.

The Committees appointed at last meeting, of which Dr. Cope and Mr. Biddle were respectively Chairmen, were continued.

And the Society was adjourned by the presiding member.

Stated Meeting, January 16, 1891.

Present, 73 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted and accessions to the Library were reported.

Mr. L. Vossion and Prof. G. S. Fullerton took their seats.

A circular was received from the Museo de la Plata, Argentine Republic, requesting exchanges, also sending one of its publications.

Letters of acknowledgment were received from the Geological Survey of India, Calcutta (131, 132, 133); Taschkent

Observatory, Taschkent, Russia (131, 132, 133); K. K. Geologische Reichsanstalt, Drs. Friederich Müller, Dionys Stur, Vienna (131, 132, 133); Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. O. (131, 132, 133); Mr. Joseph Prestwich, Shoreham, Kent, England (127, 128, 129, 130); Chicago Academy of Science, Chicago (130, 131, 132, 133).

Accessions to the Library were received from the Académie R. de Belgique, Bruxelles; Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. O.; Verein für Erdkunde, Halle a. S.; Physikalische-Medicinische Societät, München; Prof. Ferdinando Bosari, Naples; R. Accademia dei Lincei, Rome; Osservatorio Astronomico, Turin; Société de Géographie, Lille; Commission des Annales des Mines, Rédaction "Cosmos," Paris; R. Astronomical Society, Editors of the "Geological Magazine," "Nature," London; Prof. George M. Dawson, Ottawa, Canada; Museum of Comparative Zoölogy, Harvard University, Cambridge, Mass.; American Statistical Association, Boston; Editors of "American Journal of Science," Yale College, New Haven; University of State of New York, Albany; New York Historical Society, New York; Franklin Institute, Engineers' Club, College of Pharmacy, Editors of the "Homœopathic Physician," "Medical and Surgical Reporter," "Medical News," American Bar Association, Mercantile Library, Messrs. J. E. Ives, Henry Phillips, Jr., Philadelphia; U. S. Naval Institute, Annapolis; Johns Hopkins University, Editors of "American Journal of Philology," "American Chemical Journal," Baltimore; Department of State, U. S. Naval Observatory, Smithsonian Institution, Anthropological Society, Hydrographic Office of U. S. Navy, Prof. Albert S. Gatschet, Washington, D. C.; Public Library of Cincinnati; Musée de la Plata.

The stated business of the meeting was then taken up, and, on motion, the Society resolved to proceed to the election of Librarian for the ensuing year. It was resolved to conduct the same by ballot, and that the polls should remain open thirty minutes, during which the Society took a recess to enable the members present to deposit their votes.

J. Sergeant Price, Esq., and Dr. Persifor Frazer were appointed by the Chair as tellers to conduct the said election; who, after the polls had been closed, reported to the President that Mr. Henry Phillips, Jr., had received 39 votes, and Mr. Benjamin Smith Lyman, 31 votes; whereupon the President declared Mr. Henry Phillips, Jr., to have been duly elected Librarian of the Society for the ensuing year.

[Secretary Phillips being present and not voting.]

On motion, the President was authorized to appoint at his leisure the Standing Committees of the Society, which he subsequently selected, as follows:

Finance.

William B. Rogers, Philip C. Garrett, Charles S. Wurts.

Hall.

J. Sergeant Price, William A. Ingham, Charles A. Oliver.

Publication.

Daniel G. Brinton, George H. Horn, Samuel Wagner,
Patterson DuBois, Horace Jayne.

Library.

Edwin J. Houston, William V. McKean, William John Potts,
Jesse Y. Burk, William H. Greene.

The Committee on the Paper of Dr. J. Lindahl reported the same to be worthy of publication, which was so ordered, and the Committee was discharged.

Prof. Cope's Committee and Mr. Arthur Biddle's Committee reported progress and were continued.

Pending nomination, No. 1217, and new nominations, Nos. 1218 and 1219, were read.

And the Society was adjourned by the President.

Stated Meeting, February 6, 1891.

Present, 17 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted and accessions to the Library were announced.

The President announced the death of Hon. George Bancroft (January 17, 1891), æt. 91, and, on motion, was authorized to appoint a suitable person to prepare the usual obituary notice. Prof. J. Bach McMaster was subsequently appointed.

Pending nominations 1217, 1218 and 1219 were read.

Mr. Arthur Biddle presented a report from the Committee on the Etting Bequest, recommending that the Society decline to take any part in the litigation arising out of the caveat filed to the last two codicils of the will of F. M. Etting, deceased, now pending, and that the Society decline to act as Trustee under said will.

On motion of Mr. Horner, the report was accepted.

On motion of Dr. Morris, the Society declined to litigate under the caveat to the last two codicils now pending.

On motion of Mr. Horner, the Society declined to accept the trust.

On motion of Mr. Biddle, the Secretaries were requested to notify the executors of the action of the Society.

And the Society was adjourned by the President.

Stated Meeting, February 20, 1891.

Present, 12 members.

Mr. WILLIAM A. INGHAM in the Chair.

The death of Prof. Alexander Winchell, Ann Arbor, Mich., February 18, 1891, æt. 72, was reported.

Correspondence was submitted and accessions to the Library were reported.

The Free Public Library, Jersey City, was placed on exchange list to receive Proceedings.

The Library Committee reported suggestions to facilitate the replacing of the books on the shelves in the Society's Library; that the Library room should be finished; that bookcases to contain works of reference should be placed in the meeting room, and that the Society should appropriate $500 for the purchase of new books.

After this latter recommendation had been presented, a letter was read from the Treasurer requesting that no appropriation should be made for that purpose for the present, giving his reasons for the same.

The Committee's recommendation was postponed for the present.

The minutes of the Board of Officers and Council were submitted.

Pending nominations Nos. 1217, 1218 and 1219 were read, spoken to, and balloted for, and No. 2187, Commander F. M. Green, U. S. School Ship *Saratoga*, was declared elected a member of the Society.

And the Society was adjourned by the presiding member.

Stated Meeting, March 6, 1891.

Present, 19 members.

President, Mr. FRALEY, in the Chair.

Correspondence was presented and donations to the Library reported:

A letter from Theodore Turrettini (Geneva, February 8, 1891) accepting membership.

A circular in relation to the formation of State library associations.

A circular in relation to the Fifth International Geographical Congress to be held in Washington, August 26, 1891.

A circular from the Society of Borda, Dax, announcing the death of M. Henry du Boucher, a former President.

A circular from l'Académie des Sciences, etc., de Belgique, announcing the death of Lieut.-General J. B. I. Liagre, its Permanent Secretary.

A letter from R. Brabbée (Vienna VIII, Kochgasse 27) enclosing a specimen of his new method of reckoning.

A letter from Dr. Antonio Del Bon (Padua) in relation to Prof. P. E. Chase's paper on "English and Sanskrit Root-analogues."

Letters from August Tischner (Leipzig) on "The Celestial Phenomena," "The Movements of the Sun in Space," "The Movements of the Planets," "The Solar System" and "The Elements of the Elliptic Orbits."

A paper by Dr. D. G. Brinton entitled "Some Vocabularies from the Musquito Coast" was presented.

Dr. J. Cheston Morris presented a pamphlet entitled "Tepeu" (by Dr. Thomas E. Pickett), on the hypothetical migrations of the *Morbus Americanus*, upon which he made some remarks, referring to the account given by Josephus of the evils caused the Jewish youth by the entrance of the Midianitish women into the Hebrew camp.

Dr. J. Cheston Morris made some remarks on "Hebrew Phonetics," and was followed by Prof. J. P. Lesley upon the same subject.

Prof. Lesley made some remarks on a report by Mr. John Fulton (Johnstown, Pa.) on the diminution of the supply of natural gas and its ratio.

Dr. Morris called attention to the case of the miners recently entombed at Jeanesville, Pa., for nineteen days almost without food. "They were found in a breast near where they had been working. The water from an abandoned mine at a much higher level, estimated at 145 feet, had entered the mine and

imprisoned them. This is the longest period in the history of mining in Pennsylvania of preservation of life under such circumstances. And in this connection it may be also well consider that in no case on record has an attempt at cannibalism been made by the sufferers. This fact should be placed to the credit of a class of men too often unjustly despised and maligned. When these men were borne alive from the mine, the whole crowd of bystanders accompanied them to the temporary hospital singing the doxology.

"The level of the water in abandoned mine dropped slowly, day by day, in consequence of pumping incessantly, at rates varying from two to fourteen feet."

New nominations Nos. 1220, 1221 and 1222 were read.

The Committee on Improved Accommodations reported progress.

Prof. Cope, from the Committee appointed December 19, 1890, to consider the improvement of the Proceedings of the Society, presented a report.

Considerable discussion took place upon the same, and the following resolution was adopted, *nem. con.*:

Resolved, That the Report and Resolutions accompanying be recommitted to the same Committee, and the Committee be continued in order to obtain fuller data as to the matters therein referred to; and the Committee be instructed to present its Report at the first meeting of the Society in May, 1891 (May 1).

On motion, the Society

Resolved, That the Treasurer, J. Sergeant Price, Esq., be authorized and directed to give notice to the City of Philadelphia to quit the rooms in the building of the Society now occupied by it for the use of the courts and its officers, at the end of the present tenancy, viz., on the 1st of July, 1891.

And the Society was adjourned by the President.

Stated Meeting, March 20, 1891.

Present, 3 members.

Dr. J. Cheston Morris in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the Ministère des Travaux Publics, Paris; Meteorological Office, London.

Letters of acknowledgment were received from Royal Society of Victoria, Melbourne, Australia (131, 132, 133); Mr. Samuel Davenport, Adelaide, Australia (130); Royal Society of N. S. Wales, Sydney, Australia (131, 132, 133); Tokyo Anthropological Society (131, 132, 133); Société R. des Sciences, Upsal, Sweden (130, 131, 132, 133, and Trans. xvi, 3); Friesch Genootschap, Leuwarden (133); R. Accademia degli Agiati, Rovereto, Austria (129, 130, 132, 133); Prof. Hermann Rollett, Vienna (129, 130, 132, 133); Prof. Hauer, Vienna, Austria (132, 133); Naturwissenschaftliche Wochenschrift, Berlin (131, 132, 133); K. Bibliothek, Berlin (131, 132, 133); Naturforschende Gesellschaft, Emden (131, 132, 133); Prof. E. Hœckel, Jena (131, 132, 133); Dr. Julius Platzmann, Leipzig (131); Verein für Vaterländische Naturkunde, Stuttgart (131, 132, 133); Am. Geog. Society, New York (131); Mr. L. Vossion, Philadelphia (131, 132, 133, 134); Denison Scientific Association, Granville, O. (131, 132, 133); Michigan State Library, Lansing (131, 132, 133, 134); Museo National de Buenos Aires (125, 126, 127, 128, 129, 131, 132, 133).

Letters of acknowledgment (134) were received from Mr. J. M. Le Moine, Quebec; Toronto University Library, Canadian Institute, Sir Daniel Wilson, Toronto; Geological Survey, Ottawa; Maine Historical Society, Society of Natural History, Portland, Me.; New Hampshire Historical Society, Concord; Dr. C. N. Hitchcock, Hanover, N. H.; Amherst College, Boston Society of Natural History, Mass. Historical Society, Athenæum, Messrs. T. M. Drown, Robert C. Winthrop, S. P.

Sharples, Boston; Museum of Comparative Zoölogy, Profs. A. Agassiz, Robert N. Toppan, Cambridge; The Essex Institute, Salem; American Antiquarian Society, Worcester; Free Public Library, New Bedford; Mr. James B. Francis, Lowell; Prof. Pliny Earle, Northampton, Mass.; New Haven Colony Historical Society; Connecticut Historical Society, Hartford; Mr. George F. Dunning, Farmington, Conn.; New York State Library, Albany; Hamilton College, Clinton; Profs. T. F. Crane, J. M. Hart, B. G. Wilder, Ithaca; Vassar Brothers' Institute, Poughkeepsie; Rochester Academy of Science; Library of U. S. Military Academy, West Point; The Oneida Historical Society, Utica, N. Y.; New York Hospital, University of the City of New York, Dr. John J. Stevenson, Columbia College, Gen. Henry L. Abbot, Meteorological Observatory, American Museum of Natural History, New York; New Jersey Historical Society, Newark; Free Public Library, Jersey City; Prof. C. A. Young, Princeton; Mr. Isaac C. Martindale, Camden, N. J.; Dr. Robert H. Alison, Ardmore; Mr. Burnet Landreth, Bristol; Dr. Martin H. Boyè, Coopersburg; Mr. Eckley B. Coxe, Drifton; Drs. Traill Green, J. W. Moore, Thomas C. Porter, Easton; Mr. Andrew S. McCreath, Harrisburg; Haverford College; Drs. Allen C. Thomas, Isaac Sharpless, Lyman B. Hall, Haverford College; Mr. J. N. Fulton, Johnstown; Linnean Society, Lancaster; Mr. P. F. Rothermel, Linfield; Messrs. Heber S. Thompson, P. W. Sheafer, Pottsville; Mr. M. Fisher Longstreth, Sharon Hill; Lackawanna Institute of History and Science, Scranton; Philosophical Society, Messrs. Washington Townsend, Philip P. Sharples, West Chester, Pa.; Library of the Pennsylvania Hospital, Engineers' Club of Philadelphia, Philadelphia Library, Wagner Free Institute of Science, Zoölogical Garden, Franklin Institute, Academy Natural Science, Messrs. John Ashhurst, Jr., Andrew A. Blair, Charles Bullock, Edwin J. Houston, S. Castner, Jr., Thomas M. Cleemann, C. S. Dolley, Samuel Dixon, Patterson Du Bois, Frederick Fraley, Persifor Frazer, George Friebis, George S. Fullerton, Horace Howard Furness, H. D. Gregory, F. A. Genth,

Fred. A. Genth, Jr., Edward Hopper, W. A. Ingham, William W. Jefferis, W. W. Keen, J. P. Lesley, John Marshall, Geo. R. Morehouse, James T. Mitchell, E. Y. McCauley, Charles A. Oliver, J. Sergeant Price, Robert Patterson, William Pepper, Henry Phillips, Jr., Franklin Platt, C. N. Peirce, W. S. W. Ruschenberger, Henry Reed, Theo. D. Rand, James W. Robins, L. A. Scott, Benjamin Sharp, Albert H. Smyth, Aubrey H. Smith, H. Clay Trumbull, Samuel Wagner, William H. Wahl, Henry Willis, Mrs. Helen Abbott Michael, Philadelphia; Rev. F. A. Mühlenberg, Reading, Pa.; U. S. Naval Institute, Annapolis; Peabody Institute, Maryland Institute, Maryland Historical Society, Baltimore, Md.; Bureau of Ethnology, U. S. Geological Survey, Smithsonian Institution, U. S. Signal Office, U. S. Naval Observatory, Surgeon-General's Office, Anthropological Society, Patent Office, Rt. Rev. John J. Keane, Messrs. Charles A. Schott, H. Haupt, Albert S. Gatschet, Garrick Mallery, W. Strong, Washington, D.C.; Prof. J. C. White, West Virginia University, Morgantown, W. Va.; University of Virginia, University of Virginia P. O.; Mr. Jed. Hotchkiss, Staunton, Va.; Elliott Society of Science and Art, Charleston, S. C.; Georgia Historical Society, Mr. William Harden, Savannah, Ga.; University of Alabama; Denison Scientific Association, Granville; Cincinnati Society Natural History, Cincinnati Observatory; Rev. Henry S. Osborn, Oxford; Dr. E. W. Claypole, Akron, O.; Dr. Robert Peter, Lexington, Ky.; Athenæum, Columbia, Tenn.; University of Tennessee, Knoxville, Tenn.; University of Illinois, Champaign, Ill.; The Newberry Library, Chicago, Ill.; Dr. John L. Campbell, Crawfordsville, Ind.; State Historical Society of Wisconsin, Madison; Prof. J. C. Branner, Little Rock, Ark.; Col. William Ludlow, Gen. W. F. Raynolds, Detroit; Prof. Alexander Winchell, Ann Arbor, Mich.; Colorado Scientific Society, Denver; Kansas State Historical Society, The Kansas Academy of Science, Topeka; Observatorio Astronómico National Mexicano, Tacubaya, Mexico.

Accessions to the Library were reported.

Pending nominations 1220, 1221, 1222, and new nominations 1223, 1224, 1225 and 1226 were read.

And the Society was adjourned by the presiding member.

Stated Meeting, April 3, 1891.

Present, 13 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted.

Accessions to the Library were reported.

Prof. Lesley read an obituary notice of the late Peter W. Sheafer (b. March 31, 1819; died at Pottsville, March 26, 1891).

The death of Dr. Thomas B. Reed was announced (Philadelphia, April 1, 1891, æt. 59).

Prof. Lesley read a paper "On An Important Boring Through 2000 Feet of Trias in Eastern Pennsylvania," which was followed by some remarks on the subject by Mr. B. S. Lyman.

Pending nominations, Nos. 1220, 1221, 1222, 1223, 1224, 1225 and 1226 were read.

The report of the Trustees of the Building Fund was presented.

And the Society was adjourned by the President.

Stated Meeting, April 17, 1891.

Present, 13 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

A letter was received from the American Consul General, Melbourne, Australia, asking the Society to participate in a

scientific expedition to the Solomon Islands and other places, with a view of collecting ethnological and anthropological specimens.

A circular was received from the Royal Society of New South Wales, offering its medal and money prize, for the best communication containing the results of original research or observation upon scientific subjects.

An invitation was received from the Hungarian Committee to attend the Second International Ornithological Congress, which will be held in Budapest at Whitsuntide, 1891.

Letters were received from the Société Hongroise de Géographie, and from the "Journal of Comparative Neurology," Cincinnati, Ohio, asking for exchanges, which were so ordered.

Letters of envoy were received from the Royal Society of New South Wales, Sydney; Musée Teyler, Haarlem; Nederlandsche Letterkunde, Leiden; Ministère de l'Instruction Publique, Paris; Bath and West and Southern Counties Societies, Bath, England; Royal Statistical Society, London; Mr. Frank Vincent, New York; Department of the Interior, Smithsonian Institution, Washington, D. C.

Letters of acknowledgment were received from the Tokyo Library (131, 132, 133); Université Royale, Lund, Sweden (130, 131, 132, 133); Physikalisch-Medizinische Societät, Erlangen (131, 132, 133); K. Sächs. Alterthumsverein, Dresden (131, 132, 133); Oberhess. Gesellschaft für Natur- und Heilkunde, Giessen (131, 132, 133); Prof. Otto Bottlingk, Leipzig (131, 132, 133); K. K. Sternwarte in Prag (130); Museum d'Histoire Naturelle, Strasburg (131, 132, 133); Naturforschende Gesellschaft, Schweiz. Naturforsch. Gesellschaft, Bern (131, 132, 133); Biblioteca Nazionale Centrale, Firenze (131, 132, 133); R. Comitaté Geologico D'Italia, Rome (131, 132, 133).

Mr. R. Meade Bache read a paper on "Possible Sterilization of City Water," which was followed by a discussion.

Pending nominations 1220, 1221, 1222, 1223, 1224, 1225 and 1226, and new nominations Nos. 1227, 1228 and 1229 were read.

And the Society was adjourned by the President.

Stated Meeting, May 1, 1891.

Present, 13 members.

President, Mr. FRALEY, in the Chair.

Letters of envoy were received from the K. Akademie der Wissenschaften, Vienna, Austria; Société des Sciences Naturelles et Archéologiques de la Creuse, Guéret, France.

Letters of acknowledgment were received from the Naturhistorische Gesellschaft, Hanover, Prussia (131, 132, 133); R. Accademia dei Lincei, Prof. G. Sergi, Rome (131, 132, 133); Marquis Antoine de Gregorio, Palermo, Sicily (131, 132, 133); Société Nationale des Sciences Naturelles et Mathematiques, Cherbourg, France (131, 132, 133); Société des Sciences Naturelles et Archéologiques de la Creuse, Guéret, France (131, 132, 133); Prof. Léon de Rosny, Paris (131); Société Académique, Troyes (131, 132, 133); Société Polymathique de Morbihan, Vannes (131, 132, 133); Sir J. W. Dawson, Montreal (134); State Library of Massachusetts, Boston (134); Prof. Elihu Thomson, Swampscott, Mass. (134).

At request of the Kg. Norske Videnskabers Selskab, Throndhjem, Norway, it was placed on list to receive Proceedings from 131.

The following societies were placed on the exchange list to receive Proceedings from No. 131:

K. Sächs. Meteorologische Institut, Leipzig; K. Sächs. Sternwarte, Leipzig; Académie des Sciences, etc., Angers, France; Schlesische Gesellschaft für Vaterländische Kultur, Breslau, Germany; Società Italiana delle Scienze (5 Piazza S. Pietro in Vincoli), Rome, Italy; Naturwiss. Verein, Regensburg, Germany; Bureau für Wetter Prognose, Leipzig, Saxony; Naturhist. Landes-Museum, Klagenfürt, Austria; Société Géologique de Normandie, Havre, France.

An engraved portrait of the late Prof. Von Rath was presented by his widow.

The following deaths of members were announced:

Rev. S. S. Lewis (Cambridge, England), March 31, 1891.

Dr. John LeConte (Berkeley, Cal.), April 29, 1891, æt. 73 (b. Dec. 4, 1818).

Dr. Joseph Leidy (Philadelphia), April 30, 1891 (b. Sept. 9, 1823).

On motion, the President was authorized to appoint suitable persons to prepare the usual obituary notices of Dr. Leidy and Dr. LeConte.

Prof. Lesley read a paper on "Artesian Wells in Philadelphia, Norristown, Montgomery and Delaware Counties," with notes by Prof. Oscar C. S. Carter.

Prof. Lesley presented a paper by Prof. Oscar C. S. Carter on "The Feldspar Bed in the Laurentian Gneiss near Lafayette Station."

Mr. Holman made an oral communication in relation to a new microscope, lately invented by him, by which objects distant from its front lens over two and a half feet could be readily examined in their habitat. For example, at that distance a salamander of a few inches in size would appear some thirty inches in length, and its whole circulation of blood would be plainly visible. The instrument uses a photographic lens as an object glass, and is really a short-focus telescope.

Pending nominations Nos. 1220 to 1229 (inclusive) were read.

Mr. J. Sergeant Price, the Treasurer, having reported to the Society that he had received through its attorney, Mr. John H. Harjes, of Paris, the sum of three thousand eight hundred and fifty-five dollars and forty-two cents, the full amount of the legacy of twenty thousand francs (at the exchange of 5.18¾ francs per docia) given to it by the will of the late Mr. Auguste Carlier, of Paris, a member of our Society, submitted the following resolutions, which were unanimously adopted:

Resolved, That the thanks of the Society be returned to Mr. Louis Vossion, the French Consul at Philadelphia, for his aid in preparing the necessary papers and certificates therein for presenting our claim for said legacy to Mr. P. Massion, of Paris, the Executor of Mr. Auguste Carlier; he as a member of our Society declining to make any charge therefor for fees and expenses.

Resolved, That the thanks of the Society be returned to Mr. John H. Harjes, of the firm of Messrs. Drexel & Co., for his valuable services as our representative in Paris, in obtaining from Mr. P. Massion, the Executor of Mr. Auguste Carlier, the legacy of twenty thousand francs given to us by his will and remitting the same to us without any charge for the time and care given to our interests, which acts of kindness are highly appreciated by the Society.

The Committee on Extended Accommodations reported progress.

The deferred business being in order, the report of the Committee submitted March 6, 1891, was taken up.

Prof. Cope moved that the consideration of the same be postponed until the next regular meeting of the Society, and that notice thereof should be placed upon the meeting postal-cards.

Mr. Price moved, as a substitute and amendment, that the consideration of the report should be postponed until the first regular meeting in November, 1891.

The amendment, being put to a vote, was declared carried.

The resolution as amended was then unanimously adopted.

And the Society was adjourned by the President.

Stated Meeting, May 15, 1891.

Present, 19 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows: A circular was received from the Observatorio de San Fernando announcing the death of the Director of the Observatory, Sr. D. Cecilio Pujazon.

Letters of envoy were received from the K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Royal Statistical Society, London.

Letters of acknowledgment were received from the Linnæan Society of New South Wales, Sydney (130); Rhode Island Historical Society, Providence (134); Prof. O. N. Rood, New York Academy of Sciences (134); Dr. Morris Longstreth, Messrs. John R. Baker, J. S. Harris, George de B. Keim, George Stuart, College of Pharmacy, Philadelphia (134); State Library of Pennsylvania, Harrisburg (134); Mr. John F. Carll, Pleasantville (134); Prof. J. T. Rothrock, West Chester (134); Wyoming Historical and Geological Society, Wilkesbarrè (134); Signal Office, Washington (131, 132, 133, and Transactions xvi, 1, 2, 3); Leander McCormick Observatory, University of Virginia (134); Denison Scientific Association, Granville, O. (134); Davenport Academy of Sciences, Davenport, Iowa (134); Observatorio Nacional de Tacubaya, Sociedad Cientifica "Antonio Alzate," Mexico (134); Museo Michoacano, Morelia; Bishop Crescencio Carrillo, Merida, Yucatan (134).

Dr. Ruschenberger read an obituary notice of the late Dr. Gouverneur Emerson.

The death of Julius E. Hilgard (Washington, D. C.), May 2, 1891, was announced.

The President reported that he had appointed Dr. Ruschenberger to prepare the obituary notice of the late Dr. Leidy, and Prof. Barker that of the late Dr. LeConte (Berkeley, Cal.).

Mr. R. Meade Bache read a paper entitled "A Fragment of Objectionable University-Extension Teaching."

The minutes of the Board of Officers and Council were submitted.

Pending nominations Nos. 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228 and 1229 were read, spoken to and balloted for.

At the call of Committees, Prof. E. J. Houston, Chairman, reported a minute of resolutions adopted at the last meeting of the Committee on Library, but the hour of 10 P.M. having arrived, after which, by the laws of the Society (Chapter ix, § 5), it is not permitted to take up new business, the considera-

tion of the Report and the matters therein contained, was postponed, on motion, to an adjourned meeting of the Society to be held at its Hall on May 29, 1891, at 8 P.M.

Secretaries Barker and Brinton, the tellers appointed to conduct the balloting for members, reported the following to have been duly elected members:

2188. Dr. René Gregory, Leipzig.

2189. Prof. Henry W. Spangler, University of Pennsylvania, Philadelphia.

2190. Prof. A. de Quatrefages, Membre de l'Institut, Paris, France.

2191. Sir Robert S. Ball, Astronomer Royal for Ireland, Dublin.

2192. Prof. Charles E. Munroe, Newport, R. I.

2193. Right Rev. William Stubbs, LL.D., D.D., Bishop of Oxford, England.

2194. Dr. E. T. Hamy, Conservator du Musée du Louvre, Paris, France.

2195. Prof. Jules Oppert, Membre de l'Institut, Paris, France.

2196. Prof. Gaston Maspero, Paris, France.

And the Society was adjourned by the President.

An Adjourned Meeting was held May 29, 1891.

Present, 11 members.

President, Mr. FRALEY, in the Chair.

The President stated the object of the meeting.

Prof. Edwin J. Houston, Chairman, read the following ex-

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tract from the minutes of the last meeting of the Committee on Library:

The Library Committee respectfully reports to the Society that it is unable to understand the plans of the Committee on Extended Accommodations as regards the general character of the new bookcases to be furnished, their location, number and size.

The Library Committee cannot intelligently carry on the work delegated to it by the Society, unless its duties and those of the Committee on Extended Accommodations be clearly defined by the Society.

A general discussion took place, and the Chairman of the Committee on Extended Accommodations explained the work and the plans of the Committee.

Prof. Houston stated the points at issue to be three, viz.:

1. Does the Society desire all its books to be placed in the new Library room? or,
2. Does it wish any in the North room? or,
3. Does it wish any in the Meeting room.

On motion of Dr. Morris it was, *nem. con.:*

Resolved, That the stock of publications issued by the Society shall be placed in a portion of the North room.

On motion of Dr. Hayes it was, *nem. con.:*

Resolved, That the Committee on Extended Accommodations be directed to locate and construct cases for books, and cabinets, in accordance with plans to be approved of by the *Library Committee.*

On motion of Prof. Smyth it was, *nem. con.:*

Resolved, That Daniel G. Brinton and Henry Phillips, Jr., and each of them, be appointed delegates to represent this Society at the meeting at Moscow, this year, of the Congres International d'Anthropologie et Archéologie Prehistoriques, provided that the said appointment shall entail no expense whatever upon the Society.

And the Society was adjourned by the President.

JAN 28 1892

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXIX. JULY TO DECEMBER, 1891. NO. 136.

Notes on Calospasta Lec.

By George H. Horn, M.D.

(*Read before the American Philosophical Society, October 2, 1891.*)

Some years ago, in a critical review of the genera of Meloidæ, it seemed evident, from the modifications of the form of the tarsal claws, that some genera remained to be discovered to fill the gaps existing. These forms were indicated at the time and one of them has already been found. Another of the missing links must come in the vicinity of the genus under discussion and is really foreshadowed in the slight claw modifications already observed. That the material may be at hand and ready for use in the event of further discoveries is my excuse for presenting this short paper for the consideration of those interested.

CALOSPASTA LEC.

In the *Trans. Am. Ent. Soc.*, 1878, p. 60, I gave a brief table of the species then known to me. Since then another species has been described (*loc. cit.*, 1883, p. 312).

Two more new species have recently been collected, both from California, which, with the one not included in my previous table, will require some modification of it.

1. Spurs of hind tibiæ slender and not very dissimilar 2
   Spurs of hind tibiæ dissimilar, the inner slender, the outer cylindrical and truncate..... 6
2. Elytra strongly costate ..... 1. **mirabilis.**
   Elytra not costate..... 3
3. Median line of front deeply impressed; head red..... 2. **histrionica.**
   Median line of front not at all impressed; head and thorax dark blue or green 4
4. Median line of thorax impressed; thorax not longer than wide; color green..... 3. **viridis.**
   Median line of thorax not impressed..... 5

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5. Thorax narrow, longer than wide; elytra ornate.
   Head and thorax obviously punctate..... 4. **elegans.**
   Head and thorax quite smooth..... 5. **perpulchra.**
   Thorax short, nearly twice as wide as long; black, subopaque. 6. **Fulleri.**
6. Body above and beneath entirely black..... 7. **moesta.**
   Thorax red.
   Head and thorax sparsely but distinctly punctate, each punctured with a short, black, neat hair..... 8. **Morrisoni.**
   Head and thorax absolutely smooth, without hair. 9. **nemognathoides.**

C. mirabilis Horn, *Trans. Am. Ent. Soc.*, 1870, p. 93.

In this species the antennæ are filiform, the joints closely articulated.

The anterior tarsi of the male are simple, the last ventral segment with a shallow semicircular emargination.

Occurs in Southwestern Utah, Mojave Desert and San Diego, Cal., Rock Spring and near Yuma, Ariz.

C. histrionica, n. sp.

Piceous black, moderately shining, head red, humeri triangularly orange yellow. Antennæ black, filiform, joints moderately closely articulated; head oval, smooth, with but few punctures; median line deeply impressed, hind angles rounded, mouth parts piceous; thorax longer than wide, much narrowed at anterior half; disk feebly convex, transversely depressed in front, a feeble median impression posteriorly, surface almost entirely smooth; elytra nearly twice as wide at base as the thorax, a faint slender costa on each side; surface scabrous, the humeri nearly smooth; body beneath piceous black, shining. Length .34–.54 inch; 8.5–14 mm.

Male.—First three joints of the anterior tarsi thickened, gibbous on the upper side, with a deep groove producing a bilobed appearance. Last ventral with a small triangular notch.

Female.—Anterior tarsi simple. Last ventral entire.

The form of the anterior tarsi of the male is a repetition in a less marked manner of that observed in Eupompha, while the form of the head, especially in reference to the median groove of the front, is seen in both Eupompha and Tegrodera.

It seems probable that species will yet occur requiring the union of the three genera, as all of them are characterized by the claws being unequally cleft, the lower portion shorter than the upper and connate with it.

Collected near San Diego, Cal. For specimens I am indebted to the kindness of Dr. C. V. Riley.

C. viridis Horn, *Trans. Am. Ent. Soc.*, 1883, p. 312.

Antennæ rather stoutly filiform, the joints closely articulated, 4–10 not longer than wide.

The thorax is wider than long, the median line impressed.

The male has simple anterior tarsi. The last ventral is broadly triangularly emarginate and impressed along the middle.

This species is notable in having the claws cleft very near the tip, so that the under portion is but little shorter than the upper.

Occurs in Colorado and New Mexico. Collected by Prof. F. H. Snow.

C. elegans, *Lec. Ann. Lyc.*, v, p. 161; *Proc. Acad.*, 1853, p. 341; var. *humeralis* Horn, *Trans. Am. Ent. Soc.*, 1870, p. 93.

Antennæ filiform, moderately closely articulated, joints all longer than wide. On each side of the front, at the insertion of the antennæ, is a gibbosity causing a deep depression above the clypeus.

When fully colored, the dull blue elytra have a yellow vitta of irregular form starting from the humeri, continuing closer to the side than the suture and with an interruption near the apex. The vitta may be reduced in size until there remains merely a triangular humeral spot.

The males have the anterior tarsi dilated, not very notably except the first joint; there is, however, no depression above. The last ventral segment is feebly triangularly emarginate.

Occurs in various parts of Southern California, from San Diego northward.

C. perpulchra Horn, *Trans. Am. Ent. Soc.*, 1870, p. 92.

Very like *elegans* in all its structural characters. The bright blue elytra have three yellow bands, basal, median, and apical, interrupted by the suture. This species may vary by the gradual loss of the bands, from the apical to the basal, until the elytra are entirely blue. Those with the humeral spot only resemble the var. *humeralis*, of the preceding species; but apart from the ornamentation, the two species may be distinguished by the present having a brighter blue color, smoother surface, the head and thorax quite smooth, while in *elegans* they are very obviously punctate.

The sexual characters are as in *elegans*.

Occurs in Owen's Valley, Cal.

C. Fulleri Horn, *Trans. Am. Ent. Soc.*, 1878, p. 59.

Black, subopaque. Antennæ filiform, but rather stout; joints closely articulated and scarcely longer than wide. Head, from in front, triangular in form, the sides parallel behind the eyes, hind angles obtuse, occiput truncate. Thorax nearly twice as wide as long.

The anterior tarsi of the male are simple; the last ventral broadly triangularly emarginate, the fifth broadly and not deeply emarginate.

Occurs in Southern California. Found rather abundantly by Mr. Morrison.

C. moesta Horn, *Trans. Am. Ent. Soc.*, 1878, p. 59.

Entirely black. Thorax longer than wide, not closely punctate. Antennæ slightly thicker externally, the joints submoniliform and not

closely articulated. Tarsal claws cleft very near the base, the lower portion not half the length of the upper. Spurs of hind tibiæ dissimilar, the outer cylindrical, the apex truncate and slightly expanded, inner spur slender.

The males have the anterior tarsi simple, the last ventral with a shallow triangular emargination.

From Southern California, precise locality not known.

C. Morrisoni, n. sp.

Elongate, black, thorax orange red. Antennæ black, slightly thickened externally, joints moniliform; head transversely quadrate, usually with a central rufous spot, parallel for a short distance behind the eyes, hind angles rounded, surface sparsely punctate; thorax scarcely longer than wide, widest one-third from apex, apical third more rapidly narrowed, posterior two-thirds slightly narrowed, disk feebly convex; a slight median depression posteriorly, surface sparsely but distinctly punctate and with shortened black hairs; elytra scabrous, with very short hairs; body beneath black, shining, sparsely pubescent; posterior tibial spurs dissimilar, the outer cylindrical, truncate, slightly broadened at tip, the inner slender and acute; claws deeply cleft, the lower portion more than half the length of the upper. Length .42–.64 inch; 10.5–16 mm.

Male.—The anterior tarsi are simple. Last ventral broadly triangularly emarginate and slightly longitudinally impressed.

In color this species resembles the following, but the head and thorax are very distinctly punctate and more or less pubescent. It is, moreover, much larger, and the surface scarcely shining.

Occurs in Southern California, and was found rather abundantly by Mr. Morrison. At the time when I had but a unique of the next species I supposed these to be merely fully-developed specimens of it.

C. nemognathoides Horn, *Trans. Am. Ent. Soc.*, 1870, p. 92.

Black, moderately shining, thorax red. Antennæ comparatively slender, the joints longer than wide, not moniliform; head quite smooth, with few very indistinct fine punctures; thorax as wide as long, sides arcuately rounded in apical half, disk convex, without impression, surface smooth and shining; elytra scabrous, sometimes feebly so, surface moderately shining; body beneath black, shining; spurs of hind tibiæ dissimilar, the inner slender, acute, the outer cylindrical, truncate, and slightly wider at tip; claws not deeply cleft, the lower portion two-thirds the length of the upper. Length .22–.32 inch; 5.5–8 mm.

In the male the anterior tarsi are slender. The last ventral segment is deeply incised.

This species might be supposed to be merely a feebly developed form of the preceding. The differences have there been given, to which might here be added the form of the antennæ. It also resembles several of our species of Nemognatha.

Occurs in Owen's Valley, Cal., and in Arizona near Fort Yuma.

The Electrolysis of Metallic Formates.

By Hill Sloane Warwick.

(*Read before the American Philosophical Society, November 6, 1891.*)

The facility with which many metallic formates could be reduced to the metallic state by heat, or in the case of silver and mercury, even by the action of light, having led to the hope that they might be employed with particular advantage in electrolysis, the following series of experiments were made upon solutions of copper, zinc and cadmium formates, in order to ascertain the effect of dilution, temperature and pole separation, as well as the conditions necessary in order to effect their quantitative estimation and separation. The current was generated by a battery of ten cells, of the "crowfoot" type, each cell being 3.1 dm. in height, by 1.9 dm. in diameter, and having a capacity of 2 liters; the dimensions of the zincs were 1.5 cm. by 1.5 cm., and of the radiating copper plates constituting the positive pole 1.5 cm. by 1.5 cm. By means of this battery a comparatively uniform current of 2.8 c.c. electrolytic gas per minute was generated after the cells had been in use for some time.

The strength of the current was measured by means of an ordinary voltameter, and was ascertained before and after the completion of the experiment. For the deposition of small quantities of metal, thick platinum-foil electrodes were used, 3.8 cm. wide, and immersed to the depth of 3.8 cm. in the solution. For quantities above .05 gram, they were unsatisfactory, the metal showing a great tendency to separate in a spongy condition at the edge. In the earlier determinations a platinum dish was used, weighing about 67 grams, and having a capacity of 150 c.c.; in the later ones a dish weighing 117 grams, and with a capacity of 275 c.c., was employed. The results obtained with the larger dish were necessarily somewhat less exact than with the one of smaller size. The positive pole consisted of a thick platinum wire, the lower portion of which was wound into a horizontal spiral. In some of the separations it was found expedient to substitute for the spiral a small platinum crucible 2.5 cm. in height and 2.8 cm. in diameter, closed by a cork, through which passed a copper wire in contact with the bottom of the crucible. In order to regulate the distance between the poles, a filter stand was used, having inserted on its movable arm an ordinary binding screw, to which the positive pole was attached.

The following formates were prepared:

Copper Formate.

This salt was made by precipitating cupric oxide from a hot solution of copper sulphate, by means of caustic potash; the precipitate was washed by decantation until free from traces of potash; it was then dissolved in formic acid having the sp. gr. 1.015, obtained in the usual way from oxalic

acid and glycerine, through which a current of steam was allowed to pass in order to prevent too great a rise of temperature, with the consequent production of decomposition products; the salt was allowed to crystallize out by spontaneous evaporation in a current of warm air, and recrystallized. An abundant crop of large, blue, monoclinic crystals was obtained, having the composition $Cu(CHO_2)^2 + 4H_2O$, efflorescing in dry air, soluble in eight parts of water and changed by boiling to the sparingly soluble basic salt $Cu(CHO_2)^2 . 2Cu(HO)^2$.

Zinc Formate.

A solution of ordinary crystallized zinc sulphate was treated with an excess of sodium carbonate, heated almost to boiling, freed by decantation from soluble impurity and dissolved in hot formic acid. The solution was evaporated down and allowed to stand, after filtering off a slight precipitate that formed on boiling, and which gave the iron reaction with potassium sulphocyanate.

Monoclinic prisms having the formula $Zn(CHO_2)^2 + 2H_2O$ separated out, isomorphous with the cadmium salt, permanent in the air and soluble in twenty-four parts of water at ordinary temperature.

Cadmium Formate.

This salt was prepared by dissolving cadmium obtained by distillation in vacuuo, in nitric acid, neutralizing with a hot solution of potassium carbonate, washing by decantation until free from soluble carbonate and dissolving in formic acid. Large monoclinic crystals separated out, having the composition $Cd(CHO_2)^2 + 2H_2O$, permanent in the air, readily soluble in water.

(Note.—The formulas of copper and cadmium formates are given as follows: $Cu(CHO_2)^2$ and $Cd(CHO_2)^2$ in the last edition of Watts' *Dictionary of Chemistry*, differing from all other authorities. Experiments made to settle the question resulted in the formulas assigned, which is in accordance with the ones usually given.)

Lead Formate.

Solutions of lead acetate and sodium formate were mixed and allowed to stand. Large white anhydrous rhombic crystals gradually separated out in radiating needles, sparingly soluble in cold water, more readily in hot, but with partial decomposition into free acid, and a basic salt of variable composition.

Cobaltous Formate.

A hot solution of cobaltous sulphate was neutralized with caustic soda solution, washed by decantation until free from all but traces of the precipitant, dissolved in formic acid, filtered, and allowed to evaporate in a current of warm air. The salt separated in crusts, consisting of indistinct crystals, having the composition $Co(CHO_2)^2 + 2H_2O$, dissolving with difficulty to a reddish-colored solution.

Manganous Formate.

This salt was prepared from manganous carbonate precipitated from a hot solution of manganous sulphate, by means of sodium carbonate added to alkaline reaction and decanted as rapidly as possible until free from all except very slight traces of soluble salts. It was then dissolved in formic acid and allowed to crystallize very slowly. The crystals thus obtained were allowed to recrystallize. The crystals are small, pale reddish monoclinic prisms, soluble in fifteen parts of water, and contain two molecules of water of crystallization.

Nickel Formate.

A solution of nickel chloride was treated with a slight excess of sodic hydrate, washed several times by decantation with hot water, dissolved in acid and evaporated down. A greenish crust formed, made up of very small, bright, green needles—$Ni(CHO_2)^2 + 2H_2O$.

Ferric Formate.

Ferric chloride was treated with excess of a solution of ammonia, washed with hot water, and allowed to digest in formic acid at a temperature which was not allowed to exceed 70°, until the hydrate of iron had completely dissolved, which required several hours. The deep-red solution was allowed to crystallize by spontaneous evaporation. Yellowish-red needles, crystallizing in radiating tufts, separated out, which formed a light, loose, coherent powder. When dried at a moderate temperature, it was readily soluble in cold water with an acid reaction. Aqueous solutions on warming became turbid from the partial decomposition of the salt into ferric hydrate and free acid. A similar decomposition takes place in solutions at ordinary temperatures after standing for some time. (The foregoing salt was made in preference to ferrous formate on account of its greater solubility.)

Mercuric Formate.

Mercuric oxide was dissolved in formic acid, but on warming the solution slightly it decomposed into the very sparingly soluble white mercurous formate, carbon dioxide and formic acid, according to the following equation:

$$2Hg(CHO_2)^2 = Hg_2(CHO_2)^2 + CHO_2H + CO_2 \text{ and}$$
$$Hg_2(CHO_2)^2 = 2Hg + CHO_2H + CO_2.$$

The precipitate was gray in color from the presence of free mercury. The tendency to decompose is such that in solution at ordinary temperatures these changes take place readily in the light and, with more slowness, even in the dark. The "ous" salt comes out in minute shining crystals, very insoluble in water, and on continuous warming becomes entirely converted into free mercury. The formates of silver, bismuth

and tin were not prepared, as they were not considered available for various reasons.

In order to ascertain the comparative accuracy of the results obtained by means of the ordinary gravimetric methods, as compared with those obtained by means of the current, a series of experiments was made with the metals chosen for particular study. The gravimetric method adopted was the same for all three, namely, estimation as oxide, conducted in the ordinary way.

COPPER (DETERMINED AS CuO).

	Copper formate taken, in grams.	Copper by theory, in grams.	Copper in CuO formed.	Difference in percentage from theoretical.
(1)	.8024	.2252	.2261	+.39 per cent.
(2)	.7924	.2226	.2232	+.27 "
(3)	.7063	.1984	.1982	—.10 "
(4)	.7063	.1984	.1979	—.25 "

The first two determinations were high, due perhaps to the efflorescence of the salt. All subsequent weighings were done in a covered watch-glass, and the results obtained corresponded closely with the theoretical.

In the following electrolytic depositions of copper, solutions of copper formate of known strength were used.

COPPER (DETERMINED ELECTROLYTICALLY).

	Copper present in solution.	Copper found.	Free formic acid.	c.c. H_2O.	Time in hours.	Differ'e in percentage from theoretical.
(1)	.1434 grams.	.1438	10 c.c.	125	46	+.27%
(2)	.1074 "	1075	15 c.c.	"	16	+.09
(3)	.0987 "	.0988	5 c.c.	"	17	+.10
(4)	.0987 "	.0987	10 c.c.	"	16	.00
(5)	.1074 "	.1077	10 c.c.	"	16	+.27
(6)	.1057 "	.1056	10 c.c.	"	17	—.09
(7)	.1057 "	.1052	15 c.c.	"	17	—.47
(8)	.1101 "	.1104	10 c.c.	"	42	+.27

In the above experiments a platinum dish was used at the negative pole, and the wire spiral as the anode. A current of 0.8—1.60 c.c. HO gas per minute was allowed to run over night. The poles were separated 2.5 cm. Before cutting off the current, the level of the liquid in the dish was raised by the addition of water, and the current allowed to act for an additional half hour. No further deposit of copper took place on the clean surface of the dish, indicating that the metal was completely precipitated. The current was then discontinued, the liquid quickly poured off, and the dish washed with hot water, being finally dried on a warm iron plate at a temperature not exceeding 100° C. The dish was then set

aside for some time until it had acquired the temperature of the room and weighed. The solutions failed to give any indication, except the merest traces, of copper when tested with ferrocyanide of potassium. The time varied from sixteen to forty-six hours without materially affecting the result. No perceptible oxidation took place during drying, although the deposit was somewhat dark. It came out as a compact adherent coating, readily dissolving in nitric acid.

A comparison between the results obtained shows conclusively not only that the deposition of copper from its formate solution can be accomplished, but that it is fully as accurate as the ordinary gravimetric method.

Zinc (Determined as ZnO).

	Zinc formate taken, in grams.	Zinc by theory, in grams.	Zinc in zinc oxide found.	Difference in percentage from theoretical.
(1)	.5508	.1875	.1870	—.26%
(2)	"	"	.1876	+.05
(3)	"	"	.1869	—.31
(4)	"	"	.1872	—.16

The four determinations made by the usual gravimetric method were estimated finally as zinc oxide which, for purposes of comparison, have been converted into metal.

Zinc (Determined Electrolytically).

	Zinc present in grams.	Zinc found.	Free acid.	c.c. H_2O.	Time in hours.	Current in HO gas per minute.	Difference in percentage from theory.
(1)	.0625	.0614	none	100	16	1.8 c.c.	....
(2)	.0625	....	10 c.c.	100	16	1.8 c.c.	....
(3)	.1250	....	15 c.c.	100	16	2.0 c.c.	....
(4)	.0818	.0476	5 c.c.	100	17	.8 c.c.	....
(5)	.0818	.0816	15 c.c.	100	17	1.7 c c.	—.24%
(6)	.0818	.0819	15 c.c.	100	16	1.7 c.c.	+.12
(7)	.0513	.0513	25 c.c.	100	16	1.7 c.c.	....
(8)	.1026	.1021	10 c.c.	100	17	1.7 c.c.	—.48
(9)	.1026	.1023	15 c.c.	100	43	1.8 c.c.	—.29
(10)	.1006	.1007	10 c.c.	100	16	1.7 c.c.	+.09
(11)	.1006	.1003	10 c.c.	100	16	1.7 c.c.	—.29

The foregoing determinations of zinc formate were performed under a variety of conditions. (1), (2), (3), (4) were made with the dish as cathode, and the wire spiral as the positive pole; the results both with and without free acid were unsatisfactory, the deposit being very spongy and failing to come out completely, as proved by testing the solution with potassium ferrocyanide. The dish was then made the anode and the zinc was allowed to separate on the platinum crucible which was made the negative pole. The amount of free acid varied from 10 to 25 c.c. The deposit was

gray and adherent on the sides and bottom, but rather spongy at the periphery. Around the top of the crucible the metal was black in color. The final determinations were accurate but required the greatest care to avoid detaching loose particles of metal.

The deposit was not regular, the bottom of the crucible being more or less free from zinc on account of the accumulation of gas. The time of deposition averaged sixteen hours. Such currents as sufficed to separate copper were unsatisfactory, even when the electrodes were brought in close contact. In the determinations that were satisfactory, the current strength varied from 1.6—1.8 HO gas per minute, and the poles were close together.

Cadmium (Determined as CdO).

	Cadmium formate taken.	Cadmium by theory.	Cadmium in CdO found.	Difference in percentage from theory.
(1)	.4224	.1988	.1983	—.25%
(2)	.4224	.1988	.1982	—.30

Both results are somewhat too low, possibly owing to reduction of the oxide to metal and consequent loss by volatilization.

Cadmium (Determined Electrolytically).

	Cadmium present in grams.	Cadmium found in grams.	Free acid.	c.c. H_2O.	Time in hours.	Diff'ce in percent from theoretical.
(1)	.0497	.0498	15 c.c.	100	16	+.20%
(2)	.0994	.0996	10 c.c.	100	18	+.20
(3)	.0994	.0991	10 c.c.	100	16	—.30
(4)	.1231	.1228	10 c.c.	100	44	—.40
(5)	.1231	.1229	10 c.c.	100	17	—.16
(6)	.0984	.0984	10 c.c.	100	16	....
(7)	.0984	.0985	10 c.c.	100	16	+.10
(8)	.1004	.1005	10 c.c.	100	16	+.09
(9)	.1004	.1002	10 c.c.	100	17	—.19

The dish was used as the negative electrode, the spiral as the positive, except (1), in which the cadmium was deposited on the crucible, the dish serving as the anode. The distance between the poles was 2.5 cm. The variations in the conditions of the experiments noted above caused no noticeable difference in the results. The deposit was not apparently oxidized by moderate warming. Current 1.25 to 1.5 c.c. HO gas per minute.

The solutions were tested for cadmium at the conclusion of each experiment, but none was found, proving that the metal was completely deposited. It formed a firm and adherent coating, white in color, with a bright metallic lustre.

I. Influence of Dilution upon the Precipitation of Copper.

Copper present in grams.	Copper found.	Free acid.	c.c. H_2O.	c.c. HO gas per minute.	Time in hours.
(1) .0717	.0199	3 drops	100	1.75	1
(2) .0358	.0111	$\frac{3}{2}$ "	"	"	"
(3) .0179	.0057	$\frac{3}{4}$ "	"	"	"
(4) .0089	.0028	$\frac{3}{8}$ "	"	"	"
(5) .0044	.0014	$\frac{3}{16}$ "	"	"	"
(6) .0022	.0006	$\frac{3}{32}$ "	"	"	"
(7) .0011	.0003	$\frac{3}{64}$ "	"	"	"

The distance between the poles was 2.5 cm. The area of the electrodes was (3.8 cm. × 3.17 cm.) × 2. The deposition was performed in beakers, having a capacity of 400 c.c., a height of 10 cm. and 7.6 cm. in diameter. The deposit was bright and adherent and, although the amount of free acid present was very small, the metal was not spongy. The results obtained were in close accord with those assigned by theory, according to the law that the amount of metal deposited in a given time is proportional to the strength of solution.

II. The Influence of Temperature upon the Precipitation of Copper.

Copper taken in grams.	Copper deposited.	Free acid.	c.c. H_2O.	Time in hours.	Temperature in degrees Cent.
(1) .0211	.0019	none	150 c.c.	1	20°
(2) "	.0046	"	"	"	40°
(3) "	.0080	"	"	"	60°
(4) "	.0119	"	"	"	80°

The area of the electrodes was (3.5 cm. × 3.8 cm.) × 2. Distance between poles 2.8 cm. The current gave 1.25 c.c. HO gas per minute. (1) was slightly spongy and had a slight deposit of basic green salt at the top. (3) was somewhat dark and slightly spongy at the top but adherent. The amount of metal deposited increased with rise of temperature, as follows : .0027 grams (20°–40°), .0034 grams (40°–60°), .0039 grams (60°–80°). The ratio of increase also rose with the temperature, being greatest between 60° and 80°. In the above series the determinations were made in neutral solutions ; in the following, 15 c.c. of formic acid was added.

	Copper taken.	Copper deposited.	Free acid.	H_2O.	Time.	Temperature in degrees Cent.
	Grams.	Grams.	c.c.	c.c.	Hours.	
(1)	.1057	.0104	15	150	$\frac{1}{2}$	20°
(2)	"	.0164	"	"	"	40°
(3)	"	.0237	"	"	"	60°
(4)	"	.0319	"	"	"	80°

The distance between the poles was 2.9 cm., area of electrodes (3.5 cm. × 3.8 cm.) × 2, current strength 7.5 c.c. OH gas per minute. The ratio of increase was: (20°–40°) .0060 grams, (40°–60°) .0073 grams, (60°–80°) .0082 grams. A comparison between the two series of results would indicate that the presence of dilute free acid in moderate quantity exercises no material influence on the amount of metal deposited, even at elevated temperatures.

III. The Influence of Pole Separation upon the Precipitation of Copper.

	Copper taken.	Copper deposited.	H_2O.	Time.	Distance between electrodes.
	Grams.	Grams.	c.c.	Hours.	cm.
(1)	.1974	.0133	700	1	1.58
(2)	"	.0106	"	"	3.16
(3)	"	.0093	"	"	4.75
(4)	"	.0084	"	"	6.33
(5)	"	.0078	"	"	7.91
(6)	"	.0073	"	"	9.50
(7)	"	.0064	"	"	12.66

The area of the electrodes was (3.8 cm. × 3.48 cm.) × 2, free acid present 10 c.c. (1) was slightly spongy. (7) was very close to the edge of the dish. The diminution was (1–2) .0027 grams, (2–3) .0013 grams, (3–4) .0009 grams, (4–5) .0006 grams, (5–6) .0005 grams. The current gave 1 75 c.c. OH gas per minute.

The foregoing experiments were performed in a crystallizing dish 15.2 cm. by 7.6 cm., with a capacity of 900 c.c. In the following series the determinations took place in a beaker 10 cm. in height by 7.6 cm. in diameter.

	Copper taken.	Copper deposited.	H_2O.	Time.	Distance of electrodes.
	Grams.	Grams.	c.c.	Hours.	cm.
(1)	.1434	.0302	200	1	1.58
(2)	"	.0248	"	"	3.16
(3)	"	.0208	"	"	4.75
(4)	"	.0172	"	"	6.33

The current gave 1.75 c.c. oxyhydrogen gas per minute, area of electrodes (3.8 cm. × 3.16 cm.) × 2, free acid present 5 c.c. The diminution was (1–2) .0054 grams, (2–3) .0040 grams, (3–4) .0036 grams. In both series the rate of diminution rapidly lessened as the distance between the electrodes increased.

Experiments made under conditions similar to the above, except that no free acid was present, were failures, the deposits being exceedingly spongy.

I. Influence of Dilution upon the Precipitation of Cadmium.

	Cadmium taken.	Cadmium deposited.	H_2O.	Free acid.	Time.	OH gas per minute.
	Grams.	Grams.	c.c.	c.c.	Hours.	c.c.
(1)	.0994	....	100	none	$\frac{1}{4}$	1.75
(2)	.0497	....	"	"	$\frac{1}{2}$	"
(3)	.0994	....	"	.5	$\frac{1}{2}$	"
(4)	"	.0218	"	5	1	"
(5)	.0497	.0109	"	$\frac{5}{2}$	"	"
(6)	.0248	.0053	"	$\frac{5}{4}$	"	"
(7)	.0124	.0026	"	$\frac{5}{8}$	"	"
(8)	.0062	.0011	"	$\frac{5}{16}$	"	"

In (1) and (2) no free acid was added, and in (3) only .5 c.c. was present; all three were failures. The amount of acid was then increased to 5 c.c., and the experiment repeated, all the other conditions remaining the same. The deposit was adherent and compact. The poles were 3.16 cm. apart, and had an area of (2.85 cm. × 3.8 cm.) × 2.

II. Influence of Temperature upon the Precipitation of Cadmium.

	Cadmium taken.	Cadmium found.	H_2O.	Free acid.	H_2O gas per minute.	Temperature in degrees Cent.
	Grams.	Grams.	c.c.	c.c.	c.c.	
(1)	.1231	.0240	150	10	1.75	20°
(2)	"	....	"	"	"	40°
(3)	.0497	.0088	145	25	"	20°
(4)	"	.0110	"	"	"	40°
(5)	"	.0210	"	"	"	60°
(6)	"	.0257	"	"	"	80°

(2) was very spongy and was covered with a white gelatinous deposit resembling cadmium hydrate. The amount of cadmium was then diminished more than half, while the amount of formic acid present was increased to 25 c.c. (5) and (6) were somewhat spongy but adherent. The increase was (20°–40°) .0022 grams, (40°–60°) .0100 grams, (60°–80) .0047 grams. The amount of metal deposited increased with rise of temperature, being greatest at 80°, but the greatest ratio of increase was at 60°, being almost five times greater than at 40°, and more than twice as great as at 80°. These results were so different from those obtained with copper that a second series of determinations was made, in which the amount of cadmium in the solution was reduced still more in order to insure a compact deposit at the higher temperatures. The results which were in close accord with those above are as follows:

	Cadmium taken.	Cadmium deposited.	H_2O.	Free acid.	OH gas per minute.	Temperature in degrees Cent.
	Grams.	Grams.	c.c.	c.c.	c.c.	
(1)	.0198	.0022	135	15	1.25	20°
(2)	"	.0031	"	"	"	40°
(3)	"	.0078	"	"	"	60°
(4)	"	.0102	"	"	"	80°

III. Influence of Pole Separation upon the Precipitation of Cadmium.

	Cadmium present.	Cadmium deposited.	H_2O.	OH gas per minute.	Separation of electrodes.
	Grams.	Grams.	c c.	c.c.	cm.
(1)	.0994	....	700	2.2	1.58
(2)	"	.0059	"	1.25	"
(3)	"	.0023	"	.8	"
(4)	"	.0009	"	"	3.16
(5)	"	.0002	"	"	6.33
(6)	"	....	"	"	12.66

Although 20 c.c. of free formic acid was present in (1) and (2) both were failures, the latter, though it was weighed, being merely approximate, some particles having been washed off. The current was then reduced to .8 c.c. HO gas per minute. Adherent deposits were obtained, but in such small quantity that (5) yielded only a trace. The ratio of diminution was (3–4) .0014 grams, (4–5) .0007 grams. Area of electrodes (3.8 cm. × 3.48 cm.) × 2, time 1 hour, free acid present 10 c.c.

I. Influence of Dilution upon the Precipitation of Zinc.

	Zinc present.	Zinc deposited.	H_2O.	Free acid.	OH gas per minute.
	Grams.	Grams.	c.c.	c.c.	c.c.
(1)	.1250	.0300	100	.5	1.75
(2)	.0625	.0155	"	.25	"
(3)	.1250	.0173	"	5.	"
(4)	.0625	.0083	"	$\frac{5}{2}$	"
(5)	.0313	.0043	"	$\frac{5}{4}$	"
(6)	.0156	.0028	"	$\frac{5}{8}$	"

(1), (2), (5) and (6) were spongy, especially the last. Distance between the poles 3.16 cm. Area (2.85 cm. × 3.8 cm.) × 2, time one hour.

II. Influence of Temperature upon the Precipitation of Zinc.

	Zinc taken.	Zinc deposited.	H_2O.	Free acid.	OH gas per minute.	Temperature in degrees Cent.
	Grams.	Grams.	c.c.	c.c.	c.c.	
(1)	.1539	....	150	10	.3	20°
(2)	.1026	.0145	"	"	1.8	"
(3)	.1026	....	"	"	"	40°
(4)	.0205	....	"	none	.3	20°
(5)	"	....	"	"	.8	"
(6)	"	....	"	"	1.3	"
(7)	.0513	.0029	145	5	.9	"
(8)	"	.0019	"	"	"	40°
(9)	"	.0010	"	"	"	60°
(10)	"	....	"	"	"	80°
(11)	"	....	"	"	"	"
(12)	"	....	"	none	"	"

(1), (3), (5) and (6) were very spongy. In (4), (10) and (11) no deposition of metal took place, (12) was spongy and was covered with a white coating of zinc hydrate. At 80° no metal was deposited in the presence of free acid provided the current was not too strong. The ratio of decrease with rise of temperature was (20°–40°) 10 grams, (40°–60°) 9 grams, (60°–80°) no deposit. The distance between the poles was 2.85 cm. Area of electrodes (3.8 cm. × 3.16 cm.) × 2. Duration of experiment, one hour.

III. Influence of Pole Separation upon the Precipitation of Zinc.

	Zinc taken.	Zinc deposited.	Free acid.	H_2O.	OH gas per minute.	Time.	Distance between poles.
	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	cm.
(1)	.0102	.0046	10	700	1.9	3	1.58
(2)	"	.0023	"	"	"	"	3.16
(3)	"	.0015	"	"	"	"	6.33
(4)	"	.0003	"	"	"	"	12.66

Area of electrodes (3.8 cm. × 3.48 cm.) × 2. The deposit was firm and compact. Compared with the results obtained with copper and cadmium, the result in (4) is too low.

Lead (Determined Electrolytically).

On account of tendency of lead and manganese to separate in the form of peroxide at the positive pole, it was deemed advisable to make a series of experiments on the metals themselves before attempting to effect their separation. The results were as follows :

	Lead taken.	Lead found.	Free acid.	H_2O.	OH gas per minute.	Time.	Difference from theory.
	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	
(1)	.1153	....	5	100	1.	16	....
(2)	"	....	20	"	1.2	48	....
(3)	"	....	5	"	2.8	3	....
(4)	"	....	20	"	"	16	....

50 c.c. of a lead formate solution were used in each of the above experiments. In all of them, the lead was deposited in a spongy state at the kathode with more or less peroxide on the positive pole.

As the moist metal deposited on the kathode rapidly oxidizes, even when adherent and compact, the results obtained are invariably too high and in practice it is customary to estimate lead as peroxide on the anode securing its deposition in that form by the addition of nitric acid to the solution. The results obtained with free formic acid, as given above, were not such as to justify attempting its separation from either copper, cadmium or zinc.

MANGANESE (DETERMINED ELECTROLYTICALLY).

	Manganese taken.	Manganese found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0554	.0552	5	100	2.2	17	—.36
(2)	"	.0556	"	"	2.7	18	+.36
(3)	.1108	.1101	20	"	2.8	24	—.63
(4)	.0554	....	30	"	1.6	16	....

The platinum dish was made the anode, the wire spiral serving as the negative pole. With small quantities of free acid, (1) and (2), considerable peroxide of manganese, separated on both poles, with larger quantities, (3) (4), only very slight traces were found on the kathode. The deposition in (4) was not complete. The peroxide formed a black, lustrous coating on the dish, adherent while moist, but scaling off upon being heated.

The manganese which separated on the kathode was removed by means of a small piece of filter paper, which was ignited and the ash added to the contents of the dish, which was then raised to an intense heat in order to convert the peroxide of manganese into Mn_3O_4, in which form it was finally weighed. Traces of Mn were found in solution (3).

ELECTROLYTIC SEPARATIONS.

CADMIUM FROM MANGANESE.

	Cadmium taken.	Manganese taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0497	.0554	.0425	35	75	.8	16	....
(2)	"	"	.0440	"	"	1	"	....
(3)	"	"	.0498	25	"	2.7	17	+.20
(4)	.0511	"	.0509	20	"	2.4	19	—.39
(5)	"	"	.0697	5	150	2.7	18	....
(6)	.1022	.1108	.1098	20	75	2.5	17	....
(7)	"	"	....	40	150	2.8	45	...
(8)	.0511	.0554	.0514	30	75	2.7	18	+.58

In the preliminary experiments on manganese alone, it was found that the presence of 20 c.c. of free acid was sufficient to prevent the deposition of any peroxide on the kathode, except in the very slightest traces; but the presence of cadmium in the solution seemingly had a contrary effect, as the presence of even 40 c.c. of acid failed to prevent the separation of traces of manganese on the negative pole (7). In (5), to which 5 c.c. of free acid had been added, the deposit of peroxide of manganese upon the negative pole was almost five times greater than in a solution of manganese to which no cadmium had been added, all the other conditions being the same. In all the above experiments the platinum dish was used as

the anode, the platinum crucible serving as the negative electrode. In (1) and (2) the cadmium was not completely deposited. Traces of cadmium were found in (6) and (7). More or less manganese was found in all the deposits, but only in traces in the presence of more than 20 c.c. of free acid; (4) and (7) were very spongy; the others were slightly so at the periphery of the crucible, but adherent. The best results were obtained by fulfilling the conditions described in (3), (4) and (8); but to obtain a compact deposit of cadmium free from all traces of manganese, it is evident that the amount of free acid must be increased and the poles separated. Under these conditions, a stronger current must be employed than that furnished by the battery of "crowfoot" cells, with which my experiments were carried on.

ZINC FROM MANGANESE.

	Zinc taken.	Manganese taken.	Zinc found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.		c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0562	.0554	....	30	90	2.9	17	....
(2)	"	"	....	20	100	"	16	....

The dish served as anode, the crucible as kathode. Both were failures; the zinc being spongy and containing MnO_2 and not entirely precipitated.

COPPER FROM ZINC.

	Copper taken.	Zinc taken.	Copper found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1074	.0818	....	5	100	1.8	46	....
(2)	"	"	....	"	"	1.2	17	....
(3)	"	.1124	....	"	"	.8	16	....
(4)	"	.0818	.1072	15	"	"	"	—.18
(5)	"	"	.1073	20	"	"	17	—.09
(6)	.0987	"	.0990	"	"	"	"	+.30
(7)	"	"	.0984	"	"	.6	16	—.30
(8)	.1057	.1006	.1052	15	"	.8	"	—.47
(9)	"	"	.1061	"	"	"	18	+.37
(10)	"	"	.1058	"	150	"	"	+.09
(11)	"	"	.1059	20	"	"	19	+.18
(12)	"	"	.1053	"	"	"	21	—.37
(13)	"	"	.1060	"	"	"	16	+.28

As will be seen from the above, it was possible to separate copper free from zinc, except the slightest traces, by using a weak current in solutions to which 15–20 c.c. of free formic acid had been added. By employing stronger currents, or diminishing the amount of free acid, the copper was deposited admixed with considerable quantities of zinc. If the necessary precautions are observed no zinc will be deposited, and the copper will be compact and adherent.

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CADMIUM FROM ZINC.

	Cadmium taken.	Zinc taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1231	.0818	.....	15	100	.2	17	....
(2)	"	"	.1229	30	"	.8	19	—.16
(3)	"	"	.1234	"	"	"	43	+.24
(4)	"	"	.1426	35	"	1.25	16	+15.83
(5)	"	"	.1233	30	"	.8	"	+.16
(6)	.0492	.0409	....	15	"	"	"	....
(7)	"	"	.0842	"	"	1.25	"	....
(8)	.0984	.1026	.0322	35	"	.8	19	....
(9)	.0492	.0409	.0494	15	"	"	41	+.40
(10)	.0984	.1026	.1735	35	75	1.25	17	....
(11)	"	"	.0722	"	"	.8	"	....
(12)	"	"	.0982	25	125	"	18	—.20
(13)	"	"	.0985	"	"	"	16	+.10
(14)	.1004	.1006	.1001	"	"	1.	48	—.29
(15)	"	"	.0993	"	"	"	17	—1.09
(16)	"	"	.1000	"	"	"	"	—.39
(17)	"	"	.1001	"	"	"	18	—.29
(18)	"	"	.1008	"	"	"	20	+.39
(19)	"	"	.0999	"	"	"	16	—.49

The first seven determinations were made in a platinum dish weighing about 67 grams; the remainder in a much larger dish weighing 117 grams. The results obtained with the latter were not as satisfactory as with the smaller dish (2) (3) (5), although a qualitative examination of the deposit and solution proved that the separation was complete (9) (12–19). The distance between the poles materially influences the results. In (6) the positive pole was in close contact with the dish; the cadmium contained zinc. In (9) the conditions were similar in all respects to the preceding, except that the distance between the poles was 2.5 cm.; the deposit was free from zinc. With .2 c.c. OH gas per minute, only a small quantity of the cadmium was separated (1), the greater portion remaining in solution. With 1.25 c.c., on the other hand, the zinc was deposited as a dark-gray coating upon the cadmium (7), even in the presence of 35 c.c. of free acid (10). In solutions containing .10 grams of each metal a current of .8–1 c.c. HO gas per minute sufficed to secure a satisfactory deposit in the presence of 25 c.c. formic acid (12–19). With smaller quantities of metal (9) 15 c.c. of free acid was sufficient. The deposits in the above experiments were adherent and compact. There was no tendency to sponginess even in deposits containing large quantities of zinc.

Copper from Cadmium.

Copper taken.	Cadmium taken.	Metal deposited.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
.1074	.0984	.2061	10	100	.8	17	....

This result was not unexpected, considering what we have already learned in regard to the behavior of these metals. The deposit was very dark and spongy. Both metals were completely precipitated. Two subsequent experiments were equally unsatisfactory; in one the current was reduced to .3 c.c. OH gas per minute; in the other, 25 c.c. of formic acid was added. No separation was effected.

Copper from Iron.

	Copper taken.	Iron taken.	Copper found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1057	.1248	.1035	25	125	.8	20	....
(2)	"	"	....	"	150	"	42	....
(3)	"	"	.1019	"	"	"	19	....
(4)	"	"	.0999	"	"	"	17	....
(5)	"	"	.1014	"	"	"	18	....

Although free acid was present in considerable quantity (25 c.c.), the formate of iron in the solution was decomposed with the formation of ferric hydrate, which separated as a light yellow froth on the surface of the solution. It also formed crusts at the edge of the copper deposit, which adhered to the dish with such tenacity that all attempts at removal by mechanical means were failures. Mere washing was without avail, and more energetic measures resulted in a loss of copper, (1) and (4). Dilute hydrochloric acid was added to (2); but, while it dissolved traces of copper, it failed to remove the deposit of iron hydrate. Dilute sulphuric acid was also tried without success (3). In the final determination 20 c.c. of concentrated oxalic acid was added at the end of seventeen hours and the current allowed to act one hour longer. The froth floating on the surface was dissolved, but the deposit on the copper was not appreciably affected. Except at the periphery the copper had a bright metallic lustre and was firm and adherent.

Cadmium from Iron.

	Cadmium taken.	Iron taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.
(1)	.0984	.1248	.0996	25	150	.8	23
(2)	"	"	.1021	"	"	"	45

The same trouble was experienced here. Similar attempts were made to remove the iron, but without success. In the first of the above determinations 10 c.c. of oxalic acid solution was added before the conclusion of the experiment; in the latter, 20 c.c. of the same solution.

The hydrate of iron in the solution disappeared, but adherent crusts still remained on the surface of the cadmium.

Zinc from Iron.

Several tentative experiments were made, but as the iron showed the same tendency to separate on the sides of the dish, as in the preceding determinations, they were not continued.

Copper from Cobalt.

	Copper taken.	Cobalt taken.	Copper found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1101	.1080	.1105	100	175	1	21	+.36
(2)	"	"	.1095	"	"	"	17	—.54
(3)	"	"	.1097	"	"	"	"	—.36
(4)	"	"	.1107	"	"	"	18	+.54
(5)	"	"	.1098	"	"	1.2	17	—.27
(6)	"	"	.1097	"	"	1	16	—.36

On attempting to prepare a solution of cobaltous formate for the above determinations, it was found that the salt made according to the method already described was not readily soluble in water. The solution was therefore prepared by double decomposition as follows: 500 c.c. of water containing 6.563 grams of sodium formate was mixed with an equal amount of water in which 8.728 grains of cobalt chloride had been dissolved.

Of this solution 50 c.c. was taken, containing .1080 grams of cobalt. The distance between the poles was 3.8 cm. except (1) and (4) in which it was 2.8 cm. Both of the latter were spongy; the others slightly so. As the conditions, otherwise, were similar, the difference in the character of the deposits was apparently due to the separation of the poles. Traces of cobalt were found in all the copper deposits. The copper was all out except in (3), (5) and (6), in which the solutions were colored yellowish brown on the addition of hydrogen sulphide.

The copper deposit was dark in color and adherent, although not very compact on the bottom of the dish.

Copper from Nickel.

	Copper taken.	Nickel taken.	Copper found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1101	.1028	.1095	75	175	1	20	—.54
(2)	"	"	.1097	100	"	"	17	—.36
(3)	"	"	"	"	"	"	18	—.36
(4)	"	"	.1098	"	"	1.2	17	—.27
(5)	"	"	.1096	"	"	1	"	—.46
(6)	"	"	.1098	"	"	"	"	—.27

The same trouble was experienced in preparing a satisfactory solution of pure nickel formate as with cobalt and it was found advisable to prepare the solution by double decomposition in the same way as the latter salt, 500 c.c. of this solution contained 8.3077 grams of nickel chloride and 6.2469 grams of sodium formate. In both cases a slight excess of sodium formate was used. The copper contained traces of nickel and slightly colored the solution when tested with hydrogen sulphide. The conditions were similar to those given under cobalt and the results were quite as satisfactory. The copper was bright and compact.

Cadmium from Cobalt.

	Cadmium taken.	Cobalt taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0984	.1080	....	25	100	.5	22	....
(2)	"	"	....	"	150	.8	45	....
(3)	"	"	....	50	"	1.5	18	....

It was naturally expected that cadmium would be completely precipitated from cobalt and nickel by employing a weak current, but from an examination of the above results, it will be seen that a separation was not accomplished.

Even with a current of 1.5 c.c. OH gas per minute, the cadmium failed to deposit completely and was contaminated with cobalt (3). (1) was very spongy and the solution still contained cadmium at the expiration of 22 hours. The current was then increased and allowed to act for 45 hours (2). Cadmium was found in the solution, cobalt in the deposit. The distance between the electrodes was 2.8 cm.

Cadmium from Nickel.

	Cadmium taken.	Nickel taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c c.	c.c.	Hours.	Percentage.
(1)	0984	.1028	.0758	35	150	.5	19	....
(2)	"	"	.1045	"	"	1.5	21	....
(3)	"	"	.1348	50	125	1.5	17	....

The results were quite as unsatisfactory as with cobalt. Cadmium was found in all three solutions, and more or less nickel was found in the deposits. In (3) the nickel came out as a gray deposit on the cadmium. The deposit was firm and adherent, although dark in color. The distance between the electrodes was 2.5 cm., except (3), in which the pole separation was 2.8 cm.

Zinc from Cobalt.

	Zinc present.	Cobalt present.	Zinc found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1006	.1080	....	50	175	3	17	....
(2)	"	"	....	100	"	5	18	....

ZINC FROM NICKEL.

	Zinc present.	Nickel present.	Zinc found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(3)	.1006	.1028	....	50	175	2.7	18	....
(4)	"	"	....	100	"	5	"	....

(2) and (4) were performed under similar conditions. The distance between the poles was 2.2 cm. The current was generated by a battery of Bunsen cells. Even with a current of 5 c.c. gas per minute zinc was found in the solution in traces, while considerable quantities of cobalt and nickel separated as a coating upon the cadmium. (1) and (3) were also failures. A separation was not obtained even approximately.

SUMMARY.

As a result of the foregoing experiments, it was found that the amount of copper, cadmium or zinc deposited in a given time was proportional to the strength of the solution, and that the presence of free acid in moderate quantity did not materially affect the result.

Increasing the distance between the poles resulted in diminishing the amount of metal deposited, but the rate of decrease diminished as the distance between the electrodes increased.

Elevation of temperature caused an increase in the amount of metal deposited, the rate of increase being greatest at 80° in neutral and acid copper solutions, and at 60° in cadmium solutions containing free acid. On the other hand, the amount of zinc deposited in solutions, to which free acid had been added, diminished as the temperature rose, nothing being deposited at 80°.

Attempts to secure compact and adherent deposits of cadmium and zinc in neutral solutions were failures.

In acid solution copper and cadmium separated completely and satisfactorily. The zinc deposits were spongy, but the precipitation was complete.

Lead was mainly deposited on the negative pole, both in neutral and acid solutions. Manganese was precipitated on both poles, but the amount of peroxide separating on the kathode was reduced to mere traces by the presence of free acid.

The following separations were satisfactorily accomplished : copper from zinc, cobalt and nickel and cadmium from zinc and manganese.

Attempts to deposit copper in the presence of iron and cadmium, and zinc in the presence of iron, cobalt and nickel, were successful. Nor was it possible in the presence of the last three metals named to estimate cadmium.

In conclusion, I wish to express my obligations to Prof. Edgar F. Smith, at whose suggestion the work was undertaken. To his supervision and advice is largely due whatever value may attach to these results.

Stated Meeting, September 4, 1891.

Present, 3 members.

President, Mr. FRALEY, in the Chair.

Letters of acceptance of membership were received from Dr. Caspar René Gregory, Leipzig, Germany; Dr. E. T. Hamy, Prof. E. Mascart, Dr. Julius Oppert, Prof. A. De Quatrefages, Paris, France; Prof. W. Cawthorne Unwin, Kensington, England; Rt. Rev. William Stubbs, D.D., LL.D., Bishop of Oxford, England; Sir Robert S. Ball, Dublin, Ireland; Prof. Charles E. Monroe, Newport, R. I.; Prof. Henry W. Spangler, University of Pennsylvania.

Dr. Harrison Allen, of Philadelphia, resigned by letter from membership in the Society.

On motion, the resignation was accepted.

Letters of envoy were received from the Geological Survey of India, Calcutta; Académie Royale des Sciences, Amsterdam; Société Royale des Sciences, Upsal; Naturforschende Verein, Brünn, Austria; K. Geodätische Institut, Berlin; Schlesische Gesellschaft für Väterlandische Cultur, Breslau; Verein für Naturkunde, Cassel; K. Sächs. Meteorologische Institut, Chemnitz; Siebenbürgische Verein für Naturwissen, Hermanstadt; Leopoldinisch-Carolinische Akadémie, Halle; Societa Italiana Delle Scienze, Rome; Société des Antiquaires de Picardie, Amiens; Académie des Sciences, Arts et Belles-Lettres, Caen; Musée Guimet, Ecole Polytechnique, Bureau des Longitudes, Paris; Manchester Literary and Philosophical Society; Meteorological Office, London; Royal Irish Academy, Dublin; Smithsonian Institution, Washington.

Letters of acknowledgment were received from the Geological Survey of India, Calcutta (134); Tokyo Library, Anthropological Society, Asiatic Society of Japan, Tokyo (134); Comité Geologique de la Russie, St. Petersburg (134); Dr. Otto Donner, Helsingfors, Finland (134); Royal Danish Geographical Society (131–134), Prof. J. S. Steinstrup (134),

Copenhagen; K. K. Central-Anstalt für Meteorologie, etc., Drs. A. Brezina, E. Suess, Friederich Müller, Vienna (134); Hungarian Academy of Sciences (128–131), Prof. Paul Hunfalvy, Budapest (130–133); Naturforschende Gesellschaft des Osterlandes, Altenberg (134); Gesellschaft für Erdkunde (134), K. Geodätische Institut, Berlin (131–134); Naturhistorische Verein, Bonn (129); Naturwissenschaftliche Verein, Bremen (134); K. Sächsische Meteorologische Institut, Chemnitz (131–134); Naturforschende Gesellschaft, Emden (134); Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt (130); Dr. A. Weisbach, Freiberg (134); K. Leopoldinisch-Carolinische Akademie, Halle a. S. (109, 130–133, and Trans., xiv, 3); Geographische Gesellschaft (131), Deutsche Seewarte (131–134), Hamburg; Prof. Hermann Kopp, Heidelberg (131–134); Naturhistorische Gesellschaft, Hannover (134); K. Sächsische Gesellschaft der Wissenschaften, Dr. Julius Platzman, Prof. J. Victor Carus, Dr. Otto Böhtlingk, Leipzig (134); Naturwissenschaftliche Verein, Osnabrück (131–134); K. Sternwarte, München (134); Verein für Vaterländische Naturkunde, Würtemberg (129, 130).

Accessions to the Library were announced from the Institut Egyptien, Cairo; Geological Survey of India, Calcutta; Government Astronomer, Madras; Norwegische Meteorologische Institut, Christiania; Société Roumaine de Geographie, Bucharest; Nederlandsche Botanische Vereeniging, Nijmegen; Friessch Genootschap voor Geschied, etc., Leuwarden; Académie Royale des Sciences, Prof. Ad. De Ceuleneer, Bruxelles; Augustus R. Grote, Bremen; Tudományos Akademia, Budapest; Ostschweizerische Geogr.-Commerc. Gesellschaft, St. Gall; M. Ferdinando Borsari, Naples; M. A. Del Bon, Padua; Profs. Léon de Rosny, Emile Schwærer, Edward Pepper, Paris; Le Comte de Charencey, St. Maurice; Mr. Samuel Timmins, Coventry, England; Philosophical and Literary Society, Leeds; Mr. James L. Bowes, Liverpool; Meteorological Council, Society for Psychical Research, Profs. Joseph Prestwich, Thomas E. Pickett, London; Nova Scotian Institute of Natural Science, Halifax; Hemenway Expedition, Mr. Robert T.

Swan, Boston; Scientific Alliance, American Museum of Natural History, Prof. Edward V. D'Invilliers, New York; Empire State Association of Deaf-mutes, Rome, N. Y.; Mr. William E. Griffis, Schenectady; Mr. Charles Earle, Princeton; Mr. Samuel F. Bigelow, Newark; Geological Survey of New Jersey, Trenton; Academy of Natural Sciences, Hon. Charles O'Neill, Messrs. R. Meade Bache, Henry Phillips, Jr., Drs. J. C. Morris, Charles A. Oliver, Persifor Frazer, J. E. Ives, Edmund J. James, W. S. W. Ruschenberger, Miss Emily Phillips, Philadelphia; Wyoming Historical and Geological Society, Wilkesbarre; Historical Society of Delaware, Wilmington; Department of the Interior, Smithsonian Institution, Col. Garrick Mallery, Messrs. A. C. Peale, W. H. Seaman, Lester F. Ward, Washington, D. C.

A photograph of the Mansion and Graves of the Penn family, in England, was received from Mr. F. Gutekunst, Philadelphia.

Photographs for the Society's Album were received from Mr. Samuel Timmins, Coventry, England; Mr. Louis Vossion, Philadelphia, and Prof. Robert W. Rogers, Carlisle, Pa.

The death of James Russell Lowell (Boston, Mass., August 12, 1891, æt. 72) was announced.

Pending nominations 1230 and 1231 were read.

And the Society was adjourned by the President.

Stated Meeting, September 18, 1891.

Present, 2 members.

President, Mr. FRALEY, in the Chair.

Letters of envoy were received from the Colonial Museum of New Zealand, Wellington; Observatoire Physique Central, St. Petersburg; Université Royale de Norvége, Christiania; Musée Teyler, Harlem, Holland; K. Preussische Meteorolo-

gische Institut, Berlin; Musée Guimet, Paris; Royal Observatory, Greenwich; Zoölogical and Royal Statistical Societies, London; Bureau of Statistics of Labor, Boston; U. S. Coast and Geodetic Survey, Washington.

Letters of acknowledgment were received from the Naturforschende Gesellschaft, Bern (134); University, Basle (134); Société Royale de Zoologie Natura Artis Magistra (134), Academie Royale des Sciences (127–130, and Trans., xvi, 2, 3), Amsterdam; Royal Library, (134); K. Zoologische-Botanische Genootschap, 'S Gravenhage (134); Royal Netherland Museum of Antiquities, Leiden (134); K. Danske Videnskabernes Selskab, Copenhagen (130, 131, and Trans. xvi, 3); Société Royale des Sciences, Upsal (125–129); Bibliothèque Royale de Belgique, Bruxelles (131–133); Marquis Antonio de Gregorio, Palermo (134); R. Accademia di Scienze, etc., Modena (125–129 and Trans. xvi, 2); Università, Pisa (134); R. Comitato Geologico, Rome (134); R. Bibliotica N. C., Firenze (134); R. Osservatorio, Turin (134); Société Linnéene, Bordeaux (134); Prof. Lucien Adam, Rennes, France (134); Bureau Centrale Météorologique (131–134), Société D'Anthropologie, "Cosmos," Marquis de Nadaillac, M. A. Des Cloizeaux, Paris (134); Sir Henry Thompson, London (134); Mr. Samuel Timmins, Coventry, England (134); Philosophical Society, Prof. Dr. J. P. Postgate, Cambridge, England (134); Royal Institution, Victoria Institute, Royal Astronomical Society, Linnean Society, Royal Society, Society of Antiquaries, London (134); Geographical Society, Manchester (131–134); Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne (134); Royal Dublin Society (134); Prof. James Geikie, Royal Observatory, Royal Society, Royal Scottish Geographical Society, Edinburgh (131–133); Free Public Library, Jersey City (131–134); Prof. Thomas Chase, Providence (131–133); Drs. E. D. Cope, W. G. A. Bonwill, J. M. Maisch (134), "National Baptist," Philadelphia; University of California, Prof. Joseph Le Conte, Berkeley, Cal. (134); Prof. Daniel Kirkwood, Riverside, Cal. (134); Free Public Library, Mr. George Davidson, San Francisco (134).

Letters of acknowledgment (135) were received from the Canadian Institute, Toronto; Geological Survey, Ottawa; Mr. Horatio Hale, Clinton; Nova Scotian Institute of Natural Science; Maine Historical Society, Society of Natural History, Portland; Vermont Historical Society, Montpelier; Prof. C. H. Hitchcock, Hanover, N. H.; Massachusetts Historical Society, State Library of Massachusetts, Hon. Robert Winthrop, Mr. Hamilton A. Hill, Boston; Museum of Comparative Zoölogy, Mr. Robert N. Toppan, Prof. J. D. Whitney, Cambridge, Mass.; Essex Institute, Salem; Free Public Library, New Bedford; Dr. Pliny Earle, Northampton; American Antiquarian Society, Worcester; Rhode Island Historical Society, Providence Franklin Society, Providence; Prof. Charles E. Monroe, Newport; New Haven Colony Historical Society; Connecticut Historical Society, Hartford; Buffalo Library; Prof. E. North, Clinton, N. Y.; Profs. T. F. Crane, J. M. Hart, B. G. Wilder, Ithaca; Vassar Brothers Institute, Poughkeepsie; Oneida Historical Society, Utica; U. S. Military Academy, West Point; Prof. Henry M. Baird, Columbia College, Astor Library, American Museum of Natural History, New York Hospital, Academy of Medicine, University of the City of New York, Historical Society, Meteorological Observatory, Prof. J. J. Stephenson, Capt. R. S. Hayes, New York; Rev. Joseph F. Garrison, Mr. Isaac C. Martindale, Camden; Free Public Library, Jersey City; New Jersey Historical Society, Newark; Nassau Hall Library, Prof. C. A. Young, Princeton; Dr. R. H. Alison, Ardmore; Prof. Martin H. Boyé, Coopersburg; Hon. Eckley B. Coxe, Drifton; Dr. Traill Green, Profs. J. N. Moore, Thomas C. Porter, Easton; Mr. Andrew S. McCreath, Harrisburg; Mr. Ario Pardee, Hazleton; Mr. John Fulton, Johnstown; Linnean Society, Lancaster; Mr. Peter F. Rothermel, Linfield; Prof. John F. Carll, Pleasantville; Mr. Heber S. Thompson, Pottsville; Rev. F. A. Mühlenberg, Reading; Mr. M. Fisher Longstreth, Sharon Hill; Philosophical Society, Messrs. William Butler, Philip P. Sharples, West Chester; Mr. Thomas Meehan, Germantown; Wagner Free Institute of Science,

Academy of Natural Sciences, Zoölogical Society, Pennsylvania Hospital, Library Company of Philadelphia, Messrs. R. L. Ashhurst, John Ashhurst, Jr., R. Meade Bache, W. G. A. Bonwill, Charles Bullock, Cadwalader Biddle, S. Castner, E. D. Cope, J. Solis Cohen, Thomas M. Cleeman, Paterson Du Bois, Robert P. Field, Persifor Frazer, George Freebis, Frederick A. Genth, Frederick A. Genth, Jr., H. D. Gregory, Joseph S. Harris, Lewis M. Haupt, William A. Ingham, W. W. Jefferis, John Marshall, J. W. Maisch, James T. Mitchell, Charles A. Oliver, Franklin Platt, Robert Patterson, C. Stuart Patterson, C. N. Peirce, Henry Phillips, Jr., William Pepper, Frederick Prime, Theodore D. Rand, W. S. W. Ruschenberger, L. A. Scott, Coleman Sellers, Carl Seiler, Albert H. Smyth, H. W. Spangler, H. C. Trumbull, W. P. Tatham, D. K. Tuttle, Talcott Williams, Joseph Wharton, Louis Vossion, Philadelphia; Maryland Historical Society, Peabody Institute, Institute for the Promotion of the Mechanic Arts, Baltimore; U. S. Naval Institute, Annapolis; Smithsonian Institution, Weather Bureau, U. S. Coast and Geodetic Survey, U. S. Geological Survey, U. S. Naval Observatory, Anthropological Society, Mr. W. B. Taylor, Surgeon-General's Office, Dr. A. S. Gatschet, Major J. W. Powell, Prof. Herman Haupt, Capt. Thomas Jefferson Lee, Washington, D. C.; University of Virginia; Leander McCormick Observatory, Charlottesville; Virginia Historical Society, Richmond; Mr. Jed. Hotchkiss, Staunton; Georgia Historical Society, Savannah; Cincinnati Society of Natural History; Cincinnati Observatory; Prof. E. W. Claypole, Akron, O.; Dr. Robert Peter, Lexington, Ky.; Athenæum, Columbia, Tenn.; Geological Survey of Missouri, Jefferson City; Prof. J. C. Branner, Little Rock, Ark.; Col. William Ludlow, Detroit; Wisconsin State Historical Society, Madison; Davenport Academy of Sciences; Kansas State Historical Society, Topeka; Colorado Scientific Society, Denver; University of California, Prof. Joseph Le Conte, Berkeley; Lick Observatory, Mt. Hamilton, Cal.; Prof. Daniel Kirkwood, Riverside, Cal.; Mr. George Davidson, San Francisco; Observatorio Astronomico Nacional Mexicano, Tacu-

baya; Sociedad Cientifica, "Antonio Alzate," Mexico; Bishop Crescencio Carrillo, Merida, Yucatan.

Accessions to the Library were announced from the Comité de Conservation des Monuments de L'Art Arabe, Cairo, Egypt; Royal Society of Tasmania; Secretary of Mines, Melbourne, Victoria; New Zealand Institute, Wellington; Tokyo Library; K. Akademie der Wissenschaften, St. Petersburg; M. O. A. L. Pihl, Christiania; Naturforschende Gesellschaft, Bamberg; K. P. Geodätische Institut, Association Géodésique Internationale, Berlin; Naturforschende Gesellschaft, Emden; Verein für die Geschichte und Altertumskunde, Erfurt; Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. O.; K. Leopoldinisch-Carolinische Deutsche Akademie der Naturforscher, Halle a. S.; Schweizerische Naturforschende Gesellschaft, Bern; Société de Physique et d'Histoire Naturelle, Geneva; Biblioteca N. C. di Firenze; Direzione Générale della Statistica, Rome; Ministère de l'Instruction Publique et des Beaux Arts, Société Americaine de France, Paris; Dr. John Evans, Hemel Hempstead; Natural History and Antiquarian Society, Penzance; Royal Society, Edinburgh; Bureau of Statistics of Labor, Boston; Dr. J. S. Newberry, New York; Departments of Labor, State, War, Smithsonian Institution, Mr. Sanford Fleming, Washington, D. C.; Col. Charles C. Jones, Augusta, Ga.; Mr. William Harden, Savannah; Dennison University, Granville, O.

Pending nominations Nos. 1230 and 1231 were read.

And the Society was adjourned by the President.

Stated Meeting, October 2, 1891.

Present, 9 members.

Vice-President, Dr. RUSCHENBERGER, in the Chair.

Letters of envoy were received from the Naturforschende Verein, Brünn; K. P. Akademie der Wissenschaften, Berlin;

K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Gesellschaft zur Beförderung der gesammten Naturwissenschaften, Marburg; Verein für Vaterländische Naturkunde in Würtemberg, Stuttgart; Museo Nacional de Buenos Aires; Oficina Meteorológica Argentina, Cordoba.

Letters of acknowledgment were received from the Imperial Academy of Science, Prof. Serge Nikitin, St. Petersburg (134): Societatea Geografica Româna, Bucharest (131–134); K. Danske Videnskabernes Selskab, Copenhagen (134); Université R. de Norvège, Christiania (128–134); Société Entomologique de Belgique, Bruxelles (134); Fondation de P. Teyler van der Hulst, Harlem (134); Naturforschende Verein in Brünn (128–133); Académie des Sciences, Cracow, Austria (134); Osservatorio Marittimo, Trieste (131–134); Section für Naturkunde des Ö. T. C., Vienna (134); K. Geodätische Institut (135), K. P. Meteorologische Institut (134), Deutsche Geologische Gesellschaft (135), Berlin; K. Sächsische Altertums Verein, Dresden (134); Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. O. (134); Gr. Hess. Univ. Bibliothek, Giessen (129); K. Leopoldinisch-Carolinische Akademie, Halle a. S. (134); Verein für Thüringische Geschichte und Altertumskunde, Jena (134); Verein für Erdkunde, Metz (131–134); Dr. C. A. Dohrn, Stettin (134); Verein für Vaterländische Naturkunde in Würtemberg, Stuttgart (131–134 and Trans. xvi, 3); Prof. Johannes Dümichen, Strasbourg (134); Prof. Guido Cora, Turin (134); R. Accademia di Scienze, etc., Modena (134); Societa Africana D'Italia, Naples (131–134); R. Accademia di Scienze, etc., Padua (131–134); M. A. Des Cloizeaux, Dr. E. T. Hamy, Paris (135); Cte. de Charencey, St. Maurice les Charencey (134); Institution of Civil Engineers (129, 130), Sir James Paget (134), London; Mr. Alfred R. Wallace, Parkstone, England (131–134); Prof. Robert W. Rogers, Carlisle (135); Col. Garrick Mallery (135), Prof. C. V. Riley (134), Smithsonian Institution, Washington, D. C.; Museo Nacional, Dr. H. Burmeister, Buenos Aires (134); Instituto Fisico-Geografico Nacional, San José de Costa Rica (131–134); South African Philosophical Society, Cape Town (131–133).

Accessions to the Library were reported from the Tokyo Library; R. Accademia Degli Agiati, Rovereto, Austria; Naturwissenschaftliche Gesellschaft "Isis," Dresden; Société des Sciences Physiques et Naturelles, Bordeaux; Bureau des Longitudes, Paris; Société de Geographie, Toulouse; M. Nicholas Ball, Block Island, R. I.; New York Forest Commission, Albany; American Museum of Natural History, Prof. J. S. Newberry, New York; M. J. A. Udden, Rock Island, Ill.; Academy of Sciences, St. Louis; University of California, Sacramento; Observatorio Meteorologico-Magnetico Central, Mexico; Commissão Geographica e Geologica, San Paulo, Brazil; Museo Nacional Oficina Meteorologica Argentina, Buenos Aires; Direccion Central de Estadistica, Guatemala, C. A.

The death of D. Humphrey Storer, M.D., Boston, September 10, 1891, aged 87, was announced.

Prof. Cope offered a paper for the Transactions on the "Ophidians of North America," which was referred to Drs. Horn, Ryder and Heilprin.

Dr. Horn made a communication on the genus Calospaste.

Dr. Franz Boaz, of Worcester, Mass., presented through the Secretaries a paper entitled, "Vocabularies of the Tlingit, Haida, etc., Languages."

Prof. Cope made some remarks on the results of a late expedition to the Gallapagos islands.

Pending nominations Nos. 1230 and 1231 were read.

And the Society was adjourned by the presiding member.

Stated Meeting, October 16, 1891.

Present, 17 members.

Vice-President, Dr. RUSCHENBERGER in the Chair.

Correspondence was submitted as follows:

A circular was received from the Local Committee on Organization of Pan-Republic Congress and Human Freedom

League, inviting the Society to its reunion on October 12 and 13, 1891, at the State House and Academy of Music.

A circular from the Naturhistorische Gesellschaft zu Nürnberg, announcing the celebration of its ninetieth year.

A circular from the Académie Royale des Sciences de Lisbonne, announcing the death of its Secretary, José Maria Latino Coelho, on August 29, 1891.

Mr. Paul Leicester Ford requested by letter the permission to consult the draft of the Declaration of Independence, now stored away with other valuable papers of the Society.

Letters from the President and Mr. W. S. Baker were read in support of the request.

On motion, the Curators were authorized to restore to a place in the fireproof building of the Society its manuscript of the Declaration of Independence in the autograph of Thomas Jefferson.

Dr. Hays moved as an amendment "that it be kept in a fireproof safe."

The amendment, being put to a vote, was not agreed to, and the original motion was adopted by the Society.

On motion, it was resolved that Mr. Ford be permitted to have access to the document in question in the presence of one of the Curators of the Society.

Letters of envoy were received from the Académie Royale des Sciences, etc., de Belgique, Bruxelles; Société des Sciences Physiques et Naturelles, Bordeaux; Bureau des Longitudes, École Polytechnique, Musée Guimet, Ministère des Travaux Publiques, Paris.

Letters of acknowledgment were received from the Royal Society of N. S. Wales, Sydney, Australia (134); Accademia degli Agiati, Rovereto, Austria (134); K. K. Naturhistorisches Hofmuseum, Dr. Aristides Brezina, Vienna (135); Dr. Caspar René Gregory, Leipzig (135); Académie des Sciences, Belles Lettres et Arts, Bordeaux (134); Société de Geographie, Lille, France (135); Ecole d'Agriculture, Montpellier (135); Muséum d'Histoire Naturelle (128); M. Victor Duruy, Prof. A. de Quatrefages, Paris (135); Natural History and Philo-

sophical Society, Belfast (134); College of Pharmacy, Philadelphia (135); Central Meteorological Observatory, Mexico (135); Mr. Everard F. im Thurn, British Guiana (135).

Accessions to the Library were reported from the Société Royale de Géographie d'Anvers; Académie Royale des Sciences, Bruxelles; Geographische Gesellschaft, Bern; Naturhistorische Gesellschaft, Nürnberg; Accademia delle Scienze, Torino; Ministère des Travaux Publiques, Paris; Yorkshire Geological and Polytechnic Society, Halifax, England; Geological and Natural History Survey of Canada, Montreal Geological Society of America, Rochester, N. Y.; Free Public Library of Jersey City; Messrs. J. E. Ives, Henry Phillips, Jr., Pennsylvania Prison Society, Philadelphia; U. S. Department of Agriculture, U. S. National Museum, Washington, D. C.; Mr. W. Curtis Taylor, Tacoma, Wash.

A photograph was received for the Album from Dr. Caspar René Gregory, Leipzig.

The Committee appointed to examine Prof. Cope's paper, offered at the last meeting for the Transactions, reported that he desired to withdraw the same and recommended that the request be granted. On motion, the Society permitted the paper to be withdrawn.

The stated business of the meeting was then taken up, and pending nominations Nos. 1230 and 1231 were read, spoken to and balloted for.

The following minute was read from the Library Committee:

STATED MEETING, OCTOBER 10, 1891.

The Chairman was authorized to report to the Society the suggestion that the fireproof for the valuable books and papers heretofore ordered by a vote of the Society, which order was not executed because of the absence of any sufficient foundation for the fireproof, be now carried into effect, as the walls of the building appear to be entirely sufficient for that purpose.

On motion, the Library Committee respectfully requested the Curators to indicate to the Committee what cases they will need for the purposes mentioned by Dr. Morris to the Committee for the display of antiquities, etc.

Dr. Morris, on behalf of the Curators, stated the reasons why at present the Curators could not designate exactly how much was wanted; that much of the collections of the Society was as yet unpacked and temporarily inaccessible; that until the Curators knew how much space would be needed they could not designate it.

Mr. McKean moved that the Committee on Hall be requested to carry into effect the order of the Society, made several years ago, to procure a fireproof safe for the safe custody of the valuable books and papers of the Society, or to inform the Society, if they find such to be the fact, that the walls of the Society's building are not yet deemed strong enough to support such a safe.

Mr. DuBois inquired as to whether any limit had been placed as to the size and price of such a safe.

The Secretaries replied that in the original motion there was no limitation.

Dr. Cope suggested that a new base might have to be built to support so great a weight.

Dr. Greene suggested that several small safes might better serve the purpose than one large one.

Prof. Barker suggested that a vault could be erected in the basement of the Society's building as a receptacle for its documents.

On motion of Mr. McKean, the motion was referred to the Hall Committee.

All other business of the meeting having been disposed of, the Tellers reported the result of the voting for candidates to the Presiding Member, who declared that

2197. Prof. George Forbes, F.R.S., London,

2198. Mr. Joseph G. Rosengarten, Philadelphia,

had been duly elected members of the Society.

And the Society was adjourned by the President.

Stated Meeting, November 6, 1891.

Present, 31 members.

President, Mr. FRALEY, in the Chair.

Mr. Joseph G. Rosengarten, a newly elected member, was presented to the Chair and took his seat.

Correspondence was submitted as follows:

A letter of acceptance of membership from Mr. Joseph G. Rosengarten, Philadelphia.

A letter from Mr. William Curtis Taylor, requesting exchanges on behalf of the Tacoma Academy of Science, Tacoma, Wash. On motion, the Academy was ordered to receive Proceedings from No. 96 and Catalog.

A letter from Mr. Joseph G. Rosengarten, in behalf of various persons, requesting the Society to accept their gift of a marble relief portrait of the late Mrs. Emma Seiler, and to fix a time for its formal presentation. On motion of Mr. Dudley, the gift was accepted and the 20th of November was selected.

Letters of envoy were received from the Société Imp. Russe de Géographie, St. Petersburg; Institut Météorologique de Roumanie, Bucharest; Meteorological Office, Royal Statistical Society, London; Royal Dublin Society, Royal Irish Academy, Dublin; Geological Survey of Pennsylvania, Harrisburg; Theological Seminary, Hartford, Conn.

Letters of acknowledgment (135) were received from Prof. Serge Nikitin, St. Petersburg; Anthropologische Gesellschaft, Vienna; Prof. Peter Ritter von Tunner, Leoben, Austria; Prof. Abel Hovelacque, Paris; Mr. Samuel Timmins, Arley, England; Philosophical Society, University Library, Cambridge, England; Victoria Institute, Linnean Society, Royal Society, Royal Meteorological Society, Messrs. C. Juhlin Dannfeld, P. L. Sclater, London; Manchester Geographical Society, Philosophical Society, Glasgow; Prof. Andrew A. Blair, Mr.

Joseph G. Rosengarten, Philadelphia; Kansas Academy of Science, Topeka.

Accessions to the Library were reported from the Société Imp. Russe de Géographie, St. Petersburg; Institut Météorologique de Roumanie, Bucharest; Bataviaasch Genootschap van Kunsten en Wetenschappen, Batavia; K. Akademie van Wetenschappen, Amsterdam; Instituto y Observatorio de Marina, San Fernando; Philological Society, Cambridge, England; Meteorological Council, London; Mr. Samuel Timmins, Arley, near Coventry, England; Mr. James B. Francis, Lowell, Mass.; Massachusetts Historical Society, Boston; Hartford Theological Seminary, Mr. J. A. Spalding, Hartford; Geological Survey of Pennsylvania, Harrisburg; American Society for Extension of University Teaching, University Marine Biological Association, Prof. Edwin J. Houston, MacCalla & Company, Philadelphia; Commissioner of Pensions, Bureau of Education, U. S. Commission of Fish and Fisheries, Dr. Albert S. Gatschet, Washington, D. C.

The death of Hon. William Morris Davis at Philadelphia, was announced as having occurred in October, 1891.

On motion of Secretary Brinton, the paper of Dr. Boaz, on "Indian Languages," was ordered to be printed in the Proceedings.

A communication on "The Electrolysis of Metallic Formates," by Hill Sloane Warwick, was presented by Secretary Barker.

Curator Patterson Du Bois presented the following report on the examination, by Mr. Paul Leicester Ford, of the autograph copy of the Declaration of Independence owned by the Society.

Notes on the Various Copies of the Declaration of Independence in Jefferson's Handwriting.

According to order the Society's copy of the Declaration of Independence was examined by Mr. Paul Leicester Ford, in the meeting room of the Society, on Wednesday, October 21, 1891, in my presence as Curator. The following facts were obtained from Mr. Ford.

There were nine known MS. copies of the Declaration :

1. Jefferson's original first draft is now in the possession of the Department of State at Washington. It contains five emendations by Franklin and two by John Adams.

2. On the 28th of June, 1776, a fair copy was submitted to Congress. It was discussed on the 3d and 4th of July, and passed late in the day of the 4th of July. There is no evidence that this copy, or any other, was signed, except by the regular official attests, on the 4th of July. All traces of this copy have been lost for many years. The engrossed copy now in the Department of State at Washington, which is, of course, not in Jefferson's handwriting, was signed on the 2d of August following—some of the signers not having been in or members of the Congress on the 4th of July, while others who were there and voted for the Declaration were not among the signers.

Between July 4th and 8th, Jefferson wrote copies as follows :

3. One for John Page.

4. One for George Wythe.

5. One for Edmund Pendleton.

6. One for Richard Henry Lee, the copy now in the possession of the American Philosophical Society, to which it was presented by Lee's grandson.

7. In 1825, Jefferson wrote that he had given a copy to Mazzei, who had subsequently given it to a French countess. Of this we know nothing further.

8. A fair copy was written for Madison, perhaps fifteen years or so after the copies made in 1776 were written. This is now in the possession of the Department of State.

9. In 1821, Jefferson wrote a copy which he inserted in his autobiography.

This Society has in its possession the letter, dated July 8, 1776, in which Jefferson presents to Richard Henry Lee the copy above numbered 6. Jefferson writes : "I enclose you a copy of the Declaration of Independence as agreed to by the House, and also as originally framed ; you will judge whether it is the better or worse for the critics." On July 21, Lee acknowledged it, and said : "I wish sincerely, as well for the honor of Congress as for that of the States, that the manuscript had not been mangled as it is." On this Mr. Ford observes : "In 1825, when this manuscript came into the possession of your Society, John Vaughan, who, I believe, was then your Secretary, wrote to Jefferson, asking him 'if it was the original draft.' To this Jefferson replied, stating it was not, but added : 'Whenever in the course of the composition, a copy became overcharged and difficult to be read with amendments, I copied it fair, and when that also was crowded with other amendments, another fair copy was made, etc. These rough drafts I sent to distant friends who were anxious to know what was passing. . . . . Whether the paper sent to R. H. Lee was one of these, or whether, after

the passage of the instrument, I made a copy for him with the amendments of Congress, may, I think, be known from the face of the paper.' An examination of the paper proves conclusively that it is the latter, to which has been added an endorsement in the handwriting of Richard Henry Lee, and marginal notes in the handwriting of Arthur Lee, both of which are attested by Richard Henry Lee, the grandson of the former, on the document itself. As Arthur Lee was absent from this country in 1776, and did not return to it till 1779, his notes must have been made subsequent to the latter date."

The underscoring and bracketing in the copies 3, 4, 5, 6 signify, then, that Congress either struck out or altered the phraseology of those passages.

Mr. Ford desires me to return his hearty thanks to the Society for the privilege of examining the manuscript. It seems to me that the Society is likewise indebted to Mr. Ford for the foregoing valuable information.

PATTERSON DU BOIS, *Curator.*

The Treasurer, Mr. Price, presented a report from the Michaux Committee, as follows:

TO THE AMERICAN PHILOSOPHICAL SOCIETY:

The Michaux Committee respectfully reports that at a meeting of the Committee, held on November 5, 1891, a letter was received from Dr. J. T. Rothrock, enclosing the following list of the subjects proposed for the Thirteenth Course of Lectures given under the auspices of the American Philosophical Society:

1. Vegetation of the Bahamas and Jamaica (illustrated).
2. Vegetation of the Bahamas and Jamaica (illustrated).
3. Physical Geography of the Bahamas and Jamaica (illustrated).
4. Some Problems for the Future, arising from Forest Growth, Surface Drainage and State Lines.
5. Forestry in Pennsylvania.
6. Relation of Forests to the Surface of the Earth.
7. Some Points in Practical Forestry.

It is expected that the Lectures will be delivered in the Hall of the Academy of Natural Sciences, which has been kindly tendered to him by the Academy for that purpose.

The Committee approved of the proposition and requests the Society to make an appropriation of $255 out of the income of the Michaux fund to meet the expenses of the Lectures.

In January, 1890, the Society made an appropriation of $200, out of the income of the Michaux fund, to Prof. Heilprin, towards the expenses of his expedition to Mexico and Yucatan, and your Committee has just received from him a paper entitled "Observations on the Flora of Northern Yucatan," in the nature of a report to it of his botanical work in that

country, which is herewith submitted as part of its report to be printed in the Proceedings of the Society.

The Committee submits the following resolutions, which it desires shall be passed by the Society.

Resolved, That the sum of two hundred and fifty-five dollars be appropriated out of the income of the Michaux fund towards the expenses of the Thirteenth Course of the "Michaux Forestry Lectures," by Dr. J. T. Rothrock.

Resolved, That the paper of Prof. Heilprin, entitled "Observations on the Flora of Yucatan," as well as the paper presented by Dr. Rothrock entitled "Some Observations on the Bahamas and Jamaica," in the nature of report to the Michaux Committee of his visit to these Islands in 1891, be printed in full in the Proceedings of the Society as part of the report of the Michaux Committee.

By order of the Board,

J. Sergeant Price, *Secretary*.

The resolutions, as reported, were adopted by the Society.

Observations on the Flora of Northern Yucatan.

By Prof. Angelo Heilprin.

It is not a little singular that while the Mexican region as a whole has from the beginning of the century to the present day attracted the attention of botanists of all nations, and contributed more largely to the initial understanding of geographical botany than perhaps any other region of the globe, the Province or State of Yucatan should not have drawn to it a single botanist of note. Indeed, it is only in the last few years that any systematic effort has been made towards the determination of its flora, even the relationship of which has not yet been precisely ascertained. Grisebach, in his *Vegetation der Erde* (1884, Vol. ii, p. 301), dismisses the region with the bare statement that unfavorable climatic and physical conditions prevent luxuriance of vegetable development, and Hemsley, in his report upon the botany of Mexico and Central America, prepared for Godman and Salvin's *Biologia Centrali-Americana* (*Botany*, iv, p. 151, 1888), merely asserts our ignorance in the following words: "Before concluding this part, we may add that little is known of the details of the botany of Yucatan, except that it is very poor and scanty, and largely composed of plants that still bear long droughts without injury. The poverty of the flora is ascribed to the fact that the copious rains rapidly filter away through the porous limestone substratum." Drude, in his *Handbuch der Pflanzengeographie* (1890), ignores the region entirely. In view of this very limited knowledge of the flora of a country so interesting

as is Yucatan, I venture to submit a few general observations which were hastily picked up during a field reconnaissance made in the early part of 1890 (late February and March), principally in the interests of geological and zoölogical research. The collection of plants, which serves as a basis for some of the determinations referred to in this paper, was made by Mr. Witmer Stone, one of my associates in exploration, to whom I am indebted for notes and remarks on distribution, etc. I desire in this place also to acknowledge my indebtedness for various favors to D. Emilio MacKinney, of Merida, Yucatan, the author of the now progressing *Nuevo Judio*,* who has kindly assisted me in the determination of species not in flower, and of which specimens could not readily be obtained for our collections, and also furnished the local or Maya names.

Perhaps the traveler's first surprise on landing in Yucatan is that his eyes do not immediately fall upon a line of lofty primeval forest · secondly, he may be distressed by the utter barrenness which at times distinguishes much of the region that is covered by the bush or "jungle." This is the condition throughout much of the dry season when the trees and bushes, instead of being buried in dense and brilliant verdure, are as bare as though they had just passed through the tail end of one of our northern winters. The more striking does this condition appear when it is recollected that the region under consideration is well within the tropics, but little elevated above the level of the sea, and seemingly well fitted for the development of a rich and luxuriant flora. In the region first visited by us—the flat limestone tract included between the seaboard and the capital city—the vegetation is monotonous to a high degree. There is little of that variety of form which we are accustomed to associate with the vegetation of the south—little or nothing of the life which astonishes by its exuberance. By far the greater number of the arboreal elements of the scrub—for it is more nearly scrub than either jungle or forest—belong to the group of the Leguminosæ, among which the *yaxhabin*† (a species of Cassia) and the dog-acacia or *subinché* (*Acacia corniyera*), with their abatis of thorns, stand out as prominent members. Beyond the presence here and there of one or more species of cactus (*Cereus Peruvianus, C. flagelliformis, Cactus opuntia*) and the vision of distant cocoa-palms and oranges, there is little to remind the stranger from the north that he is not traveling in his own country. There are no large foresters swinging garlands of evergreens to the breeze, no canopy of flowers to waft perfume to the air. All about are tree-like bushes, fifteen to twenty-five feet in height, thin and so spare in their foliage as to permit of but indifferent shade, and most of them stocked with a wonderful armor of hooks and thorns. There are few flowers on the interground, and what appear on the branches above are almost wholly of a yellow color—the flowers of the Cassia and of the numer-

* *El Nuevo Judio: Apuntes que serviran para la formacion de La Flora Yucateca.* Merida, 1889.

† Pronounced with the German pronunciation of the vowels, *yashabin*. The x which appears in many of the Maya or Yucatecan words, as in Uxmal, has the sound of *sh*.

ous associated Acacias. These may be taken to represent the white blossoms of our cherry and dogwood. Here and there the eye catches a glimpse of a solitary screw-pine, the ɔipil* of the Mayas (*Pandanus candelabrum*), a plant which seems to have pretty firmly engrafted itself upon the Yucatan flora.

Withal that is lacking to indicate a tropical flora there is equally little that is really distinctive of the northern woods; there are no oaks, maples, beeches, poplars, junipers, cedars or pines. Excepting the Acacias we failed to detect a single genus of northern forest trees.† Yet the total impression produced by the vegetation was one immediately suggestive of the north, and not of a flora intermediate in character between that of the north and that of the south. The largely denuded condition of the trees undoubtedly conduced towards this impression.

This is the picture of the limestone flats between Progreso and Merida, and of much of the region lying to the east, south and west of the capital city; it is the picture as we found it in the dry season, in the month of March, before nature had yet begun to respond to those refreshing influences which are the offering of the rainy season.‡ It was the tropical winter. But even at this season of the year there were pieces of landscape that were fragrant in their verdure. Wherever the hand of man had transformed the native scrub into the fertile, but ever dreary and monotonous, henequen country, with its countless aloes (*Agave rigida?* var. *A. Sisalana*) planted in avenues of geometrical precision, the eye is sure to rest upon a number of scattered garden spots. They are the groves of the haciendas, and it is difficult to conceive of anything more brilliant or refreshing than these oases in what might be termed a fertile desert. The dense masses of foliage of the orange, *ramon* (*Brossimum alicastrum*), and one or more species of Ficus (*F. longifolia*), with their deepest tints of green, and the overarching plumes of the cocoanut, offer a sharp contrast to the bleak expanse of hennequen, and a picture of loveliness not soon to be forgotten.

Along the roadways and in the gardens of Merida numerous examples of the true arboreal vegetation of the tropics are to be met with. Conspicuous among these are the silk-cotton tree (*Bombax ceiba*) and the *bonete* or *kumché* (*Jacaratia Mexicana*), both of which assume the stately proportions of forest trees. At the time of our visit they were already in full fruit, although they as yet showed scarcely a vestige of leaf. This peculiarity, so novel to the stranger, was also true of most of the larger trees, such as the sapote (*Sapota achras*), pochote (*Eriodendron anfractuosum*), the so-called native cedar or cedro (*Cedrela odorata*), etc. The

* The Maya ɔ, or reversed C, is pronounced as a short lingual tz.

† So many of the bushes and trees being destitute of leaf, and therefore largely unrecognizable, it is possible that more of the temperate forms are actually represented than appeared to us to be the case.

‡ Returning to Progreso in the early part of June, I found that the vegetation, although considerably advanced, was still backward as compared with that of the eastern lowland plains of major Mexico, and in every way much less luxuriant.

plum or siruela (*Spondias*) was also bearing heavily, but it still bore traces of flowering. One of the most ornamental trees of the roadside is the "southern pine" or *Casuarina*, which also thrives extensively in the open and windy sand spots of Progreso.

The tree which at the time of our visit gave the tone of luxuriance to the vegetation was the ramon (*Brossimum alicastrum*), the dense masses of whose foliage are a refreshing object in the street scenery of almost every town in northern Yucatan. It is extensively cultivated for horse and mule fodder, and thus frequently appears for cause stripped of its leaves for a height of thirty to forty feet. It then shows to advantage the brilliant contrast between its pale gray, almost white, trunk and the dark green of its crown. Plants with showy flowers were not numerous, and the flowers where occurring were not specially remarkable either for beauty or for fragrance. There were, however, one or two notable exceptions, which went far to redeem the reputation of the tropics. One of these was the tree known in the Maya language as *xkuichĕ*, which comprises the two species familiar to botanists as *Pachira alba* and *P. fastuosa*. Both forms were completely naked, except for the large tufts of red and white blossoms which were scattered over the branches. The tree is a favorite with the natives, and we met with it at numerous places along the open roadside; but its true home is the village garden. Scarcely less attractive in its display of flowers is the siricote (*Cordia Sebestana*), with its large and brilliant cups of scarlet, the abiding place of several species of humming-bird.

The picture of Merida and its surroundings, so far as the vegetation is concerned, is also the picture of much of the outlying region where settlements have effected a lodgment. The approach to every village is heralded by a growth of sabal or cocoanut, the former of which attains the dimensions approximately of the Florida palmetto, rising in graceful shafts sixty to eighty feet in height. Its most picturesque garb is seen when the tree is enclosed by the trunk and cable masses of the *copó* (*Ficus rubiginosa*), whose close embrace makes it appear as though the same trunk and roots were nourishing and supporting the lives of two very distinct organisms. The fig, of later growth, had wrapped its massive descending roots about the shaft of the palm, and in such a manner as to leave little or nothing of its fellow visible except the tufts of leaves. Manifestly the pseudo-parasite had started life from above, possibly from seeds deposited by a bird, gathering sustenance from the atmosphere and its contained impurities. I could find neither here nor in Mexico proper, where I subsequently had frequent opportunity of observing this growth, evidence of strangulation of the host. Inasmuch as the trunk of the palmetto does not materially increase in bulk after it first rises from the ground, I doubt much if this closing around causes any real injury to the plant attacked, contrary to the general belief of the natives. The finest specimens of the cocoa-palm were met with by us at a locality on the north coast known as the Serrito, a few miles to the east of the Puerto de Silam. The tree does not in this place grow to any great height, perhaps forty to fifty feet, but it appears

in full vigor, and many of the trees of the large grove, which is here bathed by the ocean breezes, were laden with fruits. Compared with the cocoa-palms which I subsequently met with in the Mexican region west and northwest of Vera Cruz, these appeared to be of a much more healthy type, and altogether their general aspect was much fresher. In the same region is also found the dwarf cocoanut (*Cocos coyol*).

In the mountain region forty to sixty miles south of Merida, or beyond Ticul, certain new elements are introduced into the vegetation, which impart to it a somewhat distinctive character; but, broadly speaking, the flora is still that of the northern limestone flats, with its acacias as the dominating feature. At several points on the northern flank of the Sierra, as between the hacienda of San Juan and Uxmal, and again between Ticul and the hacienda of Tabi, there are extensive growths of the red gum, the *chakah* of the Mayas (*Bursera gummifera*), the tree which yields much of the chewing gum of commerce. Like most of the larger foresters it was destitute of leaves, and in its peculiarly dichotomizing branches and copper-colored trunk, it could not fail to attract the attention of the traveler. The tree grows to a height of some forty to sixty feet, and in such close association as to form woods of its own. I met with it in considerable abundance along the line connecting Vera Cruz and Jalapa, not far from the village of San Juan. Along the roadways and in the thinner jungle the lesser pineapple or piñuela (*Bromelia pinguin*) was very abundant, its long and rigid saw-like leaves, tipped with bright crimson, forming an effective foreground to the more delicate types of vegetation beyond. Especially beautiful is the effect produced by these plants at the approaches to the famous ruins of Uxmal; great tufted masses, five to seven feet in height, line the roadway on either side—a natural stockade alike impassable to man and beast.

Only along a comparatively short stretch of roadway between Izamal and Tunkas, on the Camino Real to Valladolid, did we meet with that phase of vegetable development which the mind popularly associates with a southern flora—a flora which is tropically luxuriant, and where luxuriance is dependent not upon the special growth of plants of a single order, but upon an assortment of largely heterogeneous elements. The beginnings of such a vegetation we found a few miles to the southeast of Sitilpech. The limestone has here undergone deep decay, liberating a rich deposit of red earth, which has attracted a profuse and varied flora. The trees are very much larger than we had heretofore seen in the bush and some of them almost noble in their proportions. Manifestly they are the remains of a forest which was at one time far more majestic than it is to-day, and which dates its primal destruction probably to the period of the early colonization of the country by the Spaniards. The overarching boughs, decked with a profusion of dog-jessamine (*Tabernæmontana amygdalifolia*), orchids and air plants, especially the latter, help to form a dainty bit of road scenery which it would be difficult to match. Of the orchids, the *Cattleya* was especially abundant, forming by its large bunches great unsightly scars in the axils of the forest trees. We col-

lected also a number of *Oncidia*, etc. The epiphytes were mainly Tillandsias or Bromelias, which in places literally covered some of the large foresters, especially the *pich* (*Inga xilocarpa*). Among other components of the vegetation are the Spanish bayonet (*Yucca*) and Fourcroya, rising thirty to forty feet, and several species of cactus (*Cereus grandiflora, C. flagelliformis, Melocactus*). The first of these, the far-famed night-blooming Cereus, occurs in great sprawling masses, dependent from the lower branches of the bush. Here and there it is closely associated with the organ or giant cactus (*Cereus Peruviana*) and with other species to form dense and impenetrable thickets. Many of the plants were in flower at the time of our visit.

Three large cenotes, or, more properly, aguadas, those of Shkashek and Balantun, open up within a short distance of one another on this road, and their deep basins are largely encircled by a luxuriant growth of forest. Over the surface of two of these, great lily pads had encroached upon the water, recalling a picture from our own far north. In a second well a brake or cane, together with the *puh* (*Pandanus utilis*), had largely usurped the place of the lily. I observed here also a number of calabash bushes or trees (*Crescentia cujete*).

On the northern coast of the peninsula, adjoining the luxuriant *sapotales* of the Serrito, is a vast mangrove maze. Unlike the mangroves of the Southern United States, such as I had observed in profuse development on the western coast of Florida, or of Bermuda, the Yucatan mangrove is a noble forester, rising a hundred feet or more in height. The great air-shoots or roots descend from an elevation of fifty to seventy-five feet, and in their massiveness recall the giant cables of some of the *Ficaceæ*. In its general aspect the mangrove forest is most impressive—a wilderness of roots, stems and foliage, into which but little sunlight penetrates.

Attention has already been directed to the *scanty* character of the Yucatan sylva; this is, indeed, the nature of the "jungle," which is referred to by nearly all travelers since the days of Stephens and which encompasses the sites of many of the larger ruins of the interior. The true forest jungle, such as is to be met with in the State of Tabasco or in the low Mexican region west of the Gulf, is wanting over the greater part of the extensive limestone plain of the north, nor does it show itself in the mountain tracts either. This condition has led botanists to assume that the northern half of the peninsula was climatically and physically unsuited to the development of the profuse and healthy vegetation which elsewhere distinguishes tropical Spanish America. Indeed, Grisebach goes so far as to assume that the deficiency of forms is mainly due to an absence of rainfall, which is, however, as well marked in Yucatan as it is in most non-mountainous tropical countries. The fallacy of this view has already been pointed out by Woeikof.* The scraps of luxuriant growth that appear here and there, taken in conjunction with the giant dimensions of some of the scattered foresters, seem to me to point rather to

* *Reise durch Yukatan und die südöstlichen Provinzen von Mexiko*, 1874. Petermann's *Mittheilungen*, 1879, p. 202.

favorable than to unfavorable conditions and to an explanation of the existing sparseness of the vegetation which has no connection with climatic or physical influences. I think it all but certain that an extensive forest at one time covered the land, and that successive devastations in one form or another have brought the surface to the condition in which we now find it. That the Spaniards here, as in Mexico proper, caused wanton destruction of the native forests is positive; but how often the destruction has been continued since the period of the conquest has not yet been determined.

The following brief notes on some of the plants observed by us may serve in a measure to elucidate the vegetation of northern Yucatan; most of the determinations have been made by Mr. MacKinney, who has also supplied the Maya names (the second name which occasionally appears in parentheses is the one in common use).

Cassia sp.? (*Yaxhabin*).—Tree, 15–20 feet, very abundant in the open scrub between the seaboard and Merida. Flowers bright yellow.

Acacia cornigera (*Subinch'*).—Very abundant in the bush.

Acacia odoratissima? (*Baalch'*).

Inga xilocarpa (*Pich*).—One of the largest of the roadside trees, 70–100 feet or more in height. This tree appears to be specially selected for decoration by the Tillandsia.

Bombax ceiba (*Yaxché*).—The silk-cotton tree is one of the giants of the Yucatan flora, of which it constitutes one of the distinctive features; 70–100 feet; very abundant. Specially noble examples of this tree, one of them measuring not less than eight feet in diameter, are found in the region about Ticul. Destitute of leaf at the time of our visit, but bearing an ample supply of pods.

Eriodendron anfractuosum (*Pochote*).—An abundant tree, mostly of smaller size than the ceiba; flowering.

Pachira alba, Pachira fastuosa (*Xcuyché—Amapola*).—Cultivated as ornamental trees; 15–25 feet; flowering, but devoid of leaves.

Brossimum alicastrum (*Ox—Ramon*).—Very abundant in all the village gardens; cultivated for fodder. Tree, 60–80 feet.

Ficus grandifolia (*Akúm*).—Large and abundant tree.

Ficus rubiginosa (*Copó*).—Very abundant as a pseudo-parasite on Sabal.

Ficus laurifolia.—Shade tree in the park of Merida.

Jacaratia Mexicana (*Kumché—Bonete*).—Large and abundant tree—in fruit. The conspicuous triangular fruit is prepared in a variety of ways as an article of food.

Carica papaya (*Put—Papaya*).—The papaw; very abundant in gardens.

Bursera gummifera (*Chacah*).—Tree (destitute of leaf at the time of our visit) very abundant in the hill region south of Ticul; 50–60 feet.

Spondias lutea (*Abal—Xkinim-kobo—Siruela*).—One of the forms of Yucatan plum; extensively cultivated.

Spondias microcarpa (*Aac-abal*).

Spondias rubra (*Xkis-abal*).

Cordia Sebestana (*Kopté—Siricote*).—Abundant in gardens.

Cedrela odorata (*Kulché*).—Abundant in gardens in Merida and in nearly all villages.

Casuarina.—Abundant in gardens and in open places; 30–60 feet.

Anona squamosa (*Ch'almui—Saramayo*).—The custard apple.

Anona muricata (*Guanávano*).

Anona glabra (*Op*).

Sapote achras.—Much cultivated for its delicious fruit; tree 50–80 feet.

Lucuma mamosa (*Chucalhas*).—The mamey.

Mamea Americana.—The San Domingo mamey; extensively cultivated.

Persea gratissima (*On—Aguacate*).—Alligator-pear.

Plumeria alba (*Nicté—Flor de Mayo*).—Cultivated for its beautiful and highly aromatic flowers.

Tabernæmontana amygdalifolia (*Uzupek—Jazmin de perro*).—Dog-jessamine. Very abundant along some of the roadways, as on the Camino Real between Izamal and Tekantó; flowering.

Crescentia cujete (*Luch—Jicara*).—Calabash tree; observed at the aguada of Shkashek.

Tecoma equinoctialis (*Sac-ak—Bejuco de Chiquiuite*).

Cucurbita pepo (*Kúm—Calabassa*).—Calabash.

Rhizophora mangle (*Tapché*).—Forming extensive forests on the north shore, east of the Puerto de Dilam.

Cereus Peruvianus (*Nun—Organo*).—The organ cactus, forming dense and almost impenetrable thickets; 20–30 feet. Very abundant near the hacienda of Tabi, southeast of Ticul. A smaller species is known as Nuntsutsui.

Cereus grandiflora (*Pitaya*).—Abundant in the thickets, where its great depending masses impede penetration.

Cereus flagelliformis (*Canchoh*).—Common on rocks.

Cereus lanatus (*Tsacám*).

Cactus opuntia (*Pakám*).—The common nopal.

Melocactus communis (*Polxnúk—Bisnaga*).—Abundant in places.

Bromelia pinguin (*Chom—Piñuela*).—Abundant, and forming dense thickets.

Musa sapientia (*Sac-haas*).—The common banana; extensively cultivated.

Musa paradisiaca (*Box-haas*).—Plantain; also common.

Cocos nucifera.—Abundantly cultivated, and forming along the northern shore beautiful groves; 50–70 feet.

Cocos coyol.—Dwarf cocoanut.

Sabal Mexicana (*Bayal-xaan*).—I am not certain that this is the common species of palmetto of Yucatan; the tree attains a height of some 70–80 feet.

Thrinax otomale (*Bon-xaan*).

Thrinax parvifolia (also *Bayal-xaan?*).

Pandanus candelabrum (*Cipil*).—Stray specimens appearing here and there in the bush, between Progreso and Merida.

Pandanus utilis (*Pah*).—In the waters of the cenote of Balantun.

Some Observations on the Bahamas and Jamaica.

By Dr. J. T. Rothrock.

(Read before the American Philosophical Society, November 6, 1891, as part of the Report of the Michaux Committee.)

The American Philosophical Society having last season set apart from the Michaux legacy the sum of three hundred dollars towards defraying the expenses of my West Indian exploring and collecting trip, I desire to offer the following:

The object of the appropriation was the collecting of photographs and information which could be utilized in the preparation and delivery of the annual lectures, popularly known as "The Michaux Forestry Course."

Towards accomplishing this, the islands of New Providence, Eleuthera, San Salvador, Watling and Inagua, all of the Bahama group, were visited, as well also as Jamaica and its lesser political dependency, the Grand Cayman, which is situated one hundred and ninety nautical miles, nearly W.N.W., from the western end of Jamaica.

As the time allowed for my entire trip was but three months, it is evident that no prolonged stay could be made in any one place. We devoted by far the greater portion of our time to the island of Jamaica, and found everywhere, but especially on its greatest altitudes of 7000 feet, ample returns for our search.

In all, about one hundred and fifty good negatives were obtained. As duplicates were usually made, it is fair to say there are about seventy-five satisfactory illustrations of trees, physical geography and topography of the islands visited.

How rich a field the island of Jamaica offers may readily be inferred from the following facts:

1. If reduced to a square, the island would be about sixty-five miles long by as many wide.

2. Its population is only about 600,000 souls.

3. Only twenty-five per cent. of its area is under cultivation.

4. The agricultural methods are very primitive and fertilizers are sparingly used.

5. Notwithstanding these facts, this small area, after retaining enough for home uses, sends into the markets of the world nearly $9,000,000 worth of products each year. These are mainly from the vegetable kingdom.

It is well, also, to call attention to the fact that, of these exports, probably about fifty per cent. are shipped to the United States as against thirty-seven per cent. to Great Britain. Of fruit alone, we received in 1889 not less than $1,580,000 worth, as rated by the exports there. Of course, its value here was vastly greater. There has been during the past five years a *decided increase* in the trade with the United States, and *some also* with Canada.

In spite of the relative proximity of the Bahamas and Jamaica, the contrast between these islands is exceedingly marked. The Bahamas are low and show no considerable elevations. Jamaica reaches a maximum altitude of 7360 feet above the sea level. The soil of the Bahamas is scanty, and consequently cultivation entails fertilization. That of Jamaica is of great depth, and its continued productiveness is evidence of a vast natural fertility. The flora of the Bahamas shows marked resemblance to that of Florida. The flora of Jamaica is essentially tropical, save at such altitudes as suit plants of cooler regions. In such places we found the common chickweed (*Stellaria media*), the white clover (*Trifolium repens*), associated with plants from the cooler parts of southern regions.

The mangrove (*Rhizophora mangle*), common to the tropical seas around the globe, attains in Jamaica (compared with that in Florida and in the Bahamas) a surprising height. Near Port Morant are large jungles, where the trees attain a height of at least sixty feet. This is the proper place to call attention to possible tannin production, which the mangrove suggests. No tree that we have here, at all approaches it in the percentage of tannin it contains. That the mangrove should have remained so long unutilized is due to the difficulty of obtaining its tannin free from coloring matter. There is this to be said, however, that in the near future, owing to exhaustion of other tannin-producing trees, the arts will be forced to draw upon the mangrove, even if an improved chemistry is not able to free it from this objectionable color. The natives obtain a red brown dye from the bark by simply steeping it in water.

When one remembers that the aboriginal population of Jamaica must have depended largely upon the indigenous vegetable products for food, it is surprising to observe to what an extent these have been supplanted by fruit and food from introduced plants. For example, the mango, bread-fruit, cocoanut, bananas, and likely also the yam. Even the logwood, now so important to Jamaica, has been introduced there.

Of the original forest but little remains in Jamaica, though reproduction has again covered the steeper slopes with a luxuriant growth of timber.

Jamaica is not wanting in hard woods. Some of these are of great value. It is claimed that of these they need none from us. Though, on the other hand, it is equally sure that for white and yellow pine the island draws very largely upon our resources. The United States furnished Jamaica in 1889 nearly $200,000 worth of building material, of which the major part was probably lumber. It is not probable that the economic resources of the vegetable kingdom in Jamaica are properly recognized, or that we derive from them now anything like what we shall in the future.

Attention should also here be called to the fact that, years ago, attempts were made to introduce the Sisal hemp from Yucatan into the islands on the southern coast of Florida. It appears to have been abandoned (probably from want of proper machinery to extricate the fibre). The plants are now growing wild in these Florida islands, and have been

introduced, under the intelligent and earnest direction of Gov. Sir Ambrose Shea, into the Bahamas, where they promise soon to furnish large quantities of fibre which will rival manila in the markets of the world.

From Publication No. 86, of the U. S. Hydrographic Office for the Year 1888, page 1, I quote the following: "The sea breeze generally sets in about 9 A.M., and, blowing either directly on shore, or, according to the trend of the coast line, at an angle to it, continues till about sunset, when a calm interval is succeeded by a light off-shore air, attaining its greatest strength about day dawn, and being succeeded by an oppressive calm, to be again followed by the sea breeze. On the coasts of Cuba, Santo Domingo, Puerto Rico and Jamaica, the regular sequence of land and sea breezes is seldom interrupted." So far as our observation could go in so brief a period, we can entirely confirm this general statement. These local breezes must not, however, be confounded with the trade winds which, from latitude 28° N., come normally from the N.E. or E.N.E. and sweep over the ocean areas in which these islands lie. Neither must we lose sight of the fact that, at Kingston, in Jamaica, the wind comes the year through almost constantly from the S.E.

Observation has shown that during the months of November, December and January frequent rains fall upon the northern side of the island of Jamaica. It would appear as if the direction of these trade winds and the position of the island of Cuba might explain some notable differences in the distribution of this winter rain upon the northern shore of Jamaica. From Cape Maysi, on the eastern end of Cuba, to Morant Point, the eastern end of Jamaica, the direction is N.E. ½ N. or about N. 39° E. The distance is about 180 nautical miles. Port Antonio bears by the compass from Cape Maysi about 8° more to the westward than Morant Point. Both of these places are, however, fairly in the line of the N.E. trade winds, which may reach them without sweeping over the mountainous, fog-enveloped eastern end of Cuba. It is important to bear in mind that these mountains on the eastern end of Cuba attain a height of 7000 feet and must have a temperature considerably below that of the sea level. A line drawn from Lucea, on the northwestern end of Jamaica, would cut the mountains of Cuba about 100 miles from the eastern end. In other words, the trade winds from the N.E., to strike Lucea, must first cross the mountains of Cuba, where, by the lower temperature, the moisture is precipitated. Whereas, the normal N.E. trade wind can reach Port Antonio without having to cross the Cuban mountains. The latter reach the Jamaica coast as wet winds, whose moistu re is precipitated on the northern side of Eastern Jamaica; but the winds which reach Lucea come as dry winds.

The facts, as observed by us, were, first, the large aqueous precipitation of Port Antonio and the small precipitation at Lucea. The whole fact is briefly expressed by the saying of the sailors, that to find Port Antonio you had but to enter the blackest, rainiest port on the northern side of Jamaica.

The practical bearing of this is not hard to see from a sanitary standpoint. The high ground on the western end of Jamaica is the climate most suitable for the invalid. The beautiful little town of Lucea, if it possessed a large, well-kept hotel, would be an ideal winter resort for our northern invalids.

Whether considered from the standpoint of climate, scenery or productiveness, Lucea could be made a more desirable winter resort than the Bahamas. Indeed, I am so strongly impressed by the possibilities of Northwestern Jamaica for the invalids of the future that I cannot refrain from making these statements as positive as I have.

There is one more factor to be considered in the climate of Lucea. It is that the trade winds from the N.E. tend, on striking the northern coast of Jamaica, to be deflected into E.N.E. winds. This would place Lucea somewhat under the protection of the parishes to the east of it; so far, at least, as the rainfall is concerned.

We lay in the harbor of Port Morant, on the southern side of Jamaica, whilst a furious north wind was blowing on the northern side of Jamaica and deluging the region near Port Antonio with the rainfall. Yet we received a very moderate share of the rain, which was drained from the clouds by the mountains north of us.

Dr. Morris read a note from Mr. Patterson, Trustee under the will of the late Franklin Peale, suggesting the removal of the stone-age collection of relics, and moved that the Curators be instructed and authorized to withdraw from the custody of the Academy of Natural Sciences the Peale stone-age collections.

A discussion ensued, in which Dr. Brinton, Dr. Morris, Dr. Cope, Mr. Dudley, Mr. Martindale and Mr. Du Bois took part.

The President stated the manner in which the Society had become the owner of the collection referred to.

On motion of Mr. Dudley, the further consideration of the whole matter was postponed until the next regular meeting of the Society, and the Curators were requested in the meantime to examine into the facts and report upon the same.

At the call of deferred business, the report from the Committee of which Prof. E. D. Cope was Chairman, postponed from May 1, 1891, was taken up and considered.

Prof. Cope requested that the same might be postponed until next meeting, which, on motion, was agreed to.

And the Society was adjourned by the President.

Stated Meeting, November 20, 1891.

Present, 26 members.

President, Mr. FRALEY, in the Chair.

On motion of Mr. Dudley, it was

Resolved, nem. con., That the ordinary business of the Society should be suspended, and that such matters as were set for this evening should be postponed until the next regular meeting, and that the only business that should be attended to to-night, should be the reading of a paper by Mr. Henry C. Baird, on "Carey and Two of His Recent Critics—Bœhm-Bawerk and Marshall," and the presentation of the portrait of Mrs. Seiler.

Mr. Henry Carey Baird read a paper on "Carey and His Recent Critics."

Mr. Rosengarten read the following letter:

FREDERICK FRALEY, ESQ.,

President American Philosophical Society.

DEAR SIR:—Some of the friends of the late Mrs. Emma Seiler, including many of her pupils, desire to present to the Philosophical Society, of which Mrs. Seiler was a member, a marble relief portrait of that lady, to be placed in your Hall, as a memorial of her scientific labors and of her success in elevating musical education, and of her contributions to a better knowledge of the voice in speaking and singing. You are respectfully asked to request the Philosophical Society at its next meeting to accept this gift, and to fix a time when it can be presented, and a memoir of Mrs. Seiler, be read, to be preserved and printed in the record of the Transactions of the Society.

We are very respectfully, etc.,

Mrs. Caspar Wister,
Mrs. Brinton Coxe,
Miss Rosengarten,
Miss Bradford,
Miss Maria Hopper,
Mrs. Messchert,
Miss Messchert,
Miss Bennett,
Miss Eliza B. Chase,
Mrs. Agnes G. E. Shipley,
Mr. William Ellis Scull,
Mr. M. H. Messchert,
Mr. Charles Platt,
Mrs. S. I. Lesley,
Mrs. Marriott C. Smythe,
Miss Maria Moss,
Mrs. John W. Field,
Miss Ella C. White,
Miss Mary A. Burnham,
Miss Kate S. Gillespie,
Miss B. M. Randolph,
Mrs. George McClellan,
Rev. Dr. T. K. Conrad,
Mr. William Platt Pepper,
Mr. Edward H. Coates,
Mr. J. G. Rosengarten.

Philadelphia, November 4, 1891.

Mr. Rosengarten, presenting the portrait of Mrs. Seiler, spoke as follows:

Mr. President:—At the last meeting, the American Philosophical Society agreed to accept a marble relief portrait of the late Madame Seiler, presented by a few of her friends and pupils. I now have the pleasure, on behalf of the subscribers, to present it to you and through you to the Society. Madame Seiler was a member of this Society, one of the six women who have thus far been enrolled on its list. The others were Princess Dashkoff, Mrs. Somerville, Mrs. Agassiz, Miss Maria Mitchell and Miss Helen Abbott. Her works on "The Voice in Singing" and "The Voice in Speaking" were not her only claims to this distinction. In Germany, her native country, Madame Seiler was a pupil of the famous teachers of the University of Berlin, and it is to her that is attributed the first use of the laryngoscope in studying the organs of the throat, while her discovery and description of some of the parts of the throat were of great value. She brought letters of introduction from well-known German savans to the late Dr. George B. Wood, for many years President of this Society, and through him was enabled to make the acquaintance of the Rev. Dr. Furness, among its oldest members. This venerable member of the Philosophical Society helped her in all of her literary work, and was her kind and steadfast friend through all her life; his last act of kindness was officiating at her funeral, when his tender sympathy and earnest words assuaged the grief of her family and her friends. But no patronage and no help would have availed without the talent, energy and ability which won for Madame Seiler hosts of friends here. Her success was shown in the establishment of a singing academy, where many pupils were trained in her methods, and her little leisure was spent in scientific and literary work. Much still remains in manuscript, but her printed books have been freely used and commended by the later writers on the subjects specially her own. As a mark of respect and affection, her friends and pupils have secured this admirable marble relief portrait. It is the work of Mr. Henry K. Bush Brown, a young American artist, and it is now presented to the Philosophical Society, with the request that it may find a suitable place on the walls of its hall, where there are portraits and busts of many of the distinguished men who have been members. What Madame Seiler did to entitle her to this honor will be set forth in detail in a biographical sketch to be read this evening, and that memoir will no doubt be preserved in the growing list of necrological notices in the printed papers of the Society. On behalf of the subscribers this marble relief portrait is presented to the Society as an expression of the affection and admiration felt for Madame Seiler in her lifetime and in the hope of thus perpetuating her name and memory as those of a woman who did much for a scientific knowledge of music and whose general culture, broad sympathies and earnest labors endeared her to all who knew her. Coming to this city almost an entire stranger—not even a master of

the language spoken here—it was the kindness shown to her by members of the Philosophical Society that enabled her to find employment and to show her mastery of her art and to carry on her scientific work and to write her books. It is eminently fitting, therefore, that this memorial portrait should find its final resting place on the walls of your hall, and that her name and services should be perpetuated in your records. I now, in the name and on behalf of the subscribers, hand over to you and through you to the keeping of the Society, the portrait of Madame Seiler, a member of the Society, a woman of many virtues and talents and beloved by a large circle of friends, who have joined in thus testifying their sense of the honor conferred on her by this Society and of her eminent right to it.

The President accepted the portrait in a few appropriate remarks.

Mrs. J. P. Lesley then read the following sketch of Madame Seiler:

Mrs. Emma Seiler was born on the 23d of February, 1821, at Wurtzberg, in the kingdom of Bavaria. Her maiden name was Diruff, and her father was court physician to Ludwig, King of Bavaria, and also Surgeon-General to the kingdom. Emma Diruff had two brothers and two sisters. One of her sisters afterwards married Dr. Canstadt, a celebrated physician and professor at Jena, who also started a medical journal, which is still in existence. Her other sister married Dr. Demme, professor of surgery at Berne, and brother of a distinguished Lutheran clergyman of that name, formerly settled in Philadelphia.

The children of Dr. Diruff were on familiar terms with the young princes and princesses at the court of King Ludwig, and occasionally shared their lessons with the same tutors and professors, and Emma grew up in close intimacy and friendship with the princesses, and with the young Maximilian, and Otto, King of Greece. She lived in the atmosphere of court life, was early presented, and the king and queen valued highly their intercourse with the family of the court physician. To our American ideas these are trifles, but unless we understand all the early influences of a young life, we cannot realize what one must have to overcome in later years when living among people to whom all such distinctions are purely artificial.

Her early youth was a very happy one, devoted to her education, in the heart of a family circle of sufficient wealth to be free from serious anxieties and cares, and their home in the midst of beautiful scenery, for which she had all her life a deep appreciation.

In the year 1841 Emma Diruff was married to Dr. Seiler, a young physician whose family like her own was one of the oldest and most aristocratic in Bavaria. The estate of her husband, to which she at once removed with him, was situated in Langenthal in Switzerland, not far from

Berne. She was then twenty years old. For some years she lived in outward comfort, not called on for serious exertions beyond the cares for her children and the guidance of her family affairs. But in 1846 some speculations in which her husband had engaged failed; all his property except the estate on which they lived was lost, and from this time forth she lived a life of deep and constant anxiety, and under the necessity for unremitting exertion. They both thought that their home on the estate might be made remunerative by turning it into a private asylum for insane patients, and into this work Mrs. Seiler threw herself with the energy and ardor of her nature, making herself the sympathetic friend of those whose mental maladies were of the milder type, and having great influence over the violent. At one time, after watching successfully for some months a case of suicidal mania, the patient escaped her and was found to have hung herself. Mrs. Seiler, after an hour of heroic effort, succeeded in restoring the life that was apparently extinct. At another time, she was badly injured by lifting an insane woman, and carried that injury and the suffering it occasioned to her dying day. But she was never one to dwell upon personal sorrows and pains, or talk about them; nor could she help away her griefs by personal resentment, a poor way for any of us to be helped. But she went on courageously with the work appointed to her, only finding her eyes and her heart more open and sympathetic with her sufferers, and her hands more active.

In the year 1847 a famine came upon Switzerland, not due to failure of crops, but to political causes. The French invaded Switzerland in preparation for the Franco-Austrian War, blockaded all the outlets, and the price of provisions became so high that the very poor had no means to supply their wants. At Langenthal and in many other places, they fell dead in the streets from starvation. Mrs. Seiler's heart ached well-nigh to bursting with the miseries she saw around her—the dead and dying in the streets, the wretchedness of those who survived. Night and day she pondered on their distresses and thought over plans for their relief. But all her plans required money and she had none. One night in her agony she prayed, "Oh, my God, send me power to help my poor dying people! Oh, my God, show me the way!" "I prayed all night upon my knees," she said, "and by daylight my mind was clear."

She rose early, and having attended to her family and her patients, she went to the clergyman of the village, to ask for his sympathy and approval. When she had finished an ardent appeal to him, he said to her in a deep and solemn tone which she was fond of imitating, "Read the Bible to those dying people." And when she said, "But they are starving to death; they must have food," he only repeated mechanically, "Read the Bible to those dying people, every one." When she declined to do this, and rose impatiently to go, he said, in the same sepulchral tone, "When that great day comes when the Judge shall separate the sheep from the goats, where will *you* be?" "That does not concern me at all," said Mrs. Seiler, "whether I shall go with sheeps or goats. I was thinking of some-

thing very different. But you, sir, how shall it be with you in that day? Will you go to sheeps or goats?" There was no answer to this question, and she hurried away to carry out her vision of the night without the aid of the clergyman. "I walked to every comfortable house that I could reach on foot," she said, "and besought them to give me whatever they could spare in food or money." Her eloquence brought a generous response. Then she went through the wretched streets, and invited three hundred to come to her house the next day. She bought materials, and herself prepared large kettles of nourishing broth, and bought huge loaves of bread. Then she lodged and fed them through the day on her own premises. Many lives were saved by this timely aid, but this was but one part of Mrs. Seiler's midnight planning. As soon as the poor lives were enough restored for work she induced them to learn some little handicraft by which to help themselves. She herself understood all the beautiful methods of embroidery and exquisite darning and crocheting, and to these she added braiding of hats and baskets and mats, that she might teach them. The hands so awkward and unskillful at first, soon became expert under her instruction, and even very little children in the end did exquisite work. And now she had a real manufactory of salable articles. Then she sent to many rich persons at a greater distance to come and see. "I was a very handsome woman then" she said with naïve simplicity, "and I thought to myself, I will now make my beauty of some use. So I did send to all my courtiers [she meant admirers] to come and see me, and I made it very agreeable for them, and they did buy all my poor people's work, and that did give me much money, to take in and feed and teach more starving people, and then many young ladies of fine families came to me and said, 'Mrs. Seiler, we will learn all your arts, and then we will come and help you to teach the poor people;' and they did. And so the circle of blessing was extended."*

I cannot close this little history of one brief period of Mrs. Seiler's life without telling you that her methods in this time of her country's needs were so successful and far reaching that the Swiss government and afterwards the Swedish and Danish governments sent emissaries to see them; and so convinced were they of their goodness and practicability that they copied them in their own administration.

Her versatility and energy and physical strength were at this time very great, and her resources unfailing. During the whole period of the famine she had to plan carefully and keep the strictest account of expenses and also arrange new plans to replenish an ever-lessening treasury. So, while teaching the handicrafts, she set about discovering the fine natural voices which she knew must exist among the poor peasants who flocked daily to her estate. Having found fifty or more capable of it, she devoted

* Mrs. Seiler's daughter writes me: "When I was in Germany, I made it a point to ask my mother's brother and sister as well as old friends about her youth, and all agreed that she was not only the handsomest girl in Wurtzburg, and called 'The Rose of Wurtzburg,' but was also beloved by all who knew her."

herself with ardor to the training of a band of choristers, who in time sang the most beautiful music all over the neighborhood ; she gave lovely concerts, and the proceeds enabled her to carry on her pious charity a much longer time.

Much of all this I learned from her own lips, told so incidentally and naturally, one could see that she did not herself appreciate its admirable character. But it was strikingly confirmed to me by a lady from this city who with her husband traveled through that region only a few years ago. In the mountains she met a peasant whom she asked if he had ever known a Mrs. Emma Seiler who once lived there. His face brightened all over as he assured her that he remembered her well, and then he told with enthusiasm the story of her saving the lives of so many of his comrades and the good she had done in many ways to all the people.

Late in August of 1851, the home at Lagenthal was broken up, the private asylum came to an end, and Mrs. Seiler found it necessary to support herself and her children by her talent for music, and she left Switzerland never to return to it as a home.

She went first to Dresden, and there took lessons of Wiek, the father of Clara Schumann, with whom she became intimate. She supported herself and her children by giving piano lessons while she was cultivating her voice. But while in training there she lost her voice, a bitter disappointment to her, because she could earn much more by teaching vocal than instrumental music. She remained in Dresden three years, during which time her house was the rendezvous of the principal musical celebrities. She worked hard at her piano lessons, but she did not recover her voice. Then she went to her sister Mrs. Canstadt at Breslau and passed a year giving lessons, and then to Heidelberg. Here she found piano lessons poorly paid; every one wanted singing, and this inspired her to study with zeal the laws of vocal physiology, and the causes of the overstrain which had destroyed her own voice and that of so many others. Here at Heidelberg she became intimate with the two Bunsens, the chemist and the statesman, and also with Kirchoff, professor of physics. Bunsen the chemist and Kirchoff together discovered the spectroscope while she was there, which excited all her enthusiasm.

In December, 1856, she met Helmholtz, who was made professor extraordinary of music. He was then engaged in writing his great work on "Sensation in Sound," and went to Mrs. Seiler almost daily for several months for advice and for verification of his calculations by her experiments. After living in Heidelberg nearly six years she went in 1856 to Leipsic to study herself, and to give her children a musical education at the conservatory. Here she knew well Moschelles, Drysholk, and David the violinist, and also the professor of physiology Ernest Heinrich Weber, and with his aid she studied the anatomy and physiology of the voice and published her first book "Old and New in the Art of Singing," which created a profound sensation in musical circles. From Leipsic she went to Berlin. By the care and training she had given herself after she

had discovered the cause of her trouble she recovered her voice, and was now once more able to give lessons in singing. She had the first laryngoscope, invented by Manuel Garcia, constructed after her own directions, and by it she discovered the verification of her theories with regard to the head notes of the female voice. In Berlin too she found herself in a delightful society, meeting often Du Bois Reymond, the egyptologist Lepsius and many other distinguished companions.

In 1866, finding her means of earning a livelihood almost at an end through the straightened means of the German people during the war, which did not permit many to indulge in the luxury of music, she left Germany and came to Philadelphia. Every movement of her life seems to have been made under the stress of stern necessity. She loved a permanent home, but she accepted these changes, the parting from old friends, the barriers of language, the unaccustomed ways of a new world, with the same sweet patience and simplicity that characterized her life.

I am not competent to speak of her musical career in this city and must leave it to abler minds to do it justice. She brought letters from wise and good men in Europe which at once placed her cause in the best hands. The extracts from the valuable sketches of Charlotte Mulligan and Harriet Hare McClellan, former pupils and friends, which follow my imperfect record, will supply the information I cannot give. From Dr. Furness she had the highest service that devoted friendship could give, since he gave time and personal labor and much care in translating her manuscripts into exquisite English. Her work on "The Voice in Singing" is entirely her own. In the "Voice in Speaking" she had much assistance from her son, Dr. Carl Seiler, in the physiological parts. In establishing her school of vocal music she had the personal assistance and generous backing of many devoted friends.

I may mention here that within two years of her residence in Philadelphia Mrs. Seiler was made a member of the American Philosophical Society, an honor accorded to but six women since its foundation : the Princess Catherine Romanowa d'Aschkow, Mrs. Somerville, Miss Maria Mitchell, Mrs. Emma Seiler, Mrs. Louis Agassiz and Miss Helen Abbot.

I have heard that she was not a good business woman, and I can well believe it. No one has all the gifts. Her monumental work consists in the voices she trained, and in the noble principles of art she inculcated. I am told that the principal strength of her teaching lay in cultivating purity of tone and truthfulness of expression.

Those who think that she overdid the value of technique, would do well to read her fine chapter on "The Esthetic View" in "The Voice in Singing." It was one of her strongest and deepest principles, differing greatly from some modern ideas, that art and genius cannot do the best if divorced from morality. So she despised Wagner's music, and would say indignantly, "He is a man of immoral life ; we must not allow that the music of the future can be furnished from such a source." As one of her dear friends said of her to me, "No, Mrs. Seiler could never believe

that a bitter spring could bring forth sweet waters. It was the same with her innocent pure mind in all art," said this same discerning friend. "She could walk about a room full of nude figures with real enjoyment of the exquisite outlines, but let her see a fully veiled figure whose attitude or expression denoted meanness or low tastes and a shudder went through her."

I had not a close intimacy with Mrs. Seiler; she was too much occupied for me to have been willing to take up much of her time; but those who knew her better can easily fill out and correct the only portrait of her that my warm personal friendship allows. She came at intervals an uninvited but most welcome guest to take tea and pass the evening with us; those evenings will never be forgotten.

Her conversation had a rare charm, and was by no means confined to those subjects she would have been supposed to be most interested in. She had an appreciative interest in what each friend had most at heart. The young artist in painting was surprised to encounter in her such sympathy with the humblest efforts, and was charmed with her accounts of the various schools of art in the Old World, and her stories of wonderful paintings and their effects. The scholar and the student found her a delighted and receptive listener to his researches in Archæology or Egyptology; and her personal stories of distinguished scholars whom she had known intimately in Europe lighted up the moments she gave them. Often most amusing in its dramatic characterization of persons and events her conversation was always kindly and could not wound. I must make one exception. There were occasions where she was carried out of herself by her indignation at what she knew or believed to be wickedness. But these occasions were rare. She had in the main a sweet and patient temper as surely as she had a warm and loving heart and a sunny spirit. One remembers far oftener the delicious humor, the innocent childlike mirthfulness with which she would tell of her own adventures and escapades. I recall how, after her first visit to Europe, after she had made a home among us, she came to spend an evening with us, and the glee with which she told us one little incident of her travels. She was in Italy, and I think on the train between Rome and Naples, when some ladies who were attracted by something she said about music to her companion joined in the conversation. In the course of it they mentioned that the Italian government had directed that the works of Mrs. Emma Seiler on the "Voice" (an American lady they called her) should be introduced into all the schools. Do you know her, they asked? She looked reflective. "Yes, I do know that woman quite well indeed," said Mrs. Seiler; "she is a good woman and she knows quite well about the voice; she has studied it long. Ladies, your gouvairnment [so she pronounced it] has done a very good thing indeed to direct that the books of Mrs. Seiler shall be taught in the schools. I will myself tell her just so soon as I return to America." And she bade them farewell without disclosing her identity.

There is no doubt that she was impulsive and impetuous; those qualities could not have existed apart from the divine energy that accomplished such results. The sources of our virtues are also the sources of our faults. Let it be said that she was sometimes undisciplined in speech, and sometimes misunderstood her friends. We will remember that she came to us Puritans, Quakers, self restrained people, from a demonstrative and enthusiastic nation of Europe, and that we are quite as likely to have misunderstood her. Let us remember, too, the constant strain and stress of her hard-working life in a profession of all others trying to nerves and spirits. And if she demanded much of others she was harder on herself. After toilsome days she often studied into the small hours of the night to keep herself at the high-water mark of knowledge which she conscientiously exacted of herself.

In 1883 her children induced her to give up a life of such incessant exertion, to close her school of vocal art, to take a trip to Europe for relaxation, and on her return to take only private pupils. Her visit to Europe at this time illuminated the remaining years of her life; everywhere she met with warm friendship and cordial admiration. When she returned, it was to a peaceful home, where loved children and grandchildren could often come to see her, where she received pupils through the day, and lived alone with one faithful, loving German servant to whom she was both friend and mother. It was a quiet, retired but peaceful life. She had always been simple and unworldly, full of humanity and taking delight in small pleasures, such as lie within the reach of all. The companion of princes, the friend of the first statesmen and philosophers, poets and musicians of Europe, the beloved of Clara Schumann and our own Anna Jackson, found joy in making one poor German girl happy and in being made happy by her. "We go to the Park in the hot summer days, Paulina and I; we sit down by the water, and under the trees and hear the birds sing; we look at the children on the flying-horses and we visit the Zoo. In the winter if we are tired or lonesome Paulina and I will go to the opera. Sometimes we do go to see Buffalo Bill, and we laugh and shake all over, and that rests us."

Mrs. Seiler left us on the morning of December 21, 1886, at two o'clock. She had been ill for nearly two weeks, but few persons had known of it, and it was a surprise to nearly every one. She had often said she hoped she might not live beyond the age of sixty-five, and her wish was granted. Her disease was spinal meningitis, and she was unconscious from the beginning of her illness to its close. For her we could ask nothing better. She escaped the languors and disabilities of old age; she never tasted death. At the brief funeral service, I longed to hear some voices of those who had loved her and whom she had trained sing the beautiful hymn, "Oh Spirit freed from Earth."

After her hard-working, self-denying life, crowded with services to her fellow-men, and faithful to the end, she has entered into immortality. For, what Dr. Furness said of her in beautiful words (which I must not

try to quote accurately, but I am sure I caught his idea) is the great truth: What she thought or believed about immortality is of less consequence, than that she lived a life which must keep the soul near to God, here and hereafter.

Extracts from a Biographical Sketch of Madame Emma Seiler, by Charlotte Mulligan.

"The death of Madame Seiler, which occurred in Philadelphia recently, deprives the world of one of the most remarkable women of the century. Every teacher of the voice in America, every student who has made a specialty of the throat and vocal apparatus, knows the value of Madame Seiler's discoveries and her books upon these subjects are the standard authority. 'Not one of us has improved upon her work, with all our efforts,' said Dr. Lennox Browne to us, three years ago, in London, 'and she stands still the peer of the greatest of us all.' In this testimony hundreds of other physicians would agree, and the world of science has long known the importance of her researches, and accorded her an honorable position among its savans. Garcia was the discoverer of the laryngoscope, but Madame Seiler applied it, and followed out a course of study that, when presented to the world, greatly facilitated the efforts of those who were endeavoring to understand the vocal action. 'The greatest living authority upon the voice,' Garcia himself, styled her his friend and colaborer, and the encomium was rightly hers.

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"During her early life Madame Seiler became deeply interested in the study of medicine, her father being at that time physician to the court of Bavaria. It was considered almost a sin in that age for a woman to learn anything about the structure of the human frame, and every tendency towards the acquisition of such knowledge was promptly checked. These restrictions greatly hampered the young girl, but she found opportunity to read books from her father's library, and before her marriage had acquired an extensive knowledge. The voice appears always to have interested her particularly, and she was first attracted to the subject by the song of a pet bird. Her own description of the way in which she arranged to see the throat of a human being after death, illustrates the persistency with which she prosecuted her studies. Going to spend some time with an aunt, she made friends with a medical student in the town, and to him confided her desire. He, at the risk of being discovered, procured a throat and took it to the house late one night, when the old aunt had retired. 'Two weeks we worked together,' she said, 'examining the muscles, dissecting them with the greatest care and studying every detail.' This study was always done at night, but the time Madame Seiler counted as most precious to her, for it developed her understanding of a subject that was of the greatest importance, yet not at all familiar even to professional men. For several weeks after this experience her work

was constantly interrupted, and she struggled with many bitter trials. Her mind was not inactive, however, and she formed theories then that later on she demonstrated to be facts. Acoustics to her became a science that offered the greatest possible interest, and she studied the inflections in the cries in birds and beasts until they became a perfect language to her. Falling water, the different sounds in the atmosphere, and the myriad tones from the insect world, all had for her their harmonies or lacked the essentials of perfect tones. She heard in nature what is shut off from ears that are duller than hers, and she lived in a world upon the border of which we can only stand. The human voice, according to Madame Seiler's view, had never yet been developed to accomplish even half of which it was capable. Some of her theories were exemplified in her own case, and up to the last year of her life, she could produce superb tones, that rang and vibrated with wonderful power and beauty. The production of such tones required constant work, but once they were acquired they were well worth the labor and discouragement that attended the study. We have never yet heard a pupil, who had studied with this famous woman, who did not show either in the speaking or singing voice, some of the remarkable qualities that she knew the voice could be made to possess. One of these was richness of tone, a peculiar concentration that demanded attention, and an effect of power combined with sweetness. Madame Seiler possessed it to a remarkable degree, and imparted it to all those who had the intelligence to study with confidence in her great ability. The voice in speech was second only to the voice in song, and she laid great stress upon the care that young children should have when they are beginning to discriminate between sound and noise. No great singer ever came directly from Madame Seiler's care, because she paid most attention to those qualities which tend to make a voice retain its beauty and freshness. When those were acquired, then the accessories were undertaken, but many a pupil tired of the preparation, and other masters built upon her enduring foundation, reaping a glory that never could have been theirs but for her conscientious work. Madame Seiler was also a woman who had lived all her early life among scientific men in Europe who appreciated her mind and made much of her. Her life in this country was one of comparative isolation. She could not understand the lack of reverence and respect with which she came in contact, especially in younger people, and she sought her chief happiness among her books. The end came peacefully, and the bright, gifted woman fell quietly asleep. Her death falls heavily upon many throughout the country, for she had been a great benefactor to hundreds, who, through her instrumentality, have learned the true use of the voice. It is difficult to believe that her work is completed, to realize that all is over, that she is removed forever from this world. As one of the many who knew her value, who appreciated her true nature and wonderful knowledge, we pay a parting tribute as friend and pupil."

Extracts from a Biographical Sketch of Madame Seiler, by Harriet Hare McClellan.

"In passing from the highest tones of the falsetto register, still higher to the head tones, she was the first to observe a change in the motions of the organ of singing, which she discovered to be due to a sudden closing together of the vocal ligaments to their middle, 'with their fine edges one over the other, leaving free only a third part of the whole glottis immediately under the epiglottis, to the front wall of the larynx.' The foremost part of the glottis formed an oval orifice which with each higher tone seemed to contract more and more, and so became smaller and rounder. It was objected to this result of her observation that such a contraction of the glottis was only possible by means of 'cartilages and muscles,' but that such cartilages and muscles as could render an action of that kind possible were not known. Madame Seiler fully admitted the soundness of this objection, while she was, after repeated trials, more and more convinced of the correctness of her own observation; so she began anew to study the anatomy of the larynx in dissected subjects and was rewarded by finding within the membranes of the vocal ligaments certain fibres of muscle which she called the aryteno-thyroid interna, and which have also been found by other observers. They consist of muscular fibres, sometimes finer, sometimes thicker, and are often described in recent works on laryngoscopy as continuations or parts of one of the principal muscles of the larynx, but her chief discovery was of certain small cuniform cartilages within the membranes of the vocal ligaments, and reaching from their junction with the arytenoid cartilages to the middle of the ligaments. She states that she found these always in the female larynx, and that they undeniably work the shutting part of the glottis, but as they are only now and then fully formed in the male larynx, it follows plainly that only a few male voices are capable of producing the head tones. She adds that observation in the microscope revealed in those larynxes in which the cuniform cartilages were wanting, parts of a cartilaginous mass or the rudiments of a cartilage in the place indicated, and accounts for the cartilages not having been discovered earlier, by the fact that the male larynx was most commonly used by anatomists for investigation, as its muscles are more powerful and its cartilages firmer than in the female larynx.

"Thus she proved her point, and better still she succeeded, by patient effort and persevering practice, of which she was unsparing now that she had discovered the cause of her inability to sing [the attempt to carry upward the throat tones beyond their proper limit] in once more recovering her voice. Certainly if proof were demanded of the truth of her theory, or the practical value of her method, it need be sought no further than in the fact of her having succeeded so completely in the restoration of her own voice, a task recognized by all singing teachers as infinitely more difficult than the original training of an untried organ. At last she who understood the art of singing could sing again—and a glad song she sang!

"She has spoken for herself as to this portion of her experience and it seems most appropriate to quote her own words:

"'As I had had for many years the best teaching, both German and Italian, in the art of singing, and had often sung with favor in concerts, I was led to believe myself qualified to become a teacher of this art, but I had hardly undertaken the office before I felt that while I was able to teach my pupils to execute pieces of music with tolerable accuracy and with the appropriate expression, I was wanting in the knowledge of any sure starting point, any sound principle from which to proceed in the special culture of any individual voice. In order to obtain the knowledge which thus appeared to be requisite in a teacher of vocal music, I examined the best schools of singing, and when I learned nothing from them that I did not already know, I sought the most celebrated teachers of singing, to learn what was wanting; but what one teacher announced to me as a rule was usually rejected by another. Every teacher had his own peculiar system of instruction. No one could give me any definite reason therefor, and the best assured me that so exact a method as I sought did not exist, and that every teacher must find his own way through his own experience. In such a state of darkness and uncertainty to undertake to instruct others appeared to me a manifest wrong, for in no branch of instruction can the ignorance of the teacher do greater injury than in the teaching of vocal music. This I unhappily learned from my own personal experience when under the tuition of a most eminent teacher I entirely lost my voice, whereby the embarrassment I was under, so far from being diminished, was only increased. After this misfortune, I studied under Frederick Wiek, in Dresden (the father and instructor of Clara Schumann), in order to become a teacher on the piano, but while I thus devoted myself to this branch of teaching exclusively, it became from that time the aim and the effort of my life to obtain such a knowledge of the human voice as is indispensable to a natural and healthy development of its beautiful powers.

"'I availed myself of every opportunity to hear Jenny Lind, who was then dwelling in Dresden, and to learn all that I could from her. I likewise hoped from a protracted abode in Italy, the land of song, to obtain the fulfillment of my wishes, but beyond certain practical advantages, I gathered there no sure or radical knowledge.

"'In the French method of instruction, now so popular (1868), I found the same superficiality and uncertainty that existed everywhere else. But the more deeply I was impressed with this state of things, and the more fully I became aware of the injurious and trying consequences of the method of teaching followed at the present day, the more earnestly was I impelled to press onward in search of light and clearness in this dim domain.

"'Convinced that only by the way of scientific investigation the desired end could be reached, I sought the counsel of Prof. Helmholtz, in Heidelberg. This distinguished man was then engaged in a scientific

inquiry into the natural laws lying at the basis of musical sounds. Prof. Helmholtz permitted me to take part in his investigations, and at his kind suggestion I attempted by myself, by means of the laryngoscope, to observe the physiological processes that go on in the larynx during the production of different tones. My special thanks are due to him that now, with a more thorough knowledge of the human voice, I can give instruction in singing without the fear of doing any injury.' ''

Mr. Rosengarten presented to the Society the laryngoscope used by Mrs. Seiler, *which was stated to be the first ever used in America.* At the conclusion of the memoir, the President invited those present to a light collation that had been prepared.

And the Society was adjourned by the President.

Stated Meeting, December 4, 1891.

Present, 11 members.

Mr. Richard Vaux in the Chair.

Correspondence was submitted as follows:

A letter of acceptance of membership from Prof. George Forbes, London, November 1, 1891.

A letter from the Coast and Geodetic Survey Office, Washington, D. C., asking for exchanges, which request was granted.

The following were ordered to be placed on the Proceedings Exchange List:

Massachusetts Agricultural College, Amherst, Mass.; Agricultural Experiment Station, New Haven, Conn.; Agricultural Experiment Station, Lincoln, Neb.; Agricultural Experiment Station, College Park, Md.; Agricultural Experiment Station, Raleigh, N. C.; Agricultural Experiment Station, Auburn, Ala.; Agricultural Experiment Station, Starkville, Miss.; Agricultural Experiment Station, Fayetteville, Ark.; Agricultural Experiment Station, Laramie, Wyo.; Agricultural Experiment Station, Providence, R. I.; Agricultural Experiment Station, Tucson, Ariz.; Agricultural Experiment Sta-

tion, Experiment, Ga.; Agricultural Experiment Station, Ames, Iowa; Agricultural Experiment Station, Fort Collins, Colo.; Agricultural Experiment Station, Auburn, Ala.; Agricultural Experiment Station, Brockings, S. Dak.; Agricultural Experiment Station, Corvallis, Oreg.; Botanische Verein, Provinz Brandenburg, Berlin, Prussia; Bowdoin College Library, Brunswick, Me.; Library of the University of Lyons, France; Museo Oaxaqueño, Oaxaca, Mexico; American Museum Natural History, New York City, N. Y.; New Jersey Natural History Society, Trenton, N. J.

A circular from the American Chemical Society, New York, announcing a meeting to be held in New York city on December 29 and 30, 1891.

Letters of envoy were received from the Geological Survey of India, Calcutta; Académie des Sciences, Amsterdam; Observatorium der K. K. Nautischen Akademie, Triest; Society of Natural Sciences, Buffalo; Secretary of State, Washington, D. C.

Letters of acknowledgment were received from the Comité Géologique de la Russie, Imperial Russian Geographical Society, St. Petersburg (135); Prof. A. E. Nordenskiold, Stockholm (134, 135); R. Danish Geographical Society, Copenhagen (135); Musée Royale d'Histoire Naturelle de Belgique, Bruxelles (129–134); Académie R. des Sciences, Amsterdam (131–134 and Transactions, xvi, 3); K. K. Militär-Geographische Institut, Wien (131–134); K. K. Sternwarte (135); K. K. Astron. Meteorolog. Observatorium, Triest (131–133, 135); Naturforschende Gesellschaft des Osterlandes, Allenburg (135); Prof. F. Reuleaux, Berlin (134); Naturwissenschaftliche Verein, Bremen (135); K. Sächsisches Meteorologisches Institut, Chemnitz (135); Verein für Erdkunde, Dresden (135); Naturforschende Gesellschaft, Freiburg i. B. (135); Naturhistorische Gesellschaft, Hanover (135); Verein für Thüringische Geschichte und Altertumskunde, Jena (135); Dr. Julius Platzmann, Leipzig (135); R. Accademia di Scienze Lettere ed Arti, Modena (135); R. Comitato Geologico d'Italia, Prof.

Guiseppe Sergi, Rome (135); Prof. Gaston Maspero, Paris (135); Société des Sciences Naturelles et Archæologiques de la Creuse, Guéret, France (134); Prof. E. Mascart, Bureau Central Météorologique de France (135); Sir Henry W. Acland, Oxford, Eng. (135); Prof. J. P. Postgate, Cambridge, Eng. (135); Department of Science and Art, Royal Astronomical Society (135), Mr. Charles Leland, London (134, 135); Royal Dublin Society (135); Royal Society of Edinburgh, Royal Observatory, Mr. James Geikie, Edinburgh (135); Vermont Historical Society, Montpelier (134); Prof. Elihu Thomson, Swampscott, Mass. (135); Prof. James Hall, Albany, N. Y. (134); Rochester Academy of Science (135); Mr. Henry Carey Baird, Philadelphia (131–135); Wyoming Historical and Geological Society, Wilkes-Barré (135); California Academy of Sciences, San Francisco (131–135).

Accessions to the Library were announced from the Naturforscher Verein, Riga, Russia; K. K. Sternwarte, Prag; Osservatorio Marittimo, Trieste; Bayerische Botanische Gesellschaft, München; Société Neuchateloise de Géographie, Neuchatel; Direzione Générale della Statistica, Prof. Guiseppe Sergi, Rome; Prof. Paul Topinard, Paris; R. Academia de la Historia, Madrid; Philosophical Society, Cambridge, Eng.; Geological Society, Mr. Henry Wilde, London; Hon. George E. Foster, Halifax, N. S.; American Oriental Society, New Haven; Wesleyan University, Middletown, Conn.; Buffalo Society of Natural Sciences; College of Pharmacy, Philadelphia; U. S. Bureau of Education, Smithsonian Institution, Washington, D. C.; Historical Society, Mr. C. S. Wake, Chicago; California Academy of Sciences, San Francisco; Geological Survey of Arkansas, Little Rock; Observatorio Astronomico Nacional de Tacubaya, Mexico.

A photograph for the Society's Album was received from Mr. Samuel Wagner.

The decease of the following members was announced:

J. H. B. Latrobe, Baltimore, August, 1891.

Dr. D. Humphreys Storer, Boston, September 10, 1891, æt. 87.

Moncure Robinson, Philadelphia, November 10, 1891, æt. 89.
Rev. Thomas Hill, Portland, Me., November 21, 1891, æt. 73.

The Curators presented the following report:

HALL OF THE
AMERICAN PHILOSOPHICAL SOCIETY,
104 SOUTH FIFTH STREET.

PHILADELPHIA, November 28, 1891.

The Curators, having fully considered the matter of the Peale Stone Age Collection now on deposit at the Academy of Natural Sciences, and all the facts relating thereto, as requested by resolution of November 6, are of opinion that a resolution should be passed requesting the return of said deposit to the custody of the Society in accordance with the terms of the bequest of the late Mrs. Peale.

PATTERSON DU BOIS.
J. CHESTON MORRIS.
R. MEADE BACHE.

On motion, the Society

Resolved, That the return of the Peale Stone Age Collection from its temporary place of deposit, the Academy of Natural Sciences, be now requested.

The Annual Report of the Treasurer was presented and referred to the Committee on Finance.

Mr. Price moved that the consideration of the report from Dr. Cope's Committee be deferred until the next stated meeting.

Dr. Cope read the report.

The subject was discussed and Mr. Price's motion was then carried.

On motion of Dr. Hayes, it was

Resolved, That the Secretaries present at the next meeting a report in writing of the cost of issuing the Proceedings quarterly and of such extra number not including the text and report a form to meet postal laws.

And the Society was adjourned by the presiding member.

Carey and Two of His Recent Critics, Eugen V. Böhm-Bawerk and Alfred Marshall.

By Henry Carey Baird.

(*Read before the American Philosophical Society, November 20, 1891.*)

Permit me, this evening, to ask your attention to a brief examination of the recent criticisms of Carey by two economists—the one an Austrian, the other an Englishman. Although these two writers treat the economic problem, each from an entirely different standpoint, one is as remote from an appreciation of the truth as the other; and further, neither recognizing what constitutes the great fundamental principle in Carey's system, they have both left his position unassailed, as indeed it is unassailable. The Austrian is Böhm-Bawerk, Honorary Professor of Political Economy at the University of Vienna; the Englishman, Alfred Marshall, Professor of Political Economy at the University of Cambridge.

Prof. Böhm-Bawerk has published two ponderous treatises, the first intended to be destructive of other men's reasonings and theories, and is entitled, "Capital and Interest, a Critical History of Economical Theory;" the second, designed to be constructive of theories of his own, is entitled, "The Positive Theory of Capital"—whatever a "positive theory" may mean, seeing that man's vision, mental as well as ocular, being limited, and thus short of the capacity to take in the whole situation, he can have no absolute or positive knowledge—nothing more than his poor faculties permit of. Mr. Böhm-Bawerk's first book, as translated by Prof. Smart of Glasgow, makes of text, 8vo, 428 pages; the second, as translated, 8vo, 426 pages, while a distinguished professor of political economy, who thinks well of the author's labors, has recently assured me that the marrow of these 854 pages might have been put into forty pages. Such is the thoroughness of this Austrian *savant* that he inflicts upon the student of economics twenty-one times as many words as the ideas he possesses are worthy of in the presentation. As for myself, I can say that I have carefully and critically read the whole of these dreary pages—dreary because of an ever-recurring sense of the unsoundness of the author's premises, as well as of his conclusions.

The net result of Dr. Böhm-Bawerk's "Capital and Interest," wherein he charges Carey, in what he says of interest, of being guilty of "a tissue of incredibly clumsy and wanton mistakes," is that "*Present goods possess a greater value than future goods;*" that a "*loan is a real exchange of present goods against future goods;*" and "*Present goods possess an agio in future goods. This agio is interest.*"

Such is the actual product of 428 pages of the most complex, confusing, narrow, hair-splitting, and arrogant criticism, criticism, too, by a man who has himself built up a superstructure which rests upon a fallacy. This fallacy consists in the fact that the writer has included in and treated

under "Interest" things that are not interest at all. Interest is the compensation paid for the use of the instrument called money, and its substitute, credit, always expressed in a money of account, *and for them alone.*

This instrument, money, is the great instrument of association—that one thing, the possession of which, with its quality of universal acceptability, in highly organized—civilized—society, commands all other things to which we attach the idea of value. To talk of the rent of a house, a farm, or a garden, the freight or passage paid to a railroad, or a steamship, or a steamboat company, or proprietor, or the porterage in a cart, or a wheelbarrow, as interest, is to add a new and most vicious element of confusion to that despair of thoughtful men, that fruitful parent of misery to mankind, the "Dismal Science." The very word *agio*, which Dr. Böhm-Bawerk would apply to all manner of goods, wares and merchandise, had its origin with reference to a money of account, and to this hour it can be applied to or qualify no manner or form of thing not expressed in a money of account.

Further, Dr. Böhm-Bawerk has jumbled up the profit that a capitalist can make out of his own business ventures over and above the profit imagined to be properly due to his own time and labor, with the interest problem. Thus does he further and hopelessly bemuddle the subject of interest. He calls this profit, which is not interest at all, interest, and which it is impossible to separate from the results of the personal exertions, sagacity, experience, and risks of the capitalist—"natural interest." Where, in nature, will he find interest, where trade, money, credit, houses, ships, railroads, tools, wagons, wheelbarrows, textile fabrics—where, I would ask, without the application of human labor, any single commodity to which we attach the idea of value? Are not civilized society and all its appliances for forwarding trade, commerce, production and consumption, purely the work of man, and hence artificial? Is not this *natural interest* a collocation without meaning? Is not this doctrine of Dr. Böhm-Bawerk's, to use his own words, as applied to Carey, "one of those theories which cast discredit, not only on their authors, but on the science that lets itself be seduced into credulous acceptance of them, not so much that it errs, as for the unpardonably blundering way in which it errs?" For one, not only do I think that it is so, but to me it is a source of wonder and amazement, that the perpetrator of such blundering can criticise others in the severe and arrogant terms in which Dr. Böhm-Bawerk has done.

But what is to be thought of his treatment of Carey? Why, that it is simply infamous, for the reason that the necessary preliminary to refuting and denouncing him as guilty of a "tissue of incredibly clumsy and wanton mistakes" has been his misrepresentation. In order to refute him, he has been forced to attempt to make it appear that Carey was guilty of the stupidity of treating *distribution*, as Dr. Böhm-Bawerk has done, as *interest*, not *distribution*. What Carey himself calls "the law of distribution," he calls "Carey's interest theory." After quoting what Carey distinctly states regarding *distribution*, and which he calls such, he

comments as follows: "On these preliminary facts, then, Carey builds his great law of interest; that, with advancing economical civilization, the rate of profit on capital—that is, the rate of interest—falls, while the absolute quantity of profit rises" (the interjected words, "that is, the rate of interest," being Dr. Böhm-Bawerk's, not Carey's). Carey distinctly and emphatically says: "*Interest is the compensation paid for the use of the instrument called money, and for that alone.*" And again: "When a man negotiates a loan, he obtains money for which he pays interest; when he borrows the use of a house, he pays rent; when he hires a ship he pays freight."

This dictum of Carey's is not merely clear and to the point, but it is in accordance with the common understanding of mankind. To change it as Dr. Böhm-Bawerk has attempted to do, is to bemuddle and confuse the subject. Before he and his translator obtain the right to arraign Carey as "a confused and blundering writer," it is incumbent on them both to show that his definition is wrong, and that Dr. Böhm-Bawerk's definition is correct, and the only correct one. Until they have done so, their denunciations obviously prove their own incapacity properly to criticise a man of Carey's originality, lucidity, power, and far-reaching influence upon mankind.

Of the numerous economists whose doctrines Dr. Böhm-Bawerk has attempted to criticise, none has he denounced in terms so opprobrious as those applied to Carey and his distinguished disciple, E. Peshine Smith, and yet of all these men, the philosophy of none but Carey and Smith is capable of explaining the real cause of interest, or of clearing up the confusion into which Dr. Böhm-Bawerk has become involved regarding value.

Interest owes its existence to precisely the same cause and conditions as does money—the necessity under which man stands for association and combination with his fellow-men. But for this necessity there would be no interest, no money, indeed no political economy. Any system, or pretended system, of political economy which is not grounded on this great principle of association, this overmastering condition of man's nature, is false and misleading, a delusion and a snare—a system of confusion leading not only to further confusion, but to the wreck of the hopes, the rights, the civilization of mankind. The system of Dr. Böhm-Bawerk does not even remotely recognize it; he has not even the faintest glimmer of it, although all political economy is and must be concerned about it. He has dropped out of his system the great fundamental law, the great dominating fact as to the existence of man in society. His system is therefore of necessity not only useless, but worse than useless.

The second treatise of Dr. Böhm-Bawerk, "The Positive Theory of Capital," gives us, as a net result, the old and exploded wage-fund theory of the economists, with, as an annex and as a result of his interest theory of present goods possessing an agio in future goods, the effects of extension

of processes of production and the number of producers to be provided for during all these imaginary processes—extended or non-extended, though they be. In fact, he has added to, not decreased, the complication which arose out of the unsound and even absurd wage-fund theory, involving, as it did, a fixed "national subsistence fund."

Attempting to bolster up the theory of saving as a source of capital, Dr. Böhm-Bawerk has no real conception of the actual source of capital. His whole theory is antagonistic to the truth that wealth consists in the power of man to obtain mastery over nature; and that capital is the instrument by means of which that mastery is acquired; and further, that capital accumulates in the exact ratio that consumption follows production, and that matter takes upon itself new and higher forms—what we term consumption and production being mere transformation of substance; in other words, the more continuous and rapid the motion of society, the greater the power to accumulate capital and to acquire wealth.

An entire "book" is devoted to the discussion of "Price," in which even a definition of that vital word is wanting, the evidence being therein presented, in abundance, that the author is quite unaware of the fact that price is the expression of the power of a commodity to command money in exchange, and is always expressed in a money of account.

While two entire volumes are filled with discussion looking towards the effort to establish the cause of interest and of the rate of interest, Dr. Böhm-Bawerk has not even the most crude conception of why it is that people are obliged to borrow money or credit, or goods, or rent houses, or factories, or why one man buys and another man sells labor power. If he had recognized association with his fellow-men as the most dominating necessity of man's nature, and that money, with its qualities of universal acceptability, and of almost perfect divisibility and aggregation, was the necessary instrument of association, he would not have inflicted upon mankind such a tissue of learned fallacy in reference to "present goods" and "future goods," labor wages and the wage fund theory. Above and beyond all, he would not have made those fundamental errors as to interest, which is paid only for the use of money or credit expressed in a money of account, but which he has jumbled up with the hire of all sorts and kinds of goods, wares and merchandise. He does not even know why "present goods" possess what he calls an *agio* in "future goods," *i. e.*, because of the necessity under which man stands for association and combination with his fellow-men.

Marshall.

Under the title of "Principles of Economics," Prof. Marshall, of the University of Cambridge, has published the first volume, 754 pages, of a treatise in which no great broad principle is presented, in which no end of petty details are given, and in which not a single clear and valuable analysis of economic phenomena is to be found; and in which an entire absence of the true capacity for analysis is shown. The profundity of

Prof. Marshall may be judged from the fact that he says: "It makes indeed little real difference to the life of a family whether its yearly income is £1000 or £5000." No one but an economist could enunciate such nonsense, and still retain his position as an authority in a high department of knowledge.

His book, largely accepting the doctrines of Ricardo, is full of apologies for him, and for his inaccuracy of statement. For instance, he says:

"His exposition is as confused as his thought is profound. He uses words in artificial senses which he does not explain, and to which he does not adhere, and he changes from one hypothesis to another without giving notice. If, then, we desire to understand him, we must interpret him generously, more generously than he himself interpreted Adam Smith. When his words are ambiguous, we must give that interpretation which other passages in his writings indicate that he would have wished us to give them."

It is quite proper that a teacher who can talk in this style should have no difficulty in deciding that Carey and others who have refuted Ricardo do not understand him. After myself reading "Ricardo" more than thirty years ago, I told Mr. Carey that I could not understand what he was driving at. His reply was, "Ricardo did not himself understand." Nor do I think he did. Confusion in language involves confusion not merely in argument, but in thought; and in no other department of knowledge but that of political economy, would it be possible for one who needs such apologies, as those made for Ricardo by Prof. Marshall, to become the founder of a distinct school.

The blunders which Mr. Marshall has made with reference to Carey and Frederick List, and especially as to the indebtedness of the former to the latter, are most remarkable.

For instance, he says Carey was born in Ireland, when, had he taken the least trouble to examine any biographical notice of him, he would, at a glance, have seen that he was born in Philadelphia. Then he asserts that List's "Outlines of a New System of Political Economy," a tract published in Philadelphia, 1827, and its wide circulation were "the beginning of his fame, as it was of the systematic advocacy of protectionist doctrines in America," whereas this movement was commenced in 1819, and Mathew Carey was one of the originators of it; and three years before the appearance of List's tract, or in 1824, the first really protective tariff enacted in the United States was passed.

Then he says that this publication of List's was made ten years before the publication of Carey's first important work, his "Principles of Political Economy," and adds, "Carey owes many of his best thoughts on protection to List."

Now, Carey's attention to economic subjects commenced in 1835, when he published his "first important work," the "Essay on the Rate of Wages," and there is not a particle of evidence that he ever read the insignificant little tract of Frederick List. If he ever did he wholly failed

to profit by it, as in all of his earlier books and papers he advocated the doctrine of *laissez nous faire*, never having publicly declared his adhesion to protection until the publication of "The Past, the Present, and the Future" (1848). Nevertheless, in each of his early books will be found the germs of those vital and far-reaching principles which he so grandly developed in his "Principles of Social Science," his progress from 1835 to 1860, and even to 1875, having been steadily onward. By the beneficent practical working of the tariff of 1842, he was, in 1844, induced by the logic of events to range himself on the side of protection as a necessary national policy. But it was not until 1847 that he was able to reconcile it to economic theory.

In 1847, when he had outlined his law of the occupation of the earth, which has completely overthrown the basis upon which rested Ricardo's theory of rent, he readily emerged from the last vestiges of a belief in so absurd a theory applied to an artificial society as *laissez nous faire*. Lying in bed one morning, picturing to himself the settlers on the sides of the hills, moving down into the valleys and approaching each other, as wealth, power and civilization grew, he realized the vital importance of bringing the consumer to the side of the producer, and, as he said to me, "I jumped out of bed, and, dressing myself, was a protectionist from that hour."

The fact is Carey, not having studied German until 1856, List's "National System of Political Economy," published in Germany in 1841, was to him a sealed book until 1851, when a French translation by Richelot appeared in Paris. Carey's copy of this book in the Library of the University of Pennsylvania, with his pencil marks in it, showing passages which he considered striking, clearly proves that he made but little use of it.

But the question of Carey's position as a social philosopher is not to be determined by whether or not he picked out from some other investigator one idea here or another there, but by his philosophy as a whole. His great merit does not consist in the fact that he has demonstrated that association and combination with his fellow-men is the greatest need of man, or that in the utilization of labor power—the most perishable of all commodities—is to be found the measure of the growth of a people in wealth, power and civilization; or that money, the instrument of association, by giving utility to billions of millions of minutes, which without it would be wasted, acts as a great saving fund for labor; or that a necessary condition of advance in civilization is that man passes from the use of poor tools, including poor lands, to the use of good tools, including good lands; or that value is the measure of the power of nature over man, and is to be found in the cost of reproduction, while utility is the measure of man's power over nature; or that, with the development of this last-named power, distribution takes place under a law by virtue of which to labor goes a large proportion of a larger yield—freedom thus growing with the growth of wealth and civilization.

It is not by reason of the clear demonstration of any one of these great

truths, or of all of them, but of their demonstration *plus* the interlocking and the interweaving of these vital truths into one great and harmonious whole. Thus and thus only is it that he has presented a system of social philosophy deeper and broader than that of any other economist from the days of Plato and Aristotle down to our own time. By this touchstone —fundamental truths with their relations to each other, worked out into a complete system—is it that Carey is to be judged, and judged rightly and justly, and not by mere verbal criticism, or by an attempt to prove that an idea here or another one there was previously promulgated by some other teacher.

A great admirer of Frederick List, for what he had done in building up the German Empire—a work without which Bismarck, Von Moltke, and William I would never have been heard of in history—Carey had but a poor opinion of List's "National System of Political Economy," for the very good reason that it lacked just what he had aimed to present in his own books, and what are absent in Prof. Marshall's volume, broad, deep and enduring fundamental principles, interlocked and interwoven into one grand and harmonious whole, like Carey's own great and noble "Principles of Social Science." Indeed, no such voluminous writer on social subjects as Carey has ever lived and written who has paid so little heed to the writings of other economists. His own economic and statistical library, now in the Library of the University of Pennsylvania, will bear me out in this statement. Colwell collected the writings of political economists; Carey collected those of travelers, historians, statisticians and scientists; and to these he went for the material out of which to demonstrate those great principles which will ever bear his honored name.

How far Carey has been successful in impressing his philosophy upon the people of the United States, and upon the national policy, is well depicted by a recent and far from friendly critic as follows: "Measured by results," says Prof. Levermore, "the Carey school, and not its opponent, has achieved success in the United States. For thirty years, the stone which the builders rejected has been the head of the corner. Carey and his friends never captured our colleges; but, for a generation, they had dominated five-sevenths of the newspaper offices, a pulpit far more influential than the professorial chair. The arguments to which Carey gave form and eloquence are in the mouths of more than half the business men and farmers of our country; and, in the last Presidential campaign, the Republican party reaffirmed the extremest principles of the Carey school, including even the rancor towards England, with a violence and absoluteness that would probably have surprised Carey himself" ("Political Science Quarterly," Dec., 1890, pp. 572, 573).

The reason for this is not far to seek. Carey dealt in broad and enduring principles so interlocked and intertwined that any man of ordinary intellect, once captured by them, might ever after during his life bid adieu to the hope of freedom from their intellectual domination.

Nihil est veritatis luce dulcius. Indeed, nothing is sweeter, nothing

more delightful, than the light of truth ; and Carey has given to mankind a great body of truth, instinct with life and being, an organic whole demonstrating those principles which govern the well-being, the happiness and the civilization of the human race. The destruction of the foundations of this system demand men of greater power than Eugen V. Böhm-Bawerk and Alfred Marshall. They have not even made a lodgment in the outworks. In the citadel all is calm and serene, without apprehension of successful attack by such incompetent leaders—leaders who lack at once a knowledge of even the elementary principles of economic truth, and the power to group and place in proper relation to each other those things which they do teach, if, indeed, their theories have any connected relations one to another. If they have such relations, these gentlemen have failed to show them.

Vocabularies of the Tlingit, Haida and Tsimshian Languages.

By Dr. Franz Boas.

(*Read before the American Philosophical Society, October 2, 1891.*)

The following vocabularies were collected by the author when studying the Indian tribes of British Columbia, under an appointment of the Committee of the British Association for the Advancement of Science, appointed for the purpose of investigating and publishing reports on the physical characters, languages, and industrial and social conditions of the Northwestern tribes of the Dominion of Canada. It was decided that in the report of the Committee a brief comparative vocabulary only should be printed. As, however, the languages of the North Pacific Coast of America are little known, the vocabularies may be found to possess some value.

The following alphabet has been used :

The vowels have their continental sounds, namely : *a* as in *father ; e* like *a* in *mate ; i* as in *machine ; ō* as in *note ; u* as in *rule.* In addition the following have been used : *ä, ö* as in German ; *â* = *aw* in *law ;* E = *e* in *flower.*

Among the consonants the following additional letters have been used : *g*', a very guttural *g*, similar to *gr ; k*', a very guttural *k*, similar to *kr ; q*, the German *ch* in *Bach ;* H, the German *ch* in *ich ;* Q, between *q* and H ; *c* = *sh* in *shore ;* Ç = *th* in *thin ; tl* an explosive, dorso-apical *l ; dl* a palatal, dorsal *l.* ' following a consonant designates the u position of the organs of articulation.

I. ENGLISH–TLINGIT.

Stikeen Dialect.

A.

above, on top of, ka.
Acer tlrā′tlrē.
adam's apple dlētu′q(1) kagu′ntlē(2) = neck (1)? (2).
afraid (akū ti) qētl.
again dētsō.
ahead ıān.
Alnus kē′cic.
always dj'ētlu′k, yūk·a.
Anas boschas kindētcunē′t = moving straight up.
—— *clypeata* k·in.
—— *histrionica* ts'utsk.
ancestor acukua.
angry k·'ant—wa nuk.
ankle k·'ōs t'aktl = foot knuckle.
Anser t'ā′wak·.
apron, woman's, cūqc′t'a.
—— *dancing,* sE′n(1)k·ēt(2) = ? (1) apparel (2).
apparel, wearing, k·ēt.
Arctostaphylus uva ursi tinH.
arm, hand, djin.
armor, wooden, tlrā′tlrē (= Alnus).
—— —— *of parallel sticks,* sE′n k·ēt (see *apron*).
—— *held in mouth,* k·'a(1)koē′t(2) = mouth (1).
Arnica cordifolia an(1)ka(2)nā′gu (3) = town (1) on (2) medicine (3).
around, outside, da.
I walk around house hīt da ya qoa gūt.
arrow tcunē′t = moving straight.
—— *double-pointed,* tcunē′t k·'atlā′-k ē.
ashes k·'an itē′ = fireplace.
Astur atricapillus kyēdju′k.
Atlda, name of a place.
aurora k·'an(1)yiq(2)k·ū(3)watē(4) = fire (1) like (2) out of doors (3) color (4).
—— gyīts'ō′k.
axe cEnqoā′ri.
—— *stone,* kyē′t'ō.

B.

baby g·ata gua′tsgō (male and female).
back dik·.
—— *of hand* djin kōtl.
bad tlētl wu c k'E = not good.
badger nōsk.
bark gan da = wood around.
basket for blankets nē′etl.
—— *for berries* k·ak·.
bat tsik'rēditā′n.
to bathe dEcūtc.
baton of shaman wū·sag·a′.
beach tl'ēn'ē′tē = sand place.
bear, black, ts'ēk.
—— *grizzly,* qūts.
—— *white (polar),* cāq.
beard k·'atatsā′ıē.
beaver ts'ikrēdē′.
bed yē′at = something to lay on (Chilkat).
bedroom īt.
bee gandasā′dji.
belly yūra′.
belt sī′gī.
berry tlēk·.
—— *salmon,* wutst'ān tlēk·.
—— *black,* gawa′k· (Rubus).
—— *dried,* atka qōk·.
—— *black,* t'ōtc tlēk· = blackberry.
Betula glandulosa tlēri′s.
—— attā′rī.

bird tō'tli.
—— *a species of, with red wings,* kōn.
black t'ōtc (see *soot*).
blanket tl'ē.
—— *cedar bark,* tsātlk k·'ō'ū.
—— *martin skin,* k'ōq k·'ō'u.
—— *Chilkat,* nā'qēin.
Blennius sp., dlūt'.
blind tlk·ōctēn.
blood ci.
to blow (*wind*) dō'wanuk
to blow uq.
blue ts'ōyi'qatē (ts'ō? yiqatē = colored).
—— *jay* k·'eck·.
board for drying salmon ganirē't = smoke place.
bone s'ak· (see *tall, short*).
boom s'ɛ'satō s'ā'gē=sail in oblique.
bow of canoe cɛkɛ'.
bow sɛk·s.
bowstring sɛk·s nā'sē = bow guts.
box kēt, tlak·t.
—— *large,* tluk·t tlēn.
bracelet kīs.
Brachyrhampus marmorata tc'īt.
braid ca kɛsī't (ca = head).
brains tlak·ēgī'.
breakers tīt ra tl'ēk· (tīt = wave).
breast hē'tk·a.
breath dɛsē'uk.
brother, elder, unu'q.
—— *younger,* kik·.
brother-in-law (wife's brother) kan.
brush hī't'a.
—— *for clothing* at k·a hī't'a.
Bubo virginianus tsisk·.
Buccinum tl'itlk·.
bucket k·'ē'ca.
butterfly tlētlu'.
by and by yīdɛtqɛ'ñga, tlīts'a'.

C.

calf of leg ts'ē'yu.
Caltha palustris ataguē'k·ē.
cambium of Tsuga sɛk·.
Canace obscura nukt.
canoe yāk·.
—— *Tlingit,* sīt.
—— *Haida,* wutsdē'.
Cardium Nuttalli (cockle) g·'atl ka'tsk.
cariboo wutsi'ɪl.
carpet nētlrītl'i'tī.
to carry in hand ran—tɛn.
cat dūc (Chinook).
cedar, yellow, qār.
—— —— *young,* tlɛqrɛ'tē.
cedar bark tīr.
—— —— *prepared for weaving mats* rūt.
cedar (*and spruce*) *root* qāt.
—— —— *hat* qāt ts'āq.
Ceryle Alcyon tlaqanēts'ē'.
chair ka ra kī'djet = on top of which one sits.
chatterbox k·'a tlēyō's = mouth playing (see *to lie*).
cheek wac.
chief ank·ā'ō (see *rich*).
child g·it'a'.
chin tēg·.
Chiton Stelleri cā'u.
—— *tunicata* kōr.
Circus Hudsonicus qēq.
clear, it is, weather, a ka wa qats.
cloud gūts (see *heaven*).
cloudy k·ū tlī gūts = it is out of doors cloudy.
club g·'uts (see *crabapple tree*).
coal t'ōtc (see *black*).
cold sia't.
Colymbus glacialis k·ɛg·ē'it.
column, heraldic (totem post) kōtē'ra.
comb qēdo'.
common people īcā'n (see *poor*).
cone of Picea ts'ōtsā'ne.
to cook (at—)saē'.
copperplate tina'.
cormorant yōk·.
corpse narū'.

cotton goods s'ᴇ'sa (see *sail*).
Cottus sp. wēk'.
council atkaqtoā'k.
country ā'n(ē).
cousin (father's sister's child) at.
—— (mother's sister's child) tlak'. (see *sister*).
crab s·ā'u.
crabapple tree g·'uts.
crescent (see *moon*).
cross (*minded*) k·'āu—raō (see *angry*).
crow ts'ᴇ'quētl.
crown of head ca kī = head top.
to cry g·āq.
Cychrus longicollis as k·'tō yik ca' = woman in the woods; as k·'tō = woods, ca = woman.

D.

dagger tsā'g·atl.
to dance a—tl'ēq.
dance of shaman iqt dāidē'dē.
dancing apparel tl'ēq k·ēt.
danger at sea kūtlēqē'tlcᴇn.
—— name of Yētl's mother, K·ōtsō teriᴇ't.
daughter sī (probably child, said by mother).
day yigᴇrī' (see *noon*, *to-day*).
daylight k·ēwa'.
dead (na) na.
deaf tlk·otl'ᴇqtc.
deer k·okā'n.
dentatia tē'k·ē.
difficult tli tsē.
dish grease g'ᴇkᴇnē'.
—— *of mountain goat horn* tlī'nēt ts'ik'.
dishes nūk'.
diver ts'uts.
to do sī, y·—sinē'.
dog kyētl.
doll sī (see *daughter*).
door k·'ahā't.
dragon fly tlk·acēcqā'wu = no man head-hair. They are said to sing: tlētl(1)qat(2)ca(3)caqawu (4) = not (1) I (2) on (3) head hair (4) = no hair is on my head.
to dream a—djūn.
to drink tana'.
drum gā'u.
dry wa qōk.
duck g'uts.
dust tc'ēH, k·es'ē'dja.

E.

eagle tc'āk'.
—— *black*, tc'āk'(1)iē's(2) = eagle (1) black (2).
ear gūk.
earring djāc.
east wind nānaqē't.
—— tl'ak·ak·a'q (Chilkat).
easy tlētl tli tsē = not difficult.
to eat (at—) qa.
ebb tide renatlē'n.
eggs of lice Hīts.
elbow t'ēr.
elk tsisk'.
Empetrum nigrum qitlēwu'ts'ē.
empty aqu'ktlē.
end cᴇ.
Epilobium angustifolium k·ō'kān nā'k' = deer medicine.
ermine da
evening qā'na
excrement hā'tlē.
eye wak'.
eyebrow ts'ē.
eyelashes wak· qā qē'q'ō.
eyelid, lower, wak· tᴇri.
—— *upper*, wak· k·a'.

F.

face rᴇ.
far (na) tl·.
far out into the sea dēkyī.
fast rᴇsīyē'k.
fat, for greasing face, rᴇ nēts'ē'.

father īc.
father-in-law rū.
fathom wāt (see *tall*, probably *length*).
—— (from elbow over breast to finger) k·āt'ē yiq ku wāt.
—— (from shoulder over breast to finger) qik cE gu'ntlē yiq ku wāt.
—— (shoulder to finger of same arm) qik cE yiq ku wāt.
—— (elbow to finger of same arm) tcik·ē yiq ku wāt.
feather k·'oā'tl.
feather bed k·'oā'tlriā't = feather place.
to feel, I feel better, ag·a ctuq dēnōk.
fern tsāts.
to fight g'aн.
finger tl'ēk· (see *toe*).
—— *first*, tc'ēq.
—— *second*, tl'ēk·(1)tlēn(2) = finger (1) great (2).
—— *third*, tl'ēk·(1)g'a'tsgō(2) = finger (1) small (2).
—— *fourth*, wun ka tc'ēq (see *first finger*).
fire k·'ān.
fire drill tōutlē' (see *round*, and *to turn round*).
fireplace k·'an i'tē = fire place.
fish, fresh-water, hin tak'a'tē.
—— *a small species*, ku'ē'ta.
fish line kyē'u.
—— —— *of kelp*, tlEra'nē.
fishotter nukcēyā'n.
flood tide dāk·nEdē'n.
flounder tsE'nt'ē.
to fly dē'k·ēn.
foot k·'ōs.
forehead kāk'.
fox nag·āts'ē' (borrowed).
friend qonē'.
frog nīqtc.
in front of k·'ē'yē (Chilkat).
frost kaquā'n.
Fucus vesiculosus tarē'dē.
fuel gan (k·'an ? = fire).
full cawahik.
fur seal q'ōn.

G.

Gallinago Wilsoni gūtsrē tōtli = heaven bird.
gens tān.
get up! cē'ndE!
girl cātk'.
to give djēt—tē.
——*give me to drink!* hāhēa qa tana'!
to go gōd, at.
I go to town ān(1)k·'ē'yē(2)dē(3)qoa(4)gūt(5) = town (1) in front of (2) ?(3) I (4) go (5) (Chilkat).
good (rE) k'E.
good-natured (tlī) an.
grandfather, mother, tlētlk'.
grandson cqa'nkē.
grass sō'uk'.
grease ēqē'.
gull kyē'tlEdī'.
gutts nāsē'
GutscEtla, Chilkat name = horizon mother.

H.

Haida Dēkyina' = people far out seaward.
hail kadE'ts.
hair ca qā'wu = head hair.
hairdress of shaman k'īts.
half cu'rō.
halibut tcātl.
hand djin.
Harelda glacialis yāau'nē.
HaricanE'kō = old woman under us, a mythical person.
hat ts'āq.
—— *war hat, shaman's hat*, wak·(1)k ēt(2) = face (1) wearing apparel (2).
to haul in sī'yik·.

he hu, hōtc, qsEtē′.
head ca.
head ornament used in dances ca k·ēt.
to hear aq, aqtc
heart tēk·.
heaven gutsErē′ = cloud place.
heavy (re) datl, (tli) tsē′.
heels k·′ētak·.
heron tlak·.
herring rā′u.
herring rake Hī′tla (see *brush*).
high water ran k·′Etwada′.
his tō(—ri).
hoof aguē′ntlē.
hook, halibut, naq.
—— *round,* t′ēq.
horizon k·ū gāts.
—— gutscE = sky end.
horn cēdē.
horse gyūdā′n (Chinook); dik· ka ra kidjēt (Sitka) = back upon sit.
house hit.
—— *dug out part in centre of,* tāk·.
humming bird tag·atg·iya′.
hungry, probably: ran : *I am hungry* qat ran owa ha; *it makes us hungry* haēt ran ā wu si ha; *if I am hungry* qat ran hē′nē.

I, J.

I qat, qatc.
ice t′ēk·′.
icicle k′iri t′ē′k′ē = above ice.
inside tō, g·ē.
it is inside white a g·ē ru.
instrument rErē′t.
island k·′āt.
ivory cuqdu′k.
jaw, lower, q′ats.
just a short time ago, resū′.

K.

kelp gīc.
—— *swimming apparatus of,* kutlt′ē′.
kelp cake tlāk·a′sk.
kettle, wooden, ōq′akā′gante.
kidneys kahā′gō.
killer (Delphinus Orca) kyīt.
knee kyīr.
kneejoint sā′rē.
kneepan ca k·unū′k′ō.
knife tlta.
—— *large,* wēks, gwa′tla.
knothole in a board k·ats.
to know aqtc = to hear often.
—— cEgōk = to understand.
knuckles (djin) kagu′ntl.
Kyinastl′ac, name of a man.

L.

labret g·ak·.
—— *silver nail,* k·′annōq (k·′a = mouth).
—— *large plug,* k·′a nd′āk·′a′.
ladder dzēt.
Lagobus albus k·′ētsauwa′.
lame tlEk·a′tck.
language yuq′atE′ñgi (see *to speak*).
large tlēn, yēk· tligē′ (?).
to laugh (at—) cō′uk·.
to leave k·ōwatē′n.
Ledum palustre ts′ikc′ etldī′n.
left hand, ts′EtnEqī (djin).
leg k·′ōs.
—— *of animals* atca′kari.
—— *above knee* k·ats.
leggings k·′ōs k·ēt = leg clothing.
liar k ′ā tlē′yē s′a′tē = mouth play master.
life tsēn.
light tlētl wu dEtl = not heavy.
lightning nētl′ē′gu = thunder bird opens his eyes.
like yiq = similar to.
Lina sp. rāg ′n wē′s′ = sun lice.
lip, upper, k·′a tlō (k·′a = mouth).
to listen (at—) sia′q (from aq = to hear).
little ga′tsgō.

liver tl'ōk'.
long ku wa't, ye—ku wat (see *fathom*).
—— ku darē't.
long ago tc'ōtlā'k.
a long time (dē) tc'āk'.
loon cuwā'n.
louse wēs'.
low water ran ūwa tlā.
lungs kyēgū'.
Lupinus ka'ntak'.
Lycopodium clavatum k·ō'kan sī'gī = deer belt.

M.

to make sī.
man k·a, tlēingi't.
many k·tōq.
—— *men* k·u ciri tihē'n.
—— *things* at ciri tihē'n.
married, baptized, hīn qERōdōwatē' = face put into water.
martin k'ōq.
mashed kaqE'k'tl.
mask wuk· katadu'k = face not perforated.
mast sE'sa (tō) a'sē = sail in tree.
master s'a'tē.
—— *of the upper world* Tahī't.
mat, made of cedar bark, g·ātc.
match, rubbed cedar bark, g·ātc.
may be—gūtl.
meat dlīr.
medicine nāk'.
Mergus serrator hin yikag·u' = water rim.
midnight tatERī'n (tāt = night).
mind tōrū'.
mink tlēnik'u'qū.
month dīs.
moon dīs.
—— *new,* kā'wakis = all out.
—— *first crescent,* wutsik ē'n.
—— *half,* dīs cu'rō.
—— *full,* dīs ran rā'wawEt.
moon, last crescent, rārē kā'nakis.
morning ra k'ō'naēn; ts'ō tāt = blue night.
mortar t'ēk·'a ria'ti = pounding place; ka qE'guaret = rubbing upon place.
mother atlī'.
mother-in-law can.
mould tlaq.
mountain goat tōwē'.
—— *horn* tlīnē'tl.
mouse, shrew, kag·ā'k'.
—— kuts'ī'n.
mouth k·'a.
much tlēq.
mud ts'ēH, k·utlk.
mussels rāk.
my aq (—ri).

N.

nail qak'.
naked kEtldarE'k.
navel kō'utl.
neck dlētu'q.
necklace s'ak· sēt = bone necklace.
nephew (sister's child) k·atlk'.
—— (brother's child) g·it'a' = child.
net g ē'wū.
news nēg.
night tāt.
no tlēk'.
noon yigERī'.
north wind is blowing qōn dōwanu'k.
nose tlō.
—— *ornament* tlō n nas.
—— —— *of shaman,* wak· k·ēt = face ornament.
nostril tlō tōru tlī.
not tlētl.
nothing tlēk'.
now hē'idEt, yā'ridEt.

O.

oak duk'.
oar aqa kdarE't = long paddle.

oblique s'ā'gē.
œsophagus tlēkatcu'q'ō.
Oidemia perspicillata k·āq.
—— *sp.* kitc ka ru = wing on white.
Olachen sāk.
old man cān.
—— *woman* cā'wat cān.
on top of ka.
—— *I put it on top of,* akayiqa'ō.
one eyed tlēcauwa'k·ē.
to open one's eyes tl'ik'.
to open a salmon tlag·E'ts.
opposite kikE'.
otter kucta.
—— *people* kucta k·a = otter man.
our ha (—ri).
outside da.
—— *the house* k·ū.
owl, white, k·ak'.

P.

to paddle adlqa'.
paddle aqa'.
to paint nēguō'tl; kE—cEhī't (see *brush*).
painter nēguō'tl s'a'tē = painting master.
paint, black, for face, t'ōtc = soot.
—— *red, for face,* tlēk.
palate ky'ē'k·tlEn.
palm of hand djin t'āk· (see *plant*).
Parmelia s'ē'qōnē.
Parus (*titmouse*), k·ā tōrū' = man's mind.
perforation of nose tlō tō rū tlī.
pestle (ka)t'ē'k·a = (upon) pounder; (ka) qē'gua = (upon) rubber.
Pica Hudsonica ts'ēg·ē'nē.
to pick gūk.
pipe ts'ēk· da kēt = smoke around box.
place for something rerē't, riā'ti.
plant of foot k·'ōs t'āk (see *palm*).
plate k·'ēyē't = something in front of (Chilkat).
plate made of slate tEts'ē'k.
point tlō.
Polygonatum tlēk'wa hintē = water berry.
Polyporus as tak·a'di = tree biscuit.
poor icā'n, k·'anickidē'q.
porcupine qatla g'E'tc = hair sharp.
porpoise tcītc.
post gādz'.
to pretend to be rich (tc'E) ck·'a—tli nēk'.
—— *to be hungry* (tc'E) tō—ran s ha.
—— *to be a Tsimshian* Ts'ōtsqE'nqc—tlie'q.
puffin qēik.

Q.

quiver guē'tl.

R.

rabbit g āq.
racoon s'āq.
rafter kaqrēt.
rain sē'u.
rainbow kitcqanag·ā't = many colored wing.
it is raining (dāg) sētē'n.
raspberry tlēk' we'dē.
rattle, made of puffin beaks, djin kaqE'ta (djin = hand), dje kaqE'ta.
—— *shaped like a skull,* cēcō'q.
raven yētl.
razor k·arēyi'qa.
to recover from sickness (wu) nēq (see *to save*).
red k·'an yiq atē = fire-like color.
reeds tlak·ridzē.
rib ts'ōk·.
Ribes qahēwu'.
rich ank·ā'ō (see *chief*).
ridge of house s'ērEtō'.
right hand cīrEneqī (djin).
ring, finger, tl'ēk·kakīs = finger on ring (see *bracelet*).

ring, foot k·'ōs ka kīs = foot on ring.
rock (*small island*) nō.
roof gan, hit ka = house-top.
rotten tl'ok·.
round tōutlcān (see *to turn round*).
to rub with pestle ka—tlEqEk'tl.

S.

sail s'E'sa (see *cotton goods*).
salmon qāt.
—— *humpback,* tcāts.
—— *spring,* g·at.
—— *hooknose,* tl'ō'uk.
—— *dog,* thītl.
—— *white,* t'ā.
—— *dried,* atk·'ēci qōk (qōk = dry).
salt ētl qōk = dry sea.
sand tl'ē'u.
satiated cāwa hik.
to save nēq.
Saxidromus s'ō'uk? gātl.
scraper Hi'ts'a.
sea rEk·ā'k, ētl.
—— *heavy,* āgōwatā'n.
seal tsā.
sea lion tān.
sea otter yuqtc.
to see tēn, sētē'n, tlī tēn.
septum tlō t'aka'.
shaman iqt.
shark tūts'.
sharp tlag'E'ts.
sheep, big horn, djE'nū.
sheets s'E'sa ka rē'gsē.
shell sp. ? īē's.
Cik·'ā' tlūtō', a point near Sitka.
shoe tītl.
shore line hīn k·'a'cō (hīn = water).
short ku watl.
shoulder qikca'.
sick nēk'.
sinew, thread, tas.
to sing (at—) ci.
sister, elder, tlak.
skin dōuk.
skull ca s'ak· = head bone.
—— *of a corpse* ca k·Eqā'gō.
sky, clear, akawaqa'ts.
—— gutsErE = cloud place.
slave gō'uq.
to sleep ta.
sleepy (rE) ta owaha'.
small ga'tsgō.
to smell tsīnē'ky.
smoke ts'ēk·.
to smoke sk·a da ts'ēk· = mouth around smoke.
smoke hole gāt, gān.
—— *roof of smoke hole* ganē'tlē.
snail tāk·.
snake tl'ut tlā'k·.
snow dlēt.
it is snowing ara kawa dan.
son g·it'a' (probably child, said by father).
son-in-law kan, sēq'u'q (?).
song of shaman iqt k·'a cī'reē.
soot t'ōtc.
Sorbus kEltcanē't.
soup, made of berries, qu'ktlē.
south wind is blowing rE'ndēu dō'wanuk.
sparrow-hawk ganō'k.
to speak yug'a—tEñ, rEka'.
Spermophylus Parryi tsātlk'.
spider k·asēst'ā'n.
spirit yēk'.
spoon citl.
—— *large bailer,* cīn.
—— *short,* cE'ca.
sprout wuts.
squid nāk'.
—— *used for bait* nEq nāk'.
squirrel kanātltsā'k.
—— *a small species,* tlk·ōqwē'tsa.
to stand gya.
stand up! gyidā'n !
star k·utaq'a'renaha.
to steal tā'ō.
to steer yūru tlaa'.
steering-paddle rEdī'gā.

stern of canoe gyikka'.
Sticta pulmonaria acakarē'ci.
stockings tl'ēx'u'n.
storm ara ōdētē'.
stone thE.
stout ku tla.
straight, upright, kin de tcun.
—— *ahead* rān de tcun.
stomach yuru'.
stop crying c'ītlk'E'tl.
storehouse in the woods tcEtl.
stranger t'auyā't.
strawberry cak'.
street dē.
strong (*rope, etc.*) tlī wu's.
—— (*man*) tlī tsē'n (see *life*).
summer k'utā'n.
sun (ra) gān.
the sun is shining (dag) gān.
sunset rē anaHi'H.
sunrise ky'ē anaHi'H.
swan g'uk'tl.
sweat t'ār.
sweat-lodge qār.
sweet tli nukts.
sweetheart tsērī'.
to swim rāndat'E'tc.

T.

tail tl'ēt.
tall (yē)—s'ak' ku wat = bone long.
temples wak'co' (wak' = eye).
then adaqai'ō.
their hastō (—ri).
they has, hastc.
thief tā'ō s'a'tē = stealing master.
thin qun.
thine i(—ri).
to think of somebody su—s'ēt'E'n.
thou woe', wo 'tc.
thumb gō'uc.
thunder, thunderbird, HētI.
tide hāt.
tired (wu ti) quē'tl.
T'laqkūic, Chilkat name = perpetual man's father.
T'lingit tlēingi't.
tobacco g'āntc.
to-day nā'yigEri.
toe k'ō's tl'ēk = foot finger.
together wūctēn—ta.
—— *we laugh,* at tō ta cō'uk'.
to-morrow sērē'nk'.
—— *day after,* sērē'nk' tliraakEtē'n.
tongue tl'ōt.
tooth ōq.
town ān (see *country*).
trap iē'q.
tree k'ats.
tribe na.
—— *the heavenly,* k'ē'wak ā'oqā'wō.
Tringa ayahī'a.
trout k'c ā't.
trunk k'ō'uk'ōk'.
Tsimshian Ts'ōtsqE'n.
Tsuga rEn.
to turn round tōutl (see *round, fire-drill*).
to turn back, on foot, k'uq k'atudaa't.
—— k'aqudigu't.
—— *in canoe,* k'uqritla'.
the tide turns ara kān dīda'.
twins wūtc kikrE'dē = two together opposite.

U.

Ulva k'atc.
uncle (father's brother)sā'ni.
—— (mother's brother) kak.
up dē kī
uvula nūt'ari.

V.

Vaccinium Vitis Idœa nēgū'n.
—— *uliginosum* ts'īk'a'qk'.
—— *ovalifolium* kanat'ā'.
Valeriana tltcanislā'k'.
vein ts'ikc.
vertebra dik' s'ak' = backbone.
very .lēq. sitē'.

Viburnum acerifolium k·Eqwē′q.
village, winter, tak'anē′.
—— *summer,* k·'utā′n.
voice sēk.

W.

to walk gōd, at.
wall gy'īrī′.
warm (rE) t'a′.
warrior g·'ān s'a′tē = fighting master.
water hin.
wave tīt.
we ohān, ohā′nc.
weak tlētl wu tli tsēn = not strong.
west wind sā′naq.
wet (ti) tl'Ek·.
whale yār.
whistle tō uq sirēt = into plow place.
white ru, tlēd yiq atē′ = snow-like color.
widow, widower, hītltsatsēcā′wat.
willow tc'ātl.
wind ky'ētlea′.
wing kitc.
wing of nose tlōgūtc.
winter tāk (see *year*).
to wish sigō′, gācu′.
wolf g·ō′utc.
woman cā′wat.
—— *a man, who is in the habit of eloping with women,* cā s'a′tē = woman master.
woodpecker gan da da gūg' = wood around (= bark) around pick.
worms tl'uk·.
wrist djin t'ak·tl.

Y.

to yawn akyē′t.
year tāk (see *winter*).
yellow kyētl ha′tlē yiq atē = dog excrement-like color.
yes ā.
yesterday tatgE (see *night*).
—— *day before,* tatgE tliraakE′t.
you riwā′n, riwā′ntc.
young ga′tsgō.
—— *man* rEdE′k·.
your rī (—ri).

II. ENGLISH–HAIDA.

Skidegate Dialect.

(Note.—The words followed by a K. are Kaigani dialect.)

A.

above gī.
—— *it is,* ca ē′tsi.
to accompany g·āk'ā′it.
Acer tlk·ātlk (borrowed from Tlingit) K.
adam's apple k·agE′n sku′tsē=lung bone.
adze qot'a′.
afternoon sEn tā′tsera gā′ista.
again ī′sEñ.
alive qai′nEñga.
all tlō′qan.
Alnus kā′ac (borrowed from Tlingit) K.
always wa gye′na.
Anas boschas tha K.
—— *clypeata* hit.
—— *histrionica* k·'E′cg'utk.
ancestor tlsta dē tsi′nga = long ago my grandfather.
ankle gy'atl t'amE′l = leg knuckle.
another k·a′lrō.
Anser tlgyitgū′n.
antlers nacā′ñrē.

antlers, many pronged, g'at g·oa'qa gig·'ā'ñrai = deer's manifold antlers.
anus k'asē'.
apparel, wearing, gya.
apron of woman dlgyītgyitlgya (dl t'ā'tsē).
apron for dances k·'antsētlqā'gya (gya = wearing apparel).
Aretostaphylus uva ursi dinq (borrowed from Tlingit) K.
arm below elbow ні, ніā'i.
—— *above elbow* ni tlrī.
armor, wooden, for breast, tcidlkit.
—— —— *for belly,* k·'antsētlqā'gya (see *apron*).
—— *made of sea lion skin,* k·'ēt'ī't (k·'ēt = sea-lion).
armpits sk·ut.
Arnica cordifolia nit hauā'c.
arrow, with bone or metal point, ts'ī'-talEñ.
—— *blunt, for birds,* k·'u'ñgal.
ashes dlтE'tlqēt.
aunt (mother's sister) āo = mother.
—— (father's sister) sk·āñ.
aurora g·ōt qalga dā'nt'atl.
axe gyētl dsāō.

B.

baby k·ā'qa (see *weak*).
back skuā'ē, gyi'ñguta.
—— *vertebra* gyi'ñguta sku'tse = backbone.
—— *of house* na stlEñ = house back.
—— *of hand* sl'ō'na.
bad dā(rañga).
bald head skaqā's.
ball, to play at, gūt kitl k'a'tsu.
—— *played with seal meat,* qōt at gūt kitl k'a'tsu.
bark of Tsuga ni; hā'i K.
—— *of other trees* k·'ō'tsē.
basket, small, for berries, k·'ā'itas.
—— *large, for berries,* k·'ē'gū.
basket qin.
bat k·'ātltsōqa'la.
baton of shaman t'ask·'.
beach gyitl.
bear, black, tān.
—— *grizzly,* qō'ots (borrowed from Tlingit).
—— *polar,* ha'l'un.
beard sk·'ē'ōrē(n).
beaver ts'Eñ.
bed thēidā'n = sleep instrument.
beetle :hansk·ea'l K. = face dirt.
before this ku'nrasta.
belly tātl.
belt (dl)dsgā'wa K.
berry g·ān(a); hān(a) K.
—— *cranberries* dlā'ē.
—— *dried,* g·an hi'l g·ata.
—— *boiled,* g·an galE'nsEl.
birch attā'ri (borrowed from Tlingit) K.
bird qēt'ē't.
—— *a bird with red wings* s:hā'ltset K.
black (tl)k·ātl, (s)k·ātl.
black cod sk·il.
bladder k'ōg·E'n sk'an.
blanket gyā'atk.
—— *Chilkat,* nā'nin (borrowed from Tlingit).
Blennius sp. :hacī'n K.
blood g·ā'i.
blue gō tlrātl.
blue jay tl'E'njūt.
body, the whole, tēā'nē.
to boil, gan; qoa'tlta.
boiled food galE'nsEln.
bone skū'tsē.
bow tlk·ē'it.
bowstring tlk·ē'it t'ā'tsē.
box g·ōta, dā'ota.
bracelet, copper, nalslgya'.
brain k·as'E'ntsEñ, k·atlE'nts'Eñ.
to break down qu'ndata.
the sea breaks (heavily) g·ā'iu g·u'ñ-gE (yū'En).

breast k·an.
brothers and sisters k·'ā'tlqa.
brother tā (said by sister).
elder brother guā'i (said by brother).
younger brother dā'(ōrEn) (said by brother).
second brother gūctnEñ k·atleqagas(?).
third brother gūct lā'na(?).
brother-in-law k·eā'= sister's husband (said by man).
—— tlE'nara = sister's husband (said by sister).
Bubo Virginianus gutgunē'st K.
Buccinum ckEtsk' K.
bucket g·ā'na.
bush tlkyi'n(ra).
butterfly stlak·a'm.
buttocks k·'atltsō.
button blanket guñ la'ñgō gyā'atk.
by and by k'oā'i.

C.

calf of leg gy'ātl k·ā'u = leg muscle.
Caltha palustris HIl gītlEgEñ = medicine above swim.
canoe tlō'u.
Cardium Nutalli chilhiē'i K.
cat tō'us (Chinook).
cedar, yellow, c:hatlā'n K.
—— —— *young,* ts'ō gyīt ē.
—— *blanket* lā'HIal.
—— *bark, used for making mats,* gyīē't.
cedar root dlē'iñ.
Ceryle Halcyon k'ut'u'n K.
cheek, lower part of, ts'i'ta.
—— *upper part of,* k·'a'n ts'i'ta.
chief (nEñ)ētlqagida'.
—— *head-chief,* lā'na ā'ora = town mother.
child gyīt'(ē).
chin tlkā'ē.
Chiton tunicata c:hē'it K.
—— *Stelleri* t'a.
Circus Hudsonica dō:hatlāga' K. = catching bird(?).
cirrostratus k·uē'au.
cirrus iā'n tsē'tla (ā'n = cloud).
clams skā'ē, ky'ū.
clothing, to wash —, tāda'n tsī'gyida.
cloud iān.
coat djit'i'skū.
red cod sk·ān.
small codfish s·ā'ētaē.
large codfish skā'ēnān.
cold quī'.
colored tlhātl.
—— *many,* aqā'i tlhā'tla.
Colymbus glacialis tatl.
come! (used with the imperative) lā'la!
the winter is coming tā'da g·i'lga.
cone of pine ctl'ack'E'māl.
to cook by means of heated stones sītl; gya'galañ.
copper plate t'ā'ō.
cormorant ky'ā'lau.
cotton wood tl'al.
Cottus sp. k·'āl.
—— —— tl'ā'ma.
cousin sk·āñ = father's sister's and mother's brother's daughter.
—— usqu'ñ = mother's brother's child.
—— lEra'n = father's sister's and mother's brother's son.
Mother's sister's child = brother.
Father's brother's son = brother. Elder or younger brother are used according as cousin is elder or younger than self.
crab k·'uct'ā'n.
crabapple k·ē'iq.
—— *tree* k·ē'yintl.
cranberry ia.
crane, and Gallinage Wilssoni, dEl (borrowed from Tlingit) K.
crazy dladlgua (see *land otter*).

crow k'ā'ltsEda.
crown of head tl'El k·ā'tsē.
to cry sk·ā'yētl.
to cut off (neck) (qil)k·'ē'tl.

D.

dagger k·'ā'otl.
to dance HIā'tl.
(*shaman's*) *dance* (sk·ā'g·at) wīkatsō.
dancing leggins gy'ātl gya = leg dancing ornament.
danger at sea c:hā'noakEn K.
daughter-in-law dzīrōnā'n.
dawn sEn gītlEñga (nō'kua).
day sEn.
—— *all day long* sEn sg·ā'sg·ō.
it is daylight k·ā'dēga.
dead g·'ōt'utl.
deer g·'at.
Delphinus O·ca sk·ā'g·a; chān K. (see *shaman*).
dish k·ā'itla = wide open.
—— *carved on both sides* k·ā'itla k·ō'la = dish forehead.
dog qa.
dog fish k·'ā'qata.
dog salmon ck'Ek.
doll gyīt; gEdē's (children's language).
dolphin sk·ul; k·'āñ.
door gy'ū; stEñ.
—— *in heraldic column* gy'ū qa'l = door hole.
down (feathers) tE'nIō; g·E'nIō.
dragon fly dē'gua t'ā'mā'i = sun louse K.; mā'mats'ikyē (borrowed from Tsimshian).
to drink qutl.
drum gā'udjau.
dry g·'ā'(ga).
duck qā'qa.
dusk aga'lgua.
dust, dirt, sk·ea'l.

E.

eagle g·ōt; :hōt K.
eagle black :hōt thātl K.
eagle gens gyītena'(c).
ear gyū.
opening of ear k·ā'tlē.
earth, ground, k·'uī' (see *island*); tlga.
earthquake tlga i'ldEñ.
east wind k·'a'ratsg·a.
to eat ta.
to eat together uā'ras.
ebb tide gyitlraHi'tl.
edge of box clEñ.
upper edge of blanket sī'dE.
egg k·ā'u.
lice eggs djāc.
elbow HI tsEguī' (HI = arm).
elk tci'cku.
Empetrum nigrum :hackā'wa.
to enter k·adl (see *to walk*).
ermine tlEk·, tlqa.
evening sEn Hi.
excrements kwā'rau.
eye qa'ñg(ē).
eyebrow skiā'tsē.
eyelashes qa'ñga dlt'a gutcē.
eyelid qa'ñga g ā'al = eyelid.

F.

face qañg(a).
fall tcā'nut k·arat (see *winter*).
to fall over k·'ā.
to fall from ēsg·oē'.
far dzīñga.
fat tlk·ō'na.
father (said by man) k·uñ.
—— (said by woman) qāt.
father-in-law k·ō'nē (see *son-in-law*).
fathom HI rōdlagī'l (HI = arm).
—— *half,* dī ky'ē'ōrē dlōg'ē'ta = my median line of body fathom.
—— (measure from left shoulder to top of finger of right hand) sk·al dlō (sk·al = shoulder).

feathers, pubis, g·ā′u.
female sexual organs kā′u; tsō′u (children's language).
a certain festival gyā′ist.
—— —— gag'uē′ta.
to fight ıā′ʜitla.
—— *together* gūtg·an ıā′ʜitla.
figure k·′ēda.
finger sl k·′a′ñē = hand finger.
—— *first*, sli k'uā′ns (sli = hand).
—— *second*, yak·′olā′na.
—— *third*, qēigā′us = weak.
—— *fourth*, sli gō′uts (sli = hand).
fire-drill tlkiā′k'ē.
fireplace k·aē′qēt.
firewood ts'ā′nō.
fish teitl.
—— *fresh-water*, tc'ē′na.
—— *salt-water*, sk·′ā′tlan.
fish knife tā′g·ataō.
fish line of kelp, tlgai.
fish otter ts'ōwu′lEk'.
fish roe tcā′ē.
fish trap, bottle-shaped, sk'aıā′ō.
fish trap, large, gyī′rau.
flat g·ā.
flesh gyērī′.
fleshy gyēıā′ulgō′u.
flood tide gā′etliʜit.
fly dē′idEn.
fog iā′n(Eñga).
food ga ta′.
foot st'ā′ē.
footprint st'a sEl.
forehead k·ul.
forenoon sEngā′ē.
fox naga′tsē (borrowed from Tlingit).
frame tlk·a.
my friend ta′quē.
frost g·alE′ñgudatl.
to fry citl.
—— *on stones* citl g·uta′ = fry stone.
Fucus vesiculosus t'al (borrowed from Tlingit) K.
fur seal k·′oā′n.

G.

gambling sticks sEn.
to give ē′ista.
to go k·a, i′sk·as, gEnd'aıi′t (?).
let us go hā′la d'ā′lEñ gEnd'aıi′t s'añ.
good lā.
grandchild t'agyE′n.
grandfather tcin.
grandmother nān.
grass k·′an.
gravel sqat'E′ldañ.
green gan tlratl = yellow; g·ōtlratl = blue.
greenstone (jadeite) dlk·ā tlō′u.
gull ck·′in.
gums ts'Eñ k·′ul = teeth skin.
gun dzī′gū.
Gyins: hā′noa (the wife of Nenkyilstlas).

H.

Haida qā′eda.
hair k·as k·′ē′tl = head hair.
—— *dress of shaman* gyiētl.
half yā′kō.
—— *moon* k·uñ gēnEroā′ē.
halibut qā′kō, ·hāk' K.
halloh! ai′diñga!
hand sli, slā′ē.
Harelda glacialis ā′ñg·ñgē.
harpoon k·′ā.
—— *line* k·′ā tl'ā′tsē.
point of salmon harpoon k'udE′nkyīl.
hat dā′dzEñ.
—— *ring* dā′dzEñ ski′lga.
he la.
head k·′ā′tsē.
—— *ring of red cedar bark* tEntlgyik·a′ldE.
to hear gū′dEñ.
heart tēk'ō′gō.
her la.
heels st'a kōsē′ (st'a = foot).

to help etlwa.
heraldic column gyā'rañ = standing upright.
herring ī'nañ.
it is high water skuā'ga (rîlgEn).
hips k·ātlu'l skū'tsē (skū'tsē = bone).
hook, for fishing halibut, tā'ō.
iron hook stīl tā'ō.
hole qal.
hoof of deer g·'āt st'ā'gun (st'a = foot).
horizon k·uēHdzi'nrau.
horn (see *antlers*).
horse gyūdā'n (Chinook).
house na.
—— *dug out part in centre of,* dā'a.
—— *front* na qañ = house face.
humming-bird qEktgyīā' (borrowed from Tlingit) K.
hungry k·'oē'ta.
husband tlāl.

I.

I dē(a), tlā'(a).
ice g·al(ga).
indeed? ōdja?
Indian of the interior ts'ak·s.
inside k·ā'tlēk, nā'gust K.
instrument tan.
interstices between fingers sli nātk·asē'.
intestines k·ēs.
invitation to autumnal festival la'gyinem.
iron ire'ts.
island guā'ē.

K.

K·atlEnsk·u'n, name of a place.
kelp tlk·ā'ma.
—— *cake* qā'eda gu'lra = Haida tobacco.
kettle ck·'El.
—— *wooden boiler,* ck'El gan.
—— *wooden,* tā'utaqai ; sk'a'lgal.
kidney tcā'ē.
to kill tē'aqan.
knee k·'ulō'.
—— *pan* k·'ulō k·ānāñ.
—— *joint* gyal k·uld'E'ñgō = leg joint.
knife sqā'u.
—— *made of shell* taqā'ō.
to know u'nsēda.
I do not know ā'ya.
knuckle d'amE'l.
Kushtaka (*otter people*) gEgyii't K.

L.

lake sū.
Lā'nas = the town, place near Rose Point.
lance tcea'tl.
land tlga.
land otter sdlgū.
large yū'an.
to laugh k·ā.
leaf dlk·'a'ñgual.
Ledum palustre hi'lk·agen K. = mouse neck.
left hand slā'nēgi slā'ē.
leg, above knee, thil.
—— *below knee,* gy'ātl.
dancing leggins gy'ā'tlgya = leg wearing apparel.
leg of table tlga.
lid of box tā'uta k·ā'al = box lid.
to lie k·'ōrat, kētlHidā'n.
liar k·'ōrat hā'era = lie master.
lightning sqēt g·āuldañ.
to like stat'E'l.
Lina sp. djuwēt'amā'ē.
line tl'ā'tsē.
lip, upper, h'ō'tsēqun.
—— *lower,* k'ō'uta.
liver tētl'Elkul.
lobe of ear gyū st'ā'ē = ear foot.
long sk·'a, dziñ.
—— *ago* tlsta.
loose cuvā'c.

lost gā'u.
louse t'am.
low water tsē'qoa.
lungs k·ā'genskē'ga (see *adam's apple*).
Lupinus gE'ndō.
Lycopodium clavatum g·'at dldsgā'wa = deer belt.
lynx tlgyan dā'udjā'ē (tlgyan = forest).

M.

to make da, gyiñ, g·ōtlra.
man ē'tliñga, k·'El.
—— ga; for instance, k·'cā'la ga = raven gens man.
many skō'l (only referring to men).
—— k·cā'n (referring to any thing including men).
—— yū'an (referring to any thing including men).
martin k·'ō'u.
mask nītca'ñgō.
master hā'ēra.
mat lgūe.
meat gyērī'.
median line of body ky'ēō'rē.
medicine HIl.
midnight g·al ȝā'kō.
mind gū'dFñ.
mine tēnE'ñga; nā'ra.
moccasin st'ā tlk'u'nkyē (st'ā = foot).
moon k·'uñ.
—— *new*, k·'uñ ihai'lōgEn.
—— *first crescent*, k·'uñ k·ēqatlg·a = the moon opens his eyes.
—— *last crescent*, k·'uñ ihailōda'lgEn.
—— *begins to be full* k·'uñ g'aisgōgi'lga.
—— *is shining* k·'uñdlan.
more ī'sEñ.
morning sEn aē'qEn.
mortar dā'rō.
mosquito ts'era'ltEquan.
mother ā'ō.
mother-in-law dzīrōnā'n (see *daughter-in-law*).
mountain t'ē'is; tldēiā'u.
—— *goat* ky'i'ñrē.
—— *sheep* mat' (borrowed from Tsimshian).
mouse ka'gan.
—— tsīgul ā'ora (ā'ora = mother).
mouth qētl'ē'.
mud tcān.
muscle k·ā'u.
Mytilus edulis :hal K.

N.

Na ēku'n, Rose Point.
nail sli g'u'n = hand nail.
naked k·oonā'nō.
nape ts'ē'kyē.
navel sgil.
near ā'qan.
neck qil.
needle sln.
nephew (man calls his sister's child) nād.
—— (man calls his brother's child) gyit.
—— (woman calls her brother's child) usqu'ñ.
—— (woman calls her sister's child) gyīt.
net a'qat.
night g·āl.
—— *it is*, g·ā'lga.
nipples tl'E'nwai.
no gaū'anō.
Nootlem qālēta'.
noon sEn tā'tsēra.
north wind k·'āHustē' ga, qū'stega.
nose kun.
nostril kuntsqul.
not gEm.
notch of arrow stlqu' tsē.
now (a)ūwia't.

O.

oak tcā′nañ.
oar ādl dzi′nda = paddle long.
ocean sī.
œsophagus tl′ɛlqō′ts′ɛl.
Oidemia perspicillata c'i′ndɛtl K.
Oidemia sp. gā′oq K.
olachen cā′u.
old k·′ā′i.
—— *clothing* k·′u′lzu.
—— *man* nɛn k·′ā′ia.
on gūd.
—— *top of* u′nsē, gī.
one squn, sqa′sgō, sqoā′nsɛñ.
open k·a.
to open one's eyes k·ē′qatlg·a.
another one gyina k·′a′lrō.
outside :hadōsi K.
owl, white, k′āk‘ (borrowed from Tlingit) K.

P.

paddle ādl.
to paint k′ōtlā′nō.
red paint for face (qañ) mā′tsa.
black paint for face (qañ) k·′ā′tsa.
palate sē′iñgatsē.
palm of hand sli k·ā′rān (sli = hand).
Parmelia k′āltsdēlē′dja.
partridge, ptarmigan ; ck·ā′u.
Parus tatldā′nsgyēt.
penis tsī′tsī.
people qā′ēdqa.
perforation of nose kun qal = nose hole.
—— *of ear* gyū qal = ear hole.
pestle dā′raō ; dā′raō ts′ɛñ.
petticoat cā′ata lgyēgyiā′qa = woman's petticoat.
pile of fuel ts′ā′nō sqa.
pillar, erected in commemoration of deceased, qāt.
pipe qē′tlɛñ g·ā′eudā′ō = mouth smoke box.
to piss tsē′gɛñ.
plant of foot st'a k·ara′u (st'a = foot).
poker kyitsqɛla′ñgō.
Polygonatum ct'ā′u hā′na = witchcraft berry.
porcupine :hatlgɛts (borrowed from Tlingit) K.
porpoise sk·ul.
to possess (tla) da, k·ē′i, (dē) ran.
post, in house, k·′ōtg·a′ñgō.
potlatch wā′tlqatl.
pregnant, she is, l tātl gyīt'ē′ (gyīt'ē′ = child, l tātl = her belly).
puffin k·oqɛ′n ; k·oana′ K.
pupil of eye qa′ñgē l tān karē′i.

Q.

Qoia g·a′ndla = Raven water, a river on Queen Charlotte Islands.
quartz tlk·a k·′ā′tsē (tlk·a = stone).
quiver ts'ītalɛ′ñ darā′ō = arrow box.

R.

rafter ts'ān sk'ā′gēt.
rain dādl.
rainbow tā′wɛl.
rain wind (generally east) qē′u.
raspberry hān gyit'ē′ = berry small.
rattle, raven, sīsa′.
—— *shaman's,* dlkum hitaga′ñgō.
—— *puffin beak's,* tlɛ hitaga′ñgō.
—— *skull-shaped,* k·′ēl hitaga′ñgō.
raven qoia′ ; yētl (borrowed from Tlingit) K.
—— *gens* k·′oā′la(c).
to recover from sickness ñgā′istl ; lgila.
red sqēt.
reed k·′ān tl'akida′ = grass wide.
rib qē′wē.
Ribes hā′iwa (borrowed from Tlingit) K. ; k·′ētguā′n K.

ridge of house, formed by a long board, tlgī'tlaï.
—— *of upper part of ear* gyu tlk·un = ear ridge.
—— *of nose* kun tlk·un = nose ridge.
right, it is all right, tE'mqEn.
—— *hand* sqōlgyīlā'nā.
river k·ā'ura.
to roast fish dlgū.
roof na ū'na = top of house.
—— *inside of*, na k·arā'n.
rope of spruce roots k·u'ntla.
—— *of cedarbark* k·oa'ē.
—— *around food box* tāut īya'ñgrē.
rotten s·ā'ga ; gu'nraga.
round g·ā's. g·ē (see *full moon*).
Rubus. Vaccinium uliginosum, han hā'ulas = berry sweet.
to run k·ā'nit.

S.

saliva tl'an.
salmon tcīn.
—— *a small species*, c:hoā'gank K.
—— *hooknose*, tāi.
—— *humpback*, ts'īt'ā'n.
—— *white*, tā'un.
—— *smoke-house for*, tā'na nā'i.
—— *weir*, Hiā'i (the centre occupied by the fish trap *gyirau*).
—— *berry* sk·ā'uran.
salt tā'ñga g·ā'ga = dry sea.
sand tās.
Saxidromus squalidus ky'ū.
scalp k·ās'E'l.
seared tlquā'k·a.
scraper of deer bone gyitsratē'skō.
scrotum k·'utlē k·'al = testicle skin.
sea tā'ñga.
—— *far out into the*, sīakō.
seal qōt (borrowed from Tsimshian).
sea lion k·ēt, k·āē.
—— *hat* sqā'tsē dadzEñ.
—— *armor made of the skin of*, k·'ōg·agya'.
sea otter k·ō'u ((?) see *martin*).
to see k·iñ, k·ea'ñ.
self tlōo, ā'gEn.
septum kun tE'ñgarē.
to sew tl'El, gya tl'El.
shaman sk·ā'g·a.
shark k·'āt ; k·'ā'qata ā'ora = dogfish mother.
she la.
sheath of dagger k·'āotl k·'al = dagger skin.
shells, burned and chewed with tobacco, guā'ga.
ship k·'ē'i.
short k·'ōdzā'ō.
shoulder sk·al.
sick st'ē.
sinew qā'ē.
to sing sqalā'ñ, k'atsā'ō.
sister, djās (said by brother).
sister-in-law tlE'nara (brother's wife, said by brother and *vice versa*).
—— tsi'ñga (brother's wife, said by sister and *vice versa*).
to sit k·'aū'ō.
skate sqā'na.
skin k·'al.
skull k·a skū'tsē = head bone.
sky k·oiē' k·arā'n.
slate tlk·a s'ā'ga = stone rotten (soft).
slave qaldE'ñga.
to sleep t'ēi.
sleep tlk·'ag·a.
sling tsawu'ñ.
small gāu gE'tsō.
to smell sku'ngudEñ.
smoke g·ā'ēu ; gyinē'it.
—— *hole* gyinadā'i.
snail c:t'E'la K.
snake si'ga.
snipe ayahī'a.
snow d'arā'ō.
son-in-law k·ō'nē.
soot k·ayū'cian.
soul catcher k·'angitlkigya = breast dancing ornament.

berry soup ac.
to speak kyētlkul.
—— *to somebody* sō′ta.
spear shaft kīt·ū′.
to throw spear kīt.
sparrow hawk skyā′mskun.
Spermophylus Parryi tsatlk‘.
spider k·′utlsiā′ñ.
spike of pine giā′.
spoon slā′gul.
large spoon slā′gul g·aniā′lō, slā′gul g·anE′l.
spring k·′in rad, k·′in rē′da (k·′in = summer).
sprout ck·′ā′u K.
squall t′ā′tsō k·ōē′wē (t′ā′tsō = wind).
squid nū K.
squirrel da′sqa ; gEtltsā′k K.
to squirt yi′ltɬñ.
to stand gyā′rañ.
star k·′ē′itsāō.
shooting star k·′ē′itsāo kwā′rau = star excrement.
starfish sk·′ā′am.
to steal k·′ō′tlta.
stomach gy′ē′tsē.
stone tlk·a, g·ōta′.
storehouse in forest gya′c halā′ñ.
storm qastl.
story k·′ā′ēg·añ.
strawberry hil dāhā′ñ.
street gy′ū.
strings for tying up blanket, handle, (dl)t′ā′ts(ē).
strong dakuya′.
stump of tree, a fallen trunk, k·′ā′qō.
summer k·′in, k·′in yā′kō.
sun dzidlg·oē.
suspensor of dagger k·′ā′otl t′ā′ts.
swan titl′u′u.
sweet hā′ulas.
sweetheart k·′atai′ra.
to swim (bird, wood) tlEgE′ñ.

T.

table gata dā′n = it eat instrument.
tail of bird, whale, ky′ī′ta, sky′ēā′ō.
—— *of fish* st′ā′i = foot.
to talk kyētlkul.
talker kyētlkul lrā′era = talking master.
tattooing gyīda′.
temples near eyebrow skya′ts qōta.
—— —— *tragus* gye′lsEntā′rē.
testicles k·′utlē′.
there ēs′.
therefore k·′a′gan.
thicket tlkyan ts′īgE′nga yū′an.
thief k·ōtlta hā′era = steal master.
thing gyi′na.
thirsty k·′ādō.
thorn dā′a, dā′ñga.
thread gy′ētlā′ō.
to throw with stones tsā wa′ñga (see *sling*).
thumb slī k′usē′.
thunder hē′lañ ; kaqē′gEl.
tide koā′kia′.
the tide turns koa′tlk·at ltā′ra.
Tlk·āgilt = *Stone beach ;* Skidegate.
toad tlkyan k′ōst′ān = forest crab.
tobacco gul.
toes st′ā k·′a′ñgē = foot finger.
to-morrow dā′rgatl.
tongue t′ā′ñgEl.
tongs, for taking stones out of fire, tlk·a tsō = stone tongues.
too g·ē′dEñ.
tooth dz′Eñ.
molar tooth dz′Eñ k·ā′tsk·ul.
town lā′na.
tree k·ēt, k·ā′ē.
trout tā′tl′at.
twice stiñgEn.
twins ntsā′ta qē′g·a stiñ.

U.

Ulva k·′ātc.
uncle (father's brother) k·uñ = father.

uncle (mother's brother) k·ā.
unmarried man dlʜiān.
—— *woman* sk'ᴇñ k·a'nda.

V.

Vaccinium ovalifolium tltān
—— *Vitis Idaea* sk·ā'uran gyīt'ē' = salmon berry small.
valley tl'ā'dan.
vein g·ā'i nsg·erē' = blood vein.
Veratrum guā'iga K.
Viburnum acerifolium tlā'ē K.

W.

to walk k·a.
wall na ta gul = house side.
warm ky'ē'ina.
warp qā'i.
warrior gutl'i'sta.
—— rā'ʜitlta lrā'era = fighting master.
to wash tlñ.
—— *one's hands* sltlā'ɴᴇñ.
wasp sral, c:hal K.
water g·andl.
wave g·ā'ēu.
we ētl, t'alᴇ'ñgua.
weak k·āqa(ga').
weft k·'ōdā'i.
wet rᴇdzī'gᴇñ.
whale kūn.
—— *fabulous, with five fins,* wāsk·.
what gōsu, gōg'us.
where gyīnū'.
whistle sk·ā'na.
white g·'ā'da.
—— *man* irē'ts qā'ētra = iron man.
—— —— k·'ᴇl g·adā'a = man white.
who gyī'stō.
why gō'gusg·anō, g·ā'tlᴇntlā'ō.
wide tlak·id '.
wife dj'ā.
wind tātsā'ō.
—— *seaward,* tatsā'ō sg·a.
—— *catpaw,* tatsā'ō sk·ada'lga.
—— *landward,* tatsā'ōgītl.
—— *increasing in strength* t'atsē'lga.
wing ʜē'i ; st'ā'rūn.
winter tā'da ; sᴇñ gā'rat.
to wish stā'tᴇl.
witchcraft ct'ā'u K.
wolf gō'utc ; hō'utc (borrowed from Tlingit) K.
woman dj'ā'ata.
woodpecker clōtsg·adā'ñ.
wood tlkyān.
worm cik ; sk·ā'ra.
wrist ʜāē k·'ōld'ᴇ'ñgō = arm joint.

Y.

year tā'da (see *winter*).
yellow g'an tlratl.
yes â; ō; ā'ñga.
yesterday dā'rgatl tlgā'ē.
day before yesterday sta g·al stiñge'lgen = two nights ago.
you, pl. dalᴇ'ñ.
young gyī'tg·ē ; ītᴇ'rᴇn.

III. ENGLISH-TSIMSHIAN.

A.

above lᴇqa'.
to accompany stōl.
across tsag·a'.
adam's apple siā'uq.
adze of stone tasᴇr ᴇm lâp = adze of stone.
to adopt sᴇwulā'isk = make relative.
afraid bas, *pl.* lᴇbas.
afternoon tla dā'otl gyā'muk.

again tla(1)gyik(2) = perfect sense (1) then (2).
against tqal.
—— (*hostile*) lEbi'lt.
ago, a few days, g'E'rdata.
—— *a few weeks,* gyetqā'utq.
—— *a year, long ago,* gye k'â'otl (k'â'otl = year).
—— *long,* tlā'gyigyat.
air ha.
all tqa'nē.
to allow Enâoq (see *to consent*).
I allow him to come Enâ'yō dEm k·ā'ēdEks.
also dī.
always tlā'wula.
ancestor, female, nag·an tsē'esk·um (see *grandmother*).
—— *male,* nag·an yētk·um (see *grandfather*).
and (connecting nouns, etc.) dītl, g·antl.
—— (before words designating human beings) dīs, g·ans.
—— (connecting sentences) ada.
angry tlō'ontē.
animal iē·ts'Esk.
ankle hEmho'm.
to answer dīlEmaqtl.
antlers qaqā'ns.
arm an'o'n.
—— *above elbow* lEbEo'n.
armor of elk skin k·'Etlā'n.
to arrive batsk.
arrow hāuā'l.
—— *bird arrow,* t'ē'es.
to ascend a river g·'a'la.
to ascend a mountain maqtl.
ashes ōE'nEk·sEk·.
ashore tsE'rEn.
to ask kErE'taq.
Asuwā'lgyat (a fabulous monster belonging to the gens K·anha'da, *raven*) gyat = person.
at (referring to distant objects) ga, gasga.
at (referring to present objects) da.
aunt (mother's sister) = mother.
——(mother's brother's wife) nEktā'.
—— (father's brother's wife) nâ'os.
autumn ksō'ot.
axe, European, gyēgyâ'otk = lengthwise fastened.
—— *stone,* dahE'rEs.

B.

baby, male, gyinē'es.
—— *female,* wok·'ā'uts = without labret.
back k·'â'o.
backward gyi'lEks.
bad hada'q.
to bail ts'ē'yuk.
bailer ha(1)ts'ē'yuksa(2) = instrument (1) bailing (2).
bark, match, gyīmst.
basket, for berries, iū'sEl.
—— *for fish,* tsElā'.
—— *of cedarbark, for carrying household goods when traveling,* dō'otlk.
to be nē, nēnē'.
bear, black, o'l.
—— *grizzly,* mEdī'ek.
—— *fabulous (?) white,* mEs'o'l.
—— *gens,* gyispotuwE'da.
beard ēmq.
to beat time k·ansp'a'.
beaver sts'âl.
because (a)wul.
bed halēlā'tlk.
bee ap (borrowed from Tinne).
beforehand gu'ldEm.
behold! rakstanā'!
belly bEn.
to belong to wāld.
below gyēek.
berries, dried, gEnē'gu (atl).
Bilqula Lalgyimē'l.
bird ts'ō'wots.

bird, all flying animals, lEpā′yeky.
black t'ō′otsk.
—— *paint for face* qtō′ots.
blackberries mā′e.
blanket gus.
—— *white,* gus mâks.
—— *sea otter,* gus ptlōn.
—— *Chilcat,* gus(1)naikyi′m(2) gyā′muk(3) = blanket (1) sun (3); naikyim, evidently from na′qin, Tlingit.
blind sū′Ens.
blood itlē′.
blue kuskua′sk.
boards in bottom of canoe ktsâ′oks.
bone sâ′yup.
book sā′wuns.
boom t'uksitlē′.
boots ts'â′oqs (see *foot*).
on both sides laqaq.
bow hāukta′k.
—— *of canoe* gyits'ā′iq.
bowstring tē′es.
box for food k·alEi′rEnk·.
—— *for blankets* qpē′is.
boy wōmtlk.
brain wunEg·ā′us (see *head*).
branch anē′is, *pl.* ananē′is.
—— *of river* lōts'ār.
—— —— ts'ā′tlē.
bread anā′ē.
breast k·ā′yek·.
breath ksEnātlk.
bridge tsaja(1)k·anē′qs = across (1).
to bring da k·â′edEks (da = at, k·â′edEks = to come).
broom had'ō′osk = instrument sweeping.
brother (called by brother) weky.
—— (called by sister) tlE′mktē.
brother-in-law (husband's brother) tlg·Egâ′otks.
—— (wife's brother) tlg·uag·atlā′m.
brown srloqlâ′p (see *stone*).
bucket ō′mtlElt.
bullhead (a fish) g·'ayē′et.
burial of shaman in house or cave ts'Em lâp = in rock.
burning the dead mālk.
—— —— *payment for,* qmālg'Eck = receive for being burned.
to burn (v. n.) gua lak (see *fire*).
—— *burning leggings,* Gualgaba′qs (traditional name).
to bury lō an'o′n = into hand.
bush species (?) qtlätl.
by and by hāuwē′nē.
—— tladzE.

C.

calf of leg hâ′EnEr.
to call hō′otk, *pl.* hukhō′otk.
—— *I call his name,* nsuwā′tkada (see *name*).
calm gyaks.
to camp gyâ.
to move camp lâyek.
cane, walking, k·ā′at.
cannibal qgyat = eat people (Olala).
canoe qsâ.
Haida canoe qsâ Em Haida.
canoe moves stern foremost läntk.
cañon ts'alā′sEr.
cape k·ā′maks.
carriage ts'e′ktsik (Chinook).
to carry into ts'ElE′m(1)ga(2) = into (1) at (2).
—— *in flying* tikyepā′ik (see *to fly*).
to carve gyetlk, *pl.* gyetlgyetlk.
carving knife hagyetla′ = instrument carving.
cat tō′us (Chinook).
to catch salmon spaqtl.
causative — En.
—— — g·an.
cataract ts'Em(1)hō′otseq(2) = in (1) ? (2).
cedar g·Elā′r, *pl.* g·Elā′r.
—— *bark* hat'ā′l.
a certain g'âlt.
chair halī′d'a (d'a = to sit, ha = instrument).

channel, narrow strait, mE'qtla.
cheek, lower part, wundâ'.
—— *upper part,* teā'l.
cherry g·'Elā'mst.
to chew k·'ā'un.
chief sEm'â'yit.
child tlguâ'mElk, *pl.* k'apEtgEretlk.
—— *of chief* tlguwā'lksek.
chin tqlakwak (kwaq = lip).
clams ts'āq.
to close one's eyes ts'ē'ep.
cloud, overcast sky, sa.
—— *cirrus,* wukts'E'n.
club, war-club, k·auwā'i.
coat kōtā's.
cold, to feel, qkua'tko.
to come k·â'edEks.
—— *from* wātk, *pl.* amiā'an (see *from*).
—— *down* kwānt.
common things skEtg Em gâ.
company nā'tatl, *pl.* natā'tltatl.
to consent Enâ'oq.
to continue tlāwula wāl = always do.
—— tlāwula hāu = always say.
copper plate haya'tsk.
cormorant k·ag·ā'.
corner amō'.
—— *of house* amō's.
council lEsā'osk, wulg·ak·â'st.
—— *combined with feast* g'ElEgā'-yetl.
councilman (next to chief in rank) lEgagī'gyat (gyat = person).
country k·a'lts'apt (see *town*).
cover of anything ât.
cow mEsmō'os (Chinook).
crab k·Elmâ's.
crabapple mâlkst.
crane k·'asqâ'os.
crest (*of gens*) ts'apk (see *town, people*).
crow k·'auqā'n.
crown of head mEsEmā'.
to cry wīhā'ut = great say, *pl.* bâk.
—— *for sorrow* t'â'oqtlk Em bâk.
cup haa'ks = drink instrument.
to cut k·'ōts, *pl.* k·'ask·'ōts.
to cut off qtsak·â'ts.
to cut open pē'atl.

D.

day sa (see *cloud*).
dagger k·'ad Em dō'osk.
dance hâlā'it.
dancing blanket gus halā'it.
—— *hat* amhalā'it = used in dance.
—— *leggings* k·aqselks Em sī (sī = leg).
daughter = female child.
dead ts'ak.
deaf ts'ē'eq.
my dear! (*male*) nād.
—— (*female*) dātl.
deep tlEp.
deer wan, *pl.* wan.
—— *fawn* kusts'ē'ek.
to die ts'ak, *pl.* dEr.
dish, carved, k·ai'itl.
—— —— *large,* k·aiitlē'ek.
—— *of mountain sheep horn* stata's.
to do wāld.
dog has, *pl.* hasha's.
door lEksâ'q (see *out*).
double gu'lba.
downward tgyē.
—— ya'g·a.
down a river gī'si.
dreadful hats'E'ks (see *ugly*).
to dream ksuwE'q.
to dress up nō'otk, *pl.* k'anō'otk.
to drink aks, *pl.* laa'ks.
drum nâ'otl.
to dry (v. a.) sigE'r.
duck mē'Ek.
—— nanā'at.
—— *black,* amgyī'ek.
—— *spotted,* g·ag·awē'.
dust yō'op.

E.

eagle qskī'yek.
car mō.

earhole ts'Em mō = in ear.
perforation of ear nak·aga mō.
east gīsiya'sk (gī'si = down river).
easy ē'EpEn.
to eat yā'wiqk, *pl.* tqâ'oqk.
—— *in compounds,* q —.
—— *something* gap.
—— *up* tsātlt.
egg tlgEma't.
elbow sk·ā'nēis.
(*person*) *elder than self* sē'elgyat (gyat = person).
elderberry bush sk·an lâ'ots (k·an = tree, lâ'ots = elderberry).
elderberry lâ'ots.
elk siâ'n.
to elope da (see *with*).
to enter ts'ē'en, *pl.* lam ts'aq.
European k·'amksī'oa (borrowed from Hedltsuk?).
evening skī'yetlaks.
eye wul'E'l.
eyebrow lEgyī'l.
eyelashes nâ'mEl
eyelid, lower, sk·ā'ul.
—— *upper,* lEqaâ'l.

F.

face ts'al, *pl.* k·ats'altsa'l.
to fall k·ā'ina, *pl.* lē'ina ; sa(1) k·ā'in(2) = suddenly(1) to fall(2).
far t'a, *pl.* t'ad'a'.
—— warait'a'.
to fasten dsē'ep.
—— *to* dsē'ep tqal (= against).
fat (n.) yā'i.
father nEguā't.
—— *address,* ā'bō.
father-in-law tlāms.
fathom g·ā'it.
—— *half fathom* k·'ā'yek = breast.
—— (left elbow to tip of finger of right hand) disk·a'nēis (see *elbow*).
fear bast.
feathers lī.
to fell (a tree) k·'ōtstl (k·an).
female (only referring to human beings) ksEm —.
few abō'o.
to fight wuldō'yitk.
—— *with fists* dal.
fin of fish nEk·auwā'i (see *paddle*).
—— *Delphinus Orca* nē'iq.
to find, to reach, to receive, wa.
finger kuts'ō'atl.
—— *first,* hats'ē'ek·.
—— *second,* ksin'ā'k·.
—— *third,* hastā'leks.
—— *fourth,* tlgō'uskai.
to finish g·ā'ōdē, g·ag·ā'ōdē.
fire lak.
—— *is burning* gua'lak.
—— *to start fire* sEgua'lga lak (sE = to make).
fire drill tkī'en.
—— —— *stick of,* nE sī'ētkī'en = foot of fire drill.
fireplace ts'Em la'k = in fire.
fish lōwE'lEm(1)ts'Em(2)aks(3) = in(2) water(3).
fish hook t'ā'wil.
flag (*European*) atlo'm(1)gyamuk (2) = sail(1) sun(2).
flanks sitlk.
flat tga, *pl.* d'aqtqa.
Flatheads d'aqtqa = the flat ones.
flounder daqs.
flower mEtsaqalā'i.
to fly kyEpā'ek.
fog yē'en.
to follow yā'ak.
food wunē'ia.
foolish mEwa'tsa (wa'tsa = land otter).
foot sī (Nass : sā'ē) tsâ'oqs (see *plant*).
forehead wâpq.
forenoon serliaqs.
fork hayā'wiqk = instrument eat.
fox naratsē' (borrowed).

friend nEsē′bansk.
frightened bas.
fringes on upper part of blanket for tying it t'â.
fringes on pants, etc., hatlâ′.
from wātk (see *to take from*).
fruit, species(?) ksī′u.

G.

gambling with sticks qsEn.
—— *sticks* qsEn sâ′yup = gambling bone.
—— —— *the trumps, sticks without marks*, g·ā′ē.
—— —— *marked with three rings* ksī, tsErda′m.
—— —— *marked with three rings, the central one broken at one side*, k·'o′dsiqt.
(to gamble with sticks): shuffling and dealing out, sā′ritsū.
—— —— —— *to choose one stick*, gū′sEn.
gens ptēq.
to get a "douceur" gyiā′iq.
ghost bä′laq, *pl.* bilbä′laq.
gills k·'ā′usq.
girl tlgua hanā′aq = little woman; wōk·'ā′uts = without labret.
to give gyEnā′m, *pl.* gyengyenā′m.
—— *food* gyī′En.
glabella lō spEq lEgyī′l (lEgyī′l = eyebrow).
glacier s'iâ′n.
glad lō(1)ama(2)k·â′ot(3) = in(1) good(2)heart(3), *pl.* lō amā′m k·ak·â′ot.
to go k·â.
—— *go!* ndâ! *pl.* ndâ′sEm.
to go into a boat lō′k·Em (lō = into).
—— *on a road* yāk, *pl.* līyā′k (see *to follow*).
—— *out of house* ksEr = out.
god sEmâ′yit kE laqa′ = chief above.
good ām, *pl.* amā′m.
goose, black, hā′aq.
—— *white*, tlē′wun.
grandchild tluktā′ayen.
grandfather niya′.
grandmother nts'ē′etsō.
grass kEyâ′qt.
great wī, *pl.* wud'a′.
great grandchild ō′olis.
great grandfather ō′olis.
grease of olachen k·'ā′wutsē.
grease bag of sea-lion guts sinek-sâ′sk.
green mEtlē′itk.
greenstone nEhâ′n.
grouse maqmē′eq.
to guess gō (see *to shoot*).
gull k·ak·ō′um.
gum for chewing skyan.
gun k·ap'Ela′.
guts k·al'â′os.

H.

Haida Haida.
hail ts'ats'a′.
hair lī.
—— *of scalp* k·ā′us (see *head*).
half qpī′yē.
—— *white* qpīmâ′k.
—— *cuttlefish (a crest)* qpīhatsalt.
halibut tqā′ō.
—— *hook* yig·a′.
haliotis pElha′.
hammer, stone, tEqtl.
hand an'o′n.
—— *back of*, lEqsEnē′itl.
handle of paddle g·ā′lon.
to hang yaq, *pl.* yā′iaq.
happy lō ama k·â′ot (see *glad*).
Harelda glacialis an'anē′eq.
hat k·ā′it.
to hate lElā′leqs.
hawk qtsō wotsk.
haws ralā′ms.
he, present, nē′EdEt.
—— *absent*, nē′Edga.

head t'Emk·ā'us.
headdress amhalā'it = used in dance.
to hear nEqEnō'.
hearsay amEk·ad.
—— *in compounds,* —k·a.
heart k·â'ot.
heavy p'a'lEk·s.
heel tō'upqs.
Heiltsuk Wutsda'.
heraldic column ptsān.
here ya'gua.
hermaphrodite k·anâ'ts.
herring skE.
—— *rake* ky'EdE'.
high gyeps.
hip t'Emba'.
to hit, arrow, bātsk (see *arrive*).
homesick wīgyatk.
hoof of cow k·asEsī'm.
—— *of deer* k·anā'q.
horse gyudā'n (Chinook).
house wālp, *pl.* hōwā'lp.
—— *place in the rear of the,* stō'op'El.
humming-bird ts'E'pts'Ep.
hungry k'tē, *pl.* luk'tē.
to hurt sg·ā'yigs.
husband naks.

I.

I nE'riō.
ice t'ā'ō.
in ts'Em.
—— tsElE'm.
inside tsElE'm.
instep lEqsnē'eqs.
instrument ha —.
—— k·an —.
to intend r'ap = must, anything serious, habitual.
interior, inside of, ts'ār, *pl.* ts'Ets'ā'r.
intestines hat (see *womb*).
into lō.
—— *to carry,* ts'ElE'm ga.
iron t'ō'otsk (see *black*).
island lEks d'a', *pl.* lEkshūwa'n = alone sitting.
island, large stand, lEqlEksd'a'.
it nē'edEt.

J.

jackknife haqpa'qt.
jay, blue, kuskua's.
just da.

K.

kelp-cake tlā'ask.
kidney lEpE ts'a't (see *stomach*).
to kill ts'ak, yets (see *dead*).
killer (Delphinus Orca) nē'iqtl (see *fin*).
kingfisher tsiâ'lk.
knife hatlebī'esk = instrument smoothing.
—— *butcher,* ha k·'ōtsa'mē (ha = instrument, k·'ōts = to cut, a'mē = meat).
knothole in board anē'is (see *branch*).
to know wulā'i.
Kwakiutl Gagō'otl, t'ad'a' = those far away.

L.

labret k·'ā'uts.
—— *perforation for,* nak·'ag·a a'q (see *mouth*).
ladder k·anā'qs.
landslide tlâ.
large wī lē'ks (wī = great).
to laugh sis'a'qs, *pl.* lasaa'qs.
law wulElâ'.
leaf ia'nEs.
to leave dā'wult, *pl.* k·adā'wult.
—— gdaqs.
—— wātk (see *from*).
—— *the house* ksEr, *pl.* ksâq (see *out*).
left hand (nE)me'tekiawan (Em an'o'n).
leg (a)sī'.

leg above knee k·Elg·ā′isil.
—— *below knee* tEmtlā′m.
to lie down nâk, *pl.* lātlk.
lightning ts'ā′mtē.
to like sa′ra.
lip, upper, kwaq.
little tlgua.
liver pē.
long wī nak‘ (wī = great).
—— *time* sk·ana′q, n'aga′.
to look nē′etsk, *pl.* neknē′etsk.
—— *after somebody moving away* knō′tlstakElā′atl.
to look up man nē′etsk.
to love hasā′oknEnan.
lungs dep.

M.

to make ts'ap, *pl.* ts'apts'a′p.
—— *the same* wilawa′ldet.
—— sE —, *pl.* g·asE′—.
—— (*to catch and dry*) *salmon* sEhâ′n, *pl.* g·asEhâ′n.
——*a fist to somebody* t'a′gyil an'o′n(2)ts'al(3) = arm(2) face(3).
man iō′ot, *pl.* iō′ota.
many hāldE, wihāldE (wī = great).
marmot kuī′yuk.
to marry naksk (see *husband*).
martin iē′nē.
mask amē′lEk· = used at night.
mast k·an Em atlo′m = tree of sail.
master miā′n.
mat of cedar bark sk·an.
meat sa′mē.
midnight sErlg·aā′tk.
milk ksEm a′ks = woman water.
miserable, good for nothing, k·a′mste.
—— *in compounds,* k·am —.
misfortune happening q—ka.
to miss guā′ades, *pl.* gutguā′ades.
to mistake for gun.
a monster of the sea ts'Em a′ks = in water.
month gy'a′muk (see *moon, sun*).
moon gy'a′muk Em hō′open = sun of night.
morning k·antlā′k·.
mortar nEbEts'ē′.
mosquito gyī′ek = piercer.
mother nâ′e.
mother-in-law tlāms.
mountain sqanē′is.
mountain goat mE′tē (see *sheep*).
—— —— *young,* wākH.
mountain lion nā′osō.
mouse wuts'ē′En.
mouth kutl'ā′q (see *lip*).
mud lōa′ky.

N.

nail (*of finger*) tlEqs.
—— *of toe* tlEqs Em sī.
name wā.
narrow, long and, mE′qtla.
a narrow opening lōtlkō′ol.
neck t'Emlā′nē.
neckring of cedar bark lō′ē (borrowed from Kwakiutl).
nephew (sister calls sister's son) = son.
—— (brother calls brother's son) = son.
—— (sister calls brother's son) tlguslē′s.
—— (brother calls sister's son) tlguslē′s.
Neqno′q, NEqno′q, *supernatural beings.*
nest nlō′otlk.
net, large, tk·ātl.
—— *small,* pE′na.
night hō′opEn.
night atk.
nimbus mē′Ek.
no ā′yen.
no (*adj.*), atlgE.
noise bō = any noise.
—— qstā′meq (of falling objects).
noon lEbarē′it sqet'ā′ gya′muk.

north gE'rElka.
north-northwest wind gyitEranē'etsk (see *Tòngas*).
nose ts'aq.
—— *ridge of,* ktō'usk Em ts'aq.
nose ornament k·alk·tsitlō'osk.
nostril tsEm ts'aq = in nose.
not atlgE.
notch of arrow hanemâ'ul.
now gyā'wun.
Nusqē'mta (of the Bilqula legends) mE.

O.

œsophagus nā'ata.
olachen rE.
—— ha lEmātk = saviour.
old (*man*) wud'a'gyat (Em iō'ot) = great people.
on top of laq (also beginning all names of islands).
on (*against*) tqal.
the one who tEi'n.
only g·am.
to order gun.
otter wa'tsa (see *foolish*).
out of ksâ.
outside gye'laq.
over, across, lē'r'an.
overcast ts'ē'ebe sa = close eye heaven.
owl qpâlrEmtlk.

P.

to paddle wā'i.
paddle wā'i.
paint, red, for face, mEs'ā'wus.
palate atlēnā'.
palm of hand ts'Em an'o'n = in hand.
pants p'aqs.
parents nEguā'at (see *father*).
to be particular whom one's child is to marry nālEgyidahā'u.
to pay qtkâ.
paying for burial to gens of father dē'wul (see *to burn*).
people gyat.
—— *who lived long ago* tEtlgyat.
—— ts'apt.
—— *common,* waā'iEn.
pestilence haiatlilā'qs (*borrowed from* Kwakiutl).
pestle sī'ist.
to pierce gyetlk, *pl.* gyetlgyetlk.
pipe (a)qpēiā'n = eat smoke.
to pity ramrâ'd.
place of kEnE — (kun —, Gyitksan dialect).
—— — k — (only in geographical names).
—— (where something is frequently done) kspE —.
—— (where something is kept) — ndE.
plant of foot ts'Em tsâ'oqs = in foot.
to play k·amē'elEk = to speak good for nothing.
to play with somebody sila k·amē'elEk.
poor guē'E.
porcupine ā'wat.
porpoise dsīi'r.
potlatch yā'uk.
powder ō'mElak (see *fire*).
prairie laq nEp'a' (laq = on).
to prepare guldEm k·a'wun = beforehand ready.
to pretend sis.
pretty amapa's (see *good*).
principal man.
to pull sā'ik.
—— *up* man sā'ik.
to pursue lōyā'ek, *pl.* lōlıyā'ek = into go on road.
to put into ts'E'lEm = into.
—— lōsgE'rE (lō = into).

Q.

quick t'ēn.
—— *to run,* alōbā'n t'ē'n.

R.

rabbit k·a.
raccoon dsâ'olky.
rain wās.
rainbow mā'qaē.
rapids dâ'eks.
rattle seso' (borrowed from Tlingit?).
raven k·āq.
—— *as deity* Tqē'msEm.
—— *gens* K·anha'da.
rays of sun sisī' gyamuk = feet of sun.
ready k·a'wun.
to receive, eat, q——.
receiving payment for burial qdē'-wul.
—— qlō an'o'n.
to receive taa'qtl.
red mEsk.
relatives wulā'isk.
remains mān.
to request gunâ' (see *to order*).
to return iē'tlk.
—— *into* lō iē'tlk.
rib ptal.
rich amawā'l = well to do.
right hand nEsimiā'uwan (Em an'o'n).
river g·'ala a'ks = ascending water, *pl.* g·'ala aka'ks.
—— *up* (locative), gīgya'nē.
—— *on the River Ksiu'n,* ts'Em siā'n.
to roll down gyā'agEltk.
roof awā'lp = house cover (ât).
—— laqa wālp = top of house.
round tkwia'tlk, *pl.* tkwiyitlye'-tlk.
rowlock k·anwā'i = instrument paddling.
to run ba, *pl.* otl.
—— *into canoe* lōk·Em ba.
—— *away* gy'ē'eqk.
—— —— *with somebody* da ba.

S.

safe mâtk.
sail atlo'm qsâ = sail boat.
saliva pōksk.
salmon hân.
—— *spring,* hânhisō'ont.
—— *berry* mEk'â'qs.
salt mân.
—— tlkum lâp (lâp = stone).
the same nenē'etl.
sand ā'us.
to save lEmā't.
to say hā'u.
—— ia.
scalp qâ'lē.
scar tlē'eky, *pl.* tlētlē'eky.
to scold wī Em hā'ut = great say; (cf. *to cry*).
scraper of stone for dressing skins halogya'tlqan.
to scream aya'wa, ayaluwāda.
sea qā'tla (obsolete).
—— laq mân = on salt.
sea egg a'sōt.
seal rE'la.
—— *big,* tō rE'la.
—— *young,* k·'oâ'tk·.
sea lion t'ē'epEn.
sea otter ptlōn.
secretly dak·'ā'mtsEn.
—— *leave,* tikyē'eqk.
to see nē.
seldom wag'E'rEdEt.
self gyilE'ks = back (in reflexive verbs).
—— lEp.
—— *myself* lEp nE'riō.
to send hā'yets.
—— *a present* yā'wus.
separate lEksgya't (gyat = people).
septum ndā'o ts'aq (ts'aq = nose).
—— *perforation of,* nag·'ag' Em ts'aq.
to sew tlō'opk.
shaman suwa'nsk.

shame! tsâq!
shavings k·am tlEbī′esk = useless shaven.
sheep mE′tē.
sheets tēhatlo′m (see *sail instrument*).
to shoot gō (see *to guess*).
shore of lake ts'oq (qtsaqtl, Gyitksan).
short tālpk.
shoulder t'Emg·ā′ē.
sick sī′epk.
sickness hasī′epk.
to sing lī′ēmi.
Sisiutl (*double-headed snake*) Laqaqua′sa = both sides head.
sister (called by sister) tlE′mktē.
—— (called by brother) tlkā′uk.
to sit d'a, *pl.* wan.
skin anā′s.
sky ts'Em laqa' = in above.
slave qā′a (tqalwā′alEmqtl?).
to sleep qstoq, *pl.* laqstâ′oq.
slime of snail yetl.
slope, gentle, wulōtla′p.
slow lāltk.
small ts'ō′osk (also, *young of animals*).
—— tlgua.
smoke p'ēiā′n.
to smoke qp'ēiā′n = to eat smoke.
smoke hole a′la.
to smoothen tlE′lEp.
smoothened tlEbī′esk.
snail hatsaE′rElt.
snake matqalā′ltq.
snow mā′dEm.
something gâ (see *what*).
—— ky'En.
sometimes k·aqpa.
son = male child.
soot g'âm.
sorrow t'âqtl.
south hā′iwas (see *rain*).
southeast gī′si hā′iwas (gīsi = down river, wās = rain).
span, thumb to second finger, sâ′ols.
sparrow-hawk qskya′msEn (borrowed from Tlingit?).
to speak a′lgiaq, *pl.* ala′lgiaq.
—— hāu.
—— *together* sarait hāu.
—— *against somebody* lEbi′lt hāu.
spider skyet.
spring kwana′ks (aks = water).
spoon of mountain-goat horn haa′ks = instrument drink.
spruce sE′mEn, *pl.* sEmsE′mEn.
squid hats'a′lt.
squirrel dasq.
to stand hā′yitk, *pl.* maqsk.
star piā′ls.
starfish k·amā′ts.
to stay d'a, *pl.* wan (see *to sit*).
—— *for a while* g·'ad'a = a while stay.
—— *to camp on beach* dsoq.
—— *boat, staying* (not moving, on water) lâ′o.
to steer hadā′i.
stockade dâ.
stomach ts'al.
stone lâp, *pl.* lEplâ′p.
to stop (v. a.), gyilâ′gō.
story adā′wuq.
stranger lEksgyat = separate people; *pl.* hagulEgya′t.
strap for basket k·anauwa′lē.
to strike t'ō′os.
to succeed, to be able to do anything, aqtl.
to suck nEhemâ′.
suddenly sa.
summer sōnt.
sun gyā′muk.
—— *rises* tlaksewā′ntk gyā′muk.
—— *sets* tkiā′sa.
swallow sEpEqī′ Em aks (aks = water).
to sweep d'ō.

T.

tail ts'ōp.
to take ga, *pl.* doqtga (see *at*).
to take away sētqa iā'gok(?).
to take into ts'E'lEm ga = into at.
to take from fire asti.
to take off blanket saga't.
tall wīnak (wī = great).
—— nEptlaqtl.
to taste baq.
tattooing on breast gyetlk·ā'yek (see *to pierce*).
—— —— *arm* gyetlo'n.
to teach sE wulā'i = to make know.
to tear down (a house) k·oa'lt.
—— *to pieces* pē'El.
tears ksīl.
to tell matl.
temples wulksitlā'ntk.
then kyek.
—— adawu'l.
they dEp nē'EdEt.
thimble k·antlō'obes = sew instrument.
thin, lean, ksa sā'yup (sā'yup = bone?).
thirsty lōgE'rEn aks ts'Em aq (aks ts'Em aq = water in mouth).
thou nE'rEn.
to throw into fire tqē'el.
thumb mâs.
thunder k·alaplē' Em laqa' = thunderbird in heaven.
thunderbird k·alaplē'ep.
the tide falls ts'â aks (aks = water).
the tide rises lēks aks (it grows the water).
to tie, fasten, ts'ē'ep.
sometime tlana'k.
Tinne ts'Ets'a'ot = those in the interior.
tired sōnā'tl, *pl.* k·asōnā'tl.
to da.
toad k·anā'o.
tobacco, Indian, wundâ'.
tobacco, European, wundâ k·'Emksī'oa.
to-day sēigya'wun.
together sarā'it.
to-morrow tsegyets'ē'ip (see *yesterday*).
—— *day after,* tsenatâ' tsegyets'ē'ip.
Tongas land and man gyiteranēts.
Tongas woman suwa't (borrowed from Tlingit = woman).
tongue dū'Ela.
tooth ua'n.
lower row of teeth ua'n Em lakī'etl.
upper row of teeth ua'n Em laqa'.
top of anything g·a'lon (obsolete, now only "handle of paddle").
—— man 'laqa'.
town k·'alts'a'p, *pl.* k·'alts'apts'a'p.
tragus nEk·'â'pEn mō (mō = ear).
to go traveling hat'ā'qs.
tree k·an, *pl.* k·ank·a'n.
trousers of skin p'aqs tqa (see *pants*).
to try, to examine, sEntsaai'lisk.
to turn back tkwia'tl (see *round*).
to turn over g·'aphā'yetk.
twins ksēt'Epqadâ'l (from *two*).
—— sEwīhâ'n = making many salmon.

U.

ugly sqats'E'r.
uncle (father's brother) nEguā't = father.
——(mother's brother) nEbē'ip.
under tlEr.
unmarried wōk·'ā'lekyetk.
upward baq.
to use hâ.

V.

valley tlkut'ē'en.
vein k·ag· Em itlē' (itlē = blood).
very sEmra'l.
—— *in compounds,* sEm —.

visible nēsa'p.
to visit g'a k·â'edeks = for a while come.

W.

wait! hawē'nē (see *by and by*).
to wait liē'tl.
to walk ya (see *to follow*).
to want (ha) sā'rau.
war uldō'yet.
warm gyā'muk (see *sun*).
watching liē'tlks (see *to wait*).
water aks.
wave g·â'op.
we nE'rEm.
wearing apparel gus.
weir for catching seals with falling tide dsīs.
west qpa'la.
whale tlpōn.
what gâ.
when? nda.
—— *future,* tsēdE'nda.
—— *past,* adE'ndade, adE'ndaē.
where wul.
where? ndā.
for a while g'a, lām.
white mâks.
who? which? gō, nā.
whose natl.
whole tqa (see *all*).
widow, widower tsEnEs ts'ak.
wife naks (see *married*).
wife, first (principal wife), sima'naks (mian = master, naks = wife).
—— *second, third wife,* k·alna'ks.
wind pask.
—— *a certain* (direction doubtful), gEgtā'tk.
windpipe haā'lagyaq = speaking instrument.
wing k·'ak·'ā'i.
—— *feathers* lī Em k·'ak·'ā'i.
to wish hasā'q.
with da.
without wō ——
wolf kyebā'ō.
—— *gens* laqkyebā'o = on the wolf.
woman hanā'aq, *pl.* hanā'naq.
womb hāt.
woodpecker kitlwuē'ansk; sEmgyī'ek = spruce pecker.
to wrestle baq.
wrist nEqpā'ra au'o'n.
to write d'am.

Y.

year k'âtl.
yes ō.
—— *said from a distance* haā' = in a high key.
yesterday gyets'ē'ip (see *to-morrow*).
—— *day before,* natâ'da gyets'ē'ip.
you nE'rEsEm.
young man sō'pas (Em iō'ot).
—— *bear* sōntlk (Em ol).
—— *animal* tlgEm.

TSIMSHIAN TEXTS.

WulaqtlÂ'tk (where a misfortune happened by a landslide), Inverness.

Tla lâ'yiksga Ts'Emsia'nga amia't gasga Ksiā'nga nu wul
Having left the Tsimshian come from they from the Skinar (past) where

g·asehâ'ntga. Adawul g'a lât gasga gyā'atsga; ada
they make salmon. And then for a while they camp at there; and

tlgō'otlg Em hanā'aqsga g'âltga sEm'â'gyitga, gō'ga sEm-
the child woman of a certain chief, which very

lEgyidahā'wutga. Tla hō'opEtga dak·'a'mdsEn
he was particular whom she should marry. (Perfect) night secretly

k·â'EdEksga g'â'ltga ā'm a sōpā's Em iō'otga. Adat k·âsga wul
comes a certain nice young man. And he goes where

nâ'gasga tlguā'lksga. Ada hā'ut gasga dEmt de batga. Adat
lies the chief's daughter. And he says (?) with run him. And
(elope with him).

enâ'oqtga. Adawul k·adā'wutltga. Tla t wasga nawālptga,
she consents. And then they left. (Perfect) they having reached his house,

adawult tqal ha'yint gasga gye'laqga, adaEl ts'ē'entga, ada
and then he against makes her stand at outside, but he enters, and

hā'us dEp nâ'otga dīs nuguâ't: "Ayentl nak·anuwā'nē,
say (plural) his mother and his father: "Did not you (past) make work you
(go for her sake),

nat?" "Hā'yetga da gya'larat," dā'yaga. Adawul ksâ otlga
my dear?" "She stands at outside here," he replies. Then out run

tlemktī'yetkgatga. Adawult ts'E'lEm ctō'oltga. Adawul
his sisters. And then into she accompanies them. And then

tqâ'oqgatga asga lōmā'msga k·agâ'otga. K·antlä'kga. Adawul
they eat being in good hearts. It is morning. Then

k·â'EdEksga tlgua wud'agya'tga, KsEmwuts'ē'enga wā'atga. Ada
comes a little old person, Female Mouse her name. And

hā'utgat: "Tqē'el g·antsemō'nt!" ada wa'lsga tlguā'lksga;
she says: "Burn your earring here!" and she does so the chief's daughter;

adaElwu'lt asti daqtga tlgua wud'ā'gyatga. Adawul hā'utga:
but then she from fire she takes it the little old person. Then she says:

"Dātl! Wulā'yenē, gō tEi'ngā'dEnt?" "Avent," dā'yaga.
"My dear! do you know, who the taker of you here?" "No," she replies.

"HatsaE'rEldEt," dā'yaga. Ada sEm·ba'sga tlguā'lksga. Ada
"The snail," she answered. And very afraid the chief's daughter. And

hā'usga KsEmwuts'ē'enga: "Ndâ'e! gy'ē'eqkEn! atlgE waraidâ otl,
it said the female mouse: "Go! run away! not far run,

wul dsoqs dEp nEguā'dEn. Da yā'kEn stō'op'El atlge
where stay (plural) your parents. Just walk on road back of house not

nēsa'ba na liyā'gESEmt yag·a. Ye'tlEt. Nenē'etl lō
visible (past) you went (plural) downward. There is slime. The same in

yā'kEn baq k·â sqanē'esit ada mE le'r'an yā'get! Nēnē' wul
go on road up go mountain that and you over go! It is where

ds'oqs dEp nEguā'dEn gyē'egEt." Adawul wā'lesga
stay on beach (plural) parents below." And then she does

tlgua'lksga. Sis lām ksErgaga'. AdaElwu'l bātga.
the chief's daughter. She pretends after a while to go out. But she runs.

Sem- lō yā'tgatga na matldEsga tlgua wud'ā'gyatga. Tlana'ksga
Exactly in she goes (past) she told the little old person. Having some time

wāldga, adawu'l guā'desga na'kstga. Adat wul wulā'isga
done so, then he misses her her husband. And he then knows

gy'ē'eqgatga. Adawult sag·ā'it hukhō'otkgasga tqanē'esga nE wī
she had escaped. And then together he called them all his great

ts'a'ptga. Adawul lōliā'gEtga. Tla sEmt wātga
tribe. Then they pursue her. (Perfect) exactly she reaches

tlgua'lksga sEm laq'o'sga sqanē'isga. da nEqnâ'etga wī
the chief's daughter the very top of the mountain, just she hears great

qstā'mEqga. Adawult gō'usga ts'Et lōyā'yet. Adawu'la tgye
noise. And then she guesses that they pursue her. And then down

bāt gasga sqanē'isga. AdaEl tlā'wula hā'usga wī qstā'mEqga;
she runs from the mountain. But always sounds great noise;

ada gyilEks nē'etsgEtga: rakstanā'ga! tla yik·ayā'sga wī tlâ'oga;
and back she looks: behold! (perfect) down comes great landslide;

k·ank·a'nga liē'natga ada wu'd'a lEplâ'opga gyikgyā'gEltgatga. Adawu'l
trees fall and great rocks roll down. Then

ayawa'sga hanā'aqga; tlat nē'etsga wul dsoqs dEp nEguā'dga,
screamed the woman; (perfect) she sees where stay (plural) her parents,

asgEt gun lōk·Em; g·ag·ā'ōditgasga ts'Em g·aqsâ'ogE. Adawul
she ordering to go into canoe; they finish (have gone) into the canoes. And then

dī gun a'qtlgatga. Adawul lō'k·em g·'aphā'yetget gasga
also towards (into) she succeeds. Then go into turns round at

qsâ'os nEgua'tga. Mâtgaga, adaEl wul wī tlâ'osga nE wul
the canoe of her father. She is safe, but where great landslide (past) where

dso'qtga. Ada gyilgs nEknē'etsgatga, rakstanā'ga! wī hä'ld Em
they had been. And back they look, behold! great many

hats·aE'rEltga k·anuwā'ltga. Adawu'lt matltga tlgua'lksga wula
snails make happen it. And then she tells the chief's daughter why

wā'ltga. Ada nē'nētgı da Wulaqtlâ'otga wulawā'ldet.
it happened. And it is at Inverness where it happened.

K·anuwā'de da wul-q-tlâ'ot-k-at.
It makes name at where landslide-misfortune happening.

Prayer 1.

Neqno'q, Neqno'q; sEm'â'yits, sEm'â'yits! ramrâ'dEn! tgyē nē'e
Neqnoq, Neqnoq; chief, chief! have mercy! downward look

wal tlErE'nt n ts'ā'pEnt.* Man sā'ikya sī'Ent. ada ma d'ō ts'ānt!
doing under you thy people Up pull thy foot, and off sweep thy face!

Prayer 2.

Neqno'q, Neqno'q; sEm'â'yits, sEm'â'yits! ramrâ'dEn! ā'yen
Neqnoq, Neqnoq; chief, chief! have mercy! else nobody

tEE'n qsEpēiā'nEksEn tlE'rEnt! Neqno'q! ramrâ'dEn!
the one to make you receive smoke under you! Neqnoq! have mercy!

Prayer 3.

Lō sā'ikya na ksEnā'tlgEnt, sEm'â'yit! dEm wul gya'kset!
Into draw thy breath, chief! (future) that it be ealm!

Before dinner the Tsimshian burn some food as an offering for Neqnoq. After having done so they pray:

Wa, sEm'â'yits! dEm gā'bEn guaa qpiyē ga'bEnmēE. Tawā'l
There, chief! (future) you eat this part of our food. That is all

mān da gua'a; tawā'l mān da gua'a tlguanēe. Gyī'EnEm!
left at here; that is all left at here to your child. Give us food!

* Instead of n ts'ā'pEnt, I heard also nEsEgya'tEnt = *your people made by you.*

SATIRICAL SONG, MOCKING THE INHABITANTS OF MEQTLAKQATLA EMIGRATING WITH MR. DUNCAN TO ALASKA.

1. Ōyeya, ōyeya, â.
Ōyeya, ōyeya, â.

Gyilâ'dsE wigya'tgEn.
Do not (future) be you homesick.

AtsEda lâ'yegEn, tsEda suwā'dEn.
When you will leave, when will be you a Tongas woman.

2. Ōyeya, ōyeya, â.
Ōyeya, ōyeya, â.

ME tsE g·am yā'wus dī
You will only send a present also

Atl gEnē'guatl ndE sineksâ'k.
Of preserved berries kept in grease bag (*sea-lion guts*).

3. Ōyeya, ōyeya, â.
Ōyeya, ōyeya, â.

Gyilâ na wī hā'ntgEn!
Do not (past) you cry!

Wul gyinad'ā's Caledonia.
Because they left behind Caledonia.

Tlatsēdē qga'nEgEn.
When you will have eaten rotten salmon heads.

4. Ōyeya, ōyeya, â.
Ōyeya, ōyeya, â.

Gyilâ'na wa k·â'dEn dâ
Do not be foolish

Gō lEbElt hā'usEm da Indian Ē'edzEn.
Who against you talk the Indian Agent.

A MYTHIC TALE OF THE ISLETA INDIANS.

BY ALBERT S. GATSCHET.

(*Read before the American Philosophical Society, December 18, 1891.*)

The study of the Indian languages of New Mexico has been neglected more than that of other sections of our wide territory and it is with much satisfaction that I present in print the first continuous text worded in one of them, that of Isleta Pueblo. It is a dialect of the Téwan, or, as it is called in J. W. Powell's classification, the Tañoan family, with a translation and with a paraphrasis, which is more comprehensible to the general

reader. The source from which the two portions of the tale were obtained is mentioned in the "Comments," with all the particulars needed.

Text I. The Boy-Antelope.

Kamäntchu′ yowa′ natüei′ we ai′; hu′ba wi′si Pi′-ʻli
It is said somewhere a village there (was); and two "Bighead"

u′-unin t'hü′ ai. Pi′-ʻli upiû′ⁿu-ide a-u′kwimban yuwi′n'a
young people lived there. "Bighead" the girl being pregnant not any (had)

ä′napa hukwa′hi pa′nat; bepapa′-u uba′ pa′ ai huä′tcheban,
place to be delivered; her elder brother then prairie to took (her),

hu′ba u′kwoban. Wi′wai bepapa′ba matcheba′n
and she bore a child. Hereupon her elder brother brought (her) back

tüei, u′-u mā′shuban pa′ ai. Hu′ba wi′m'a
to the village, the babe he left prairie upon. Then a

taʻli′ora-ide u′-u t'aba′n, hu′bak a′wa ö-ukĕmiba′n.
female antelope the babe found, and she brought it up.

Wiba′-a wi′m'a shün-i′de shütche′mik taʻlî′ora t'ha′ban
Once a hunter while hunting a she-antelope met

wim'a a ü′-a-u fiĕ′rk. Ye′de ü′wa-u-ide wi′ĕra-i tamni′n
(and) a boy along with (her). That boy was a runner antelopes

ai′ti t'hurī′m. Shü-au′ti makwibā′k nakā′tchau wi′ban
than faster. From the chase when he returned notice he gave

kie′nda ta′-i꞊kabe′-ide, betu′winiban wie′n t'hü′ we-i′ shi′mba
at once to the town-cacique, (who) proclaimed: four days after all

ta′-inin ishû shanhi′nap: "wi′m'a ü′wa-u-ide tchie′minap
the people on a hunt should start: "(that) a boy was going about

tamni′n an, hu′ba inabä′wa î′shierhinap." Wie′n t'hü we′-i
antelopes with, and we want to seize him." Four days after

shi′mba tüei′-ide u′ fier, ʻli′o fier, süa′ fier ishü-miba′n,
the whole pueblo, children with, women with, husbands with to hunt went,

ibi t'a taba′n, bi′tchu î-u′beban î′pie t'a
they the antelopes found, but were told, that not the antelopes

χüĕramhi′nab, wei′ba-i-i ü′wa-u shie′rhinap tin. Taʻliora′-ide
they should hurt, merely the boy to get hold of try. The female antelope

ana′ katchaba′n, hu′ba ü′wa-u u′miban, be-e′ ʻlipwĕrhi′nnap.
was informed, and the boy she told not to leave (her).

Ta tamni′n inakwî′er p'i-amba′n, hitüe′rwemik buorti′m
Then the antelopes began to run, and while they ran in a ring

taʻliora′-ide ü′wa-u u′miwe. "Na′yan kin wu′hi tün-ü′χ-
the female antelope the boy called (to her). "Presently we will run north-

tü′ⁿna-u; hu′bak inshu′minak, nātüⁿā′k kake′-i kwimba′hi
west; and while we pass (the ring) on the line your mother will stand

shie′rnai, hu′bak a shu′miwe-ifier, akwei′tchehi, hu′bak u′
on the left side, then as you pass (the line) you will fall down, and there

kake'ba hashie'rehi." — Hu'bak ba hu'na pu'aban. — Ka
your mother will eatch you." — And (so) it occurred. — That's

hui'kiēm.
your tail.

Text II. The Race of the Two Champions.

Ka'pio kawe'-ide na tü'wiban ɔɹe' shamba'k.
"Cold-Hearted" the chief, the earth pierced through (and) above came out.

Shamba'g pa-hwi'e muba'n, hu'ba kai'ban "Shi'ba
After emerging a lake he saw, and he named (it) "Tears

fûn'-a-i," hu'ba yeti' itai' we'ban nabat'hü' tü'ei.
dark," then thence (his) people he took to the white pueblo.

Ye'dit'hü ta'ban wim'a natü'ei we ai', na'dshûr' tü'ei,
Here they found another village being there, the yellow village,

yo-u-a' i-uwe'-siēm tai'nin pa'-in it'hüpan a'-i. Hu'bāk
where wicked people were living. Hereupon

nadshu'ri tü'ei wesie'mnin î-ukwiewi' a'-uban nabat'hü'
the yellow pueblo, the wicked people, racers invited, of the white

tü'ei hi'tai we'-in an. Wi'en t'hü' ibemaküamba'n,
pueblo its people (to be) with them. Four days did they make ready,

hû'bak shi'mba ibe'tüyiban, hu'bak imî'ban natchû'ri
then all assembled, then proceeded to the yellow

tü'ei. Nabad'hü' tü'ei tai'nin an natchû'ri tü'ei
pueblo. The white pueblo people (and) the yellow pueblo

tai'nin an yu'na kûmna' kiĕrba'n, ibenahumiba'n;
people thus their clothing laid down, they did bet;

hu'bak natchû'ri tü'ei pi'eni-ai hu'li'mihi'nab;
and the yellow pueblo (expected?) to be victorious;

natchû'ri tü'ei tai'nin ibe'wa humiba'n, hitu'mik
of the yellow pueblo the people their lives staked, saying

pa'y'a 'limba'-î 'ludehina'b natü'ei fi'er, en hi'ria-a
that who was beaten would be burnt the village with, with property

we'-in. Nabat'hü' tü'ei hûra ibe'wa humiba'n, wi'en
his. The white pueblo also their lives staked, (and) four

t'hü' we-i' kwie'win inwû'rihiei. Shi'mba tai'nin
days after the racers were to start. All the people

hitü'tcheban, witchunaida'd kwî'ewnin hinmakü'ⁿ ai. Hu'bak
assembled, of both sides the racers were ready. Hereupon

thü' be'kti hinûri'ban, wi'm'a na'hwe'-iakin tai'nin himi'ban,
the next day (they) arrived, on one eminence the people went,

hu'bak yeti' a'wan wî'tad inmi'ban. Wi'wai wi'm'a
and from there onward (the racers only) went further. (From) Another single

na'hwe'yak i'nkimbak, natchû'ri tü'ei kwiewi'de be ta'kie
eminence when they disappeared, of the yellow pueblo the racer into a hawk

peba'n. Pi'cnabĕ tüba-u' i'nmimik, shumicifie'rk
changed himself. Some distance towards east when they had gone, when he passed by

tua'mban nabat'hü' tü'ei kwiewi'de: "Hahahā', ta-u'ide!
he said of the white village to the racer: "Hahaha! antelope!

hakû' tieremi'k! me'tchu awa' wa'nhi hue'bai."
good by! perhaps you will reach the east."

Hue'bai inwa'mban hue'bai kwie'r tü'-u hinmabo'rîbak;
The east having reached from east towards north they turned;

takie'de tch'ûm' mî'mi-e-i hue'bai kwî'er tü'-u;
the hawk flew ahead from east towards north;

pie'nnak în'mimik wi'm'a 'lio'-u-ide nabat'hü' tüei'ti
halfways having gone one old woman from the white pueblo

tua'mban ta-u'ide. Ta-u'ide bewi'niban hu'bak ye'de
spoke to the antelope. The antelope stopped and that

'lio'-u-ide wi'-en'a u'wîr wie'tcheban, u'bemîk
old woman four reed-pipes gave him, telling (him)

ufetchihî'nab wî'ba hue'bai pie'nnai, wi'ba hue'-û-i
to light (them) one from east (when) halfways, one from north

pie'nnai, 'ba hue'nai pie'nnab, 'ba hue'kwi pie'nnai.
halfways, one from west halfways, one from south halfways.

Wi'wai ta-u'-ide tüĕ'ɹweban hue'bai kwiĕr pie'nnai;
Again the antelope ran east towards some distance;

mi'mik wi'p'a i'wîr fe'tchiban; ifa'ribak be fi'
while running one reed-pipe he lighted; when he had done clouds

ye'niban, hio-ati'n mi'mik benamakwĕrkie'-iban,
arose, (and) a short way moving on did wrap in (both),

nö^{n}'amin. Yo-a'btinbak pa' 'lu'laidewa'na, ta-u'-ide
it darkened. After a while rain fell in heavy drops, the antelope

beta'n bai'tin besu'rban; t'a' hue'-u-i wa'nhi
shook itself and then wiped off (the moisture); almost the north-point going to reach

pa'nab, takie' kü'wan, takie' mo'bak shi'mba pati'n
nearly, the hawk it met, the hawk it found all over wet

tu'la'ak arû'mig. Shumiei'fierk tû-a'mban: "Hahaha'!
on a cottonwood tree crying. As he passed it said (to him): "Haha!

haku' tieremi'k, yu'ni nu' siĕ'rnin i-uta'manin;
good by! in this way men treat each other,

me'tchu hue'nai a wa'nhî;" hu'bak ta'-uide bepi'kûrwan,
perhaps the west-point you will reach;" then the antelope started,

hue'nai kwir bemabuo'rimik takie'-ide bakü weba'n.
the west towards veering about the hawk overtook (it).

Shumiei'fier û'beban: "ta'-uide, ta'sim aku' tieremi'k!
As he passed by he shouted: "antelope, now good by!

Yu'ni nu' siĕ'rnin ibe-i-utama'nin. Me'tchu hwe'kui
In this manner men act towards each other. May be south

a wa'nhi!"
you will arrive!"

Takie'-ide shuba'n wi'wai; ta-u'ide be-î'-eniban, hu'bak
The hawk passed by again; the antelope arose (from the ground), then

iwi'r fetchiba'n, wi'wai bena' p'i' pe'ban, nü'ⁿamim.
(another) reed-pipe he lighted, again did cloudy it become, it darkened.

Hu'bak ta-u'ide bemadüⁿaru'itin bepi'kûrwan, wi'wai
Then the antelope did roll itself on the ground did start on a run. again

hwe'kui wa'nhi pa'nai takie' kü'wan shi'mba pa'tinmûk
at the south arriving nearly the hawk it met all over wet

aru'mig, beshu'rmik tu'la'-ag ik. "Hako'amiam!
screaming, wiping himself on a cottonwood tree while sitting. "Try (again)!

yu'ni nû siĕ'rnin yut'ama'nin! t'a' ha'ku tie'rĕmik; sîm
in this manner men act towards each other! now good by; again

me'tchu hwe'kui a wa'nhî." Wî'wai ta-u'ide be madüⁿa-
perhaps to the south you get will." Again the antelope while rolling

rume'tin bepiku'rban, wi'wai wä'kwi wa'nhi pa'nab, takie'de
itself started to run, again at the south going to arrive almost, the hawk

bakü̈weba'n. Shumie'ifier t'a'-û tu'amban tu'mig: "haku'
caught up with. As he passed to the antelope he spoke saying: "good

tieremi'k, hiu'ni nu' na'dshur' tü'ei süⁿa'nin i-utama'nin."
by, in this way of the yellow pueblo the people treat each other."

Wi'wai wä'kui kwiĕr pie'nnab ta'-uide mî'mik wibaki'n
Again south towards some distance the antelope while going another

iwîr' fätchiba'n, wi'wai bänamakoarkiei'ban, nö'amim;
reed-pipe lighted, again clouds formed, (and) it darkened;

we'bai wa'nhi pa'nai takie' kü'ban. Shumiei'fier
(when) at the east it was to arrive nearly the hawk it overtook. As he passed by

takie' tu'amban tumî'k: "Ta'sim haku' tieremi'k! yu'ni nu'
to the hawk it spoke saying: "Again good by! in this way

nabat'hü' tü'ei tai'nin i-utama'nin."
the white pueblo people treat each other."

Hu'bak shuba'n; ta'-in wa'nhi pa'nat, i-o-a' hintai'
Then it passed by (him); when on the point of arriving where they were to be

pe'hi pana't, takie'-ide wamba'n tü'ai, ta'-uide we'-i
changed into people, the hawk arrived behind, the antelope just

wĕri'mmik. Takie'-ide wa'na wi'm'a naɣre'yak; ta-u'ide
starting (again). The hawk arrived on one eminence; when the antelope

wĕri'mmik takie'-ide bepiku'rban. Wi'wai wi'ın'a naɣreya'k
started the hawk began to run. Again to another eminence

nabat'hü' tü'ei ü'waide wiĕri'bak, t'ai'nin bamu'tcheban;
of the white pueblo the boy (runner) arriving, the people perceived (him);

natchu'ri tü'ei tai'nin hitû"we: "Hita' nabat'hü' tü'ei
of the yellow pueblo the inhabitants said to themselves: "Now the white village

kina' we i'tin na' wem." Nabat'hü' tü'ei tai'nin tu'ban:
ours now surely our own is." The white pueblo people said:

"Nabat'hü' tü'ei kwiewi'de tch'ûm' î'hi, na'dshûri tü'ei
"The white pueblo racer ahead is going, the yellow pueblo

kina' we i'tin na' wem." Wî'tchuna ida'd tai'nin
ours now surely ours is." On both sides the people

i-u'shu mi'ban, hu'bak i-u'shue nabat'hü' tü'ei ü'waide
to meet (the racers) went, and they met the white pueblo boy

tch'û'm i'hik ta'-in wa'mbak. Nabat'hü' tü'ei hata'
ahead coming when arriving (at the starting place). The white pueblo then

wie'n tü' we'-i shi'mba nadshu'ri tü'ei wĕsi'emnin
four days after all of the yellow pueblo wicked (people)

hitü"ibe'itin hi'lu'deban natü'ei fierda't. Bî'tchu wi'm'a
were gathered (and) were burnt the village with. But one

wesî'emide wĕ t'hate'wa, hu'ba wē 'lu'deba; hu'ba ye'ti-i'ku
wicked (fellow) not was found, hence not was burnt; and from then

nya'n t'hü' kim we'siem t'hü'm.
to this day we have bad (people) living.

Translation of the Mythic Tale.

I.

Somewhere, at one time, there was a village, they say, and two "Big Head" (Pi'-'li) children lived there. One of them, the "Big Head" young woman, being with child, was unable to find some spot where she could be delivered; so she was taken by her brother to the prairie, where she was delivered. He left the babe upon the prairie and took his sister back to the village. A female antelope, finding the infant, brought it up.

Once a passing hunter met a female antelope, the boy being with her. That boy could run faster than any antelope, and when the hunter reached home he notified a clan-chief, who ordered that four days after all the people should start out on a hunt, "for a boy has been seen strolling with antelopes and we must get hold of him." Four days after, the whole pueblo, men, women and children, went out on a hunt and found the antelopes. They were told not to wound or slay any of the antelopes, but to try to catch that boy only. The female antelope having noticed this enjoined the boy not to part from her side. When the other antelopes began to run in a ring, that antelope called the boy to her, and said to him: "Now we will go to the northwest, and when we pass the line of the hunters your mother will stand on the left side, and, as if passing, you will fall to the ground and your mother will catch you." And so it was done. Now it is your turn!

II.

The clan-chief of the "Cold-hearted people" made his way through the earth's crust and came to the surface. After emerging from there he saw a lake and named it "Dark Tears," and then he took his clan to the

"White Pueblo." Near it he found another village, the "Yellow Pueblo," inhabited by people skilled in witchcraft. Then the Yellow Pueblo of wizards challenged the people of the White Pueblo to have a race with them. They prepared themselves during four days, when they gathered to proceed to the Yellow Pueblo. And the White Pueblo people and the Yellow Pueblo people deposited their garments on the ground and made bets. The Yellow Pueblo people expected victory with certainty, and put their lives at stake, proclaiming that the party conquered would be burnt, together with their village and all their property. Four days after the racers were to start. The people all assembled and the racers of both parties made themselves ready. The next day the crowds of people ascended a hill, whereas the racers alone went onward from there.

When on their race they descended from another hill and were lost sight of, the racer of the Yellow Pueblo transformed himself into a hawk. When they had gone quite a distance east, he overtook Antelope, the champion racer of the White Pueblo, and said to him: "Hahaha! good-by, Antelope! Perhaps you will be alive still when you reach the east point." Having attained that goal they turned from east to north; Hawk flew ahead of Antelope, and when they had gone halfway an old woman from the White Pueblo stopped Antelope and spoke to him. She gave him four ceremonial reed-pipes, and told him to light one of them when halfway from east to north, another when halfway from the north, another when halfway from the west, and the last one when halfway between south and east, the starting place.

Starting again, Antelope ran towards the east for some distance and lighted one of the pipes while on the run. When he had finished smoking it clouds arose which moved onward and enveloped both racers, so that it became dark. A while after rain began to fall in heavy drops. Antelope shook his body and wiped off the moisture. When on the point of reaching the goal at the north, he fell in with Hawk, who was dripping wet and sat on a cottonwood tree screaming. Passing by, Antelope said to Hawk: "Halloo! good-by! this is the way men treat each other, and perhaps you may reach the west point." Antelope started again, veered around towards the west and was overtaken by Hawk, who shouted to him: "Antelope, now good-by! in this manner men act towards each other; may be you will arrive south sometime!" Hawk passed by and Antelope arose from the ground, lit another reed-pipe, which brought on cloudiness and darkness again. Antelope, after rolling on the ground, started on his run again, and when he had arrived nearly at the south he overtook Hawk, wet all over from the torrential rain, screaming and wiping the water off while sitting on a cottonwood tree, and said to him: "Try it once more! In this manner people act towards each other; now good-by, perhaps you will get to the south point."

Again Antelope rolled on the ground and started out, and when on the point of reaching the south he was overtaken by Hawk. Hawk passed

him and said: "Good-by! this is the manner by which the people of the Yellow Pueblo treat each other."

When they had arrived at the place where human form had to be reassumed Hawk arrived second, and Antelope was on the way of setting out again. Hawk came upon a hill and when Antelope started, Hawk (who was transformed into a man) began to run. The boy racer of the White Pueblo, who had been Antelope, was now sighted by the people, and the inhabitants of the Yellow Pueblo said among themselves: "Now the White Pueblo is certainly our own!" But those of the White Pueblo said: "Our racer is ahead of the other and the Yellow Pueblo is now ours to a certainty." The people of both sides who went to greet the racers, met the boy of the White Pueblo ahead of his rival when both came to the starting place.

Four days after this all residents of the Yellow Pueblo of wizards were gathered and burnt, and their village also. But one of their wicked number could not be found, and hence was not burnt; and from that time until now we therefore have some wizard people living.

Comments on the Mythic Tale.

The mythic tale embodied in the above pages is very popular among the Isleta Indians, and I obtained it from one of them, Henry Kendall, who, in 1885 and for some years previous, was a pupil of the Indian Training School at Carlisle, Pennsylvania. Considering his youthful years, he showed remarkable intelligence, and could reply to almost all the questions I propounded to him on the language and ethnology of his native tribe.

The legend is divided into two parts. I have placed the description of the adventures of the boy-antelope before the main story, though I obtained it as a secondary appendix to the same, and have to state that this part is incomplete at its end, for it does not mention the capture of the boy by the Isleta hunters, which had been the cause for sending them out on a hunt. He and his mother were called "Big Head" on account of their bulky hair, flowing loosely around their heads, which made the boy's head appear to be of preternatural size when the wind was blowing into his hair during a race.

The words, "now it is your turn," have no reference to the story, but indicate that the tale is finished and that another narrator has his turn to count another story. In the original these words convey the idea: "That is your tail," ka hui'kiēm.

As to the legendary migration of the "Cold-hearted" clan out of the bowels of the earth towards the "Lake of the Dark Tears," the Indians of Cochití and Taos, New Mexico, are acquainted with it also, and relate that the lake was to the north, in what is now Colorado, and that they saw it themselves. That populations originated from the earth and crawled out of it through an opening, is a myth very frequently found in

both hemispheres. It is very conspicuous for instance in the mythology of the Iroquois and Maskoki tribes in the eastern portion of the United States, and among the Yokat, the Pomo and the Wintún in California.

Where the White and the Yellow Pueblo were nobody can tell, but the colors may be significative, for the Indian tribes of the West possess a peculiar color symbolism. The Indians of Isleta exhibit certain colors by means of paint on their faces and garments; so the red-eye section uses red and white; the black-eye section, black and white; the earth gens, white and yellow; the maize gens, white, yellow, red, sometimes also black.

Their symbol colors for the points of the compass are white for the east; from there they go to the north, which is black; to the west, which is blue, and to the south, which is red.

The race proposed by the yellow or witchcraft pueblo and performed by representatives of both towns is a race around the world. The story is told very graphically and the oft-repeated exclamations and taunts which one runner shouts to his rival are ceremonially used up to our day, though some of the terms are remnants of an archaic dialect. The reed-pipe, cigarette or calumet is a piece of reed three to four inches long, which is filled with tobacco and smoked only for ceremonial purposes. Many are now found in the sacrificial caves of the New Mexican Indians. It is thought to have the power to bring on rain-showers after a drought, but can be lit only by ministrants of sun worship. In fact all rain-clouds originate from its smoke and the carrizo-pipe plays an important rôle throughout the Pueblo legends.

In another version of the same story, which Mr. Charles F. Lummis has published in the September number of *St. Nicholas* (1891, pp. 828–835), the reeds were handed to the boy, not by an old witch, but by a mole, who for this purpose crept out of his burrow and accompanied his gift by well-meant advice.

The people of the Kapio gens or clan are called the strong, cold-hearted or persistent people on account of the persistence and energy which they evinced in digging their way through the crust of the earth up to its sun-lit surface, following the behests of their clan-chief. There are many of these clans in the Isleta Pueblo, and A. F. Bandelier has heard the names of fourteen, whereas from Kendall's indications I obtained the Indian names of eight only, the Kapio among them. All gentes seem to belong either to the red-eyed or to the black-eyed section. Of the other clans we name the shi'u tai'nin or *eagle people*, the na'm tai'nin or *earth people*, the i'-e tai'nin or *maize people*, and the hu'makun or *game people*.

According to Mr. Lummis' version, the white pueblo divided the spoils of the witch pueblo with the Isleta Indians, and later on removed to their village themselves. Such a removal to Isleta is also reported of some remnants of the Tigua people, though the principal pueblo of these was near Bernalillo, on the bank of the Rio Grande.

The two runners represent some nature powers interfered with by the

raingods, as the winds or the storm clouds chasing each other in the skies. The direction taken by the hawk and the antelope is the same as that by which the calumet smoke is blown out by the participants in the quarterly sun-worship festival.

The wording of the two stories is incomplete in several respects. So the transmutation of the racers into animals for the purpose of outdoing each other is not expressly mentioned, although the story cannot be understood without it. The other version also states that the boy-child left by his uncle and mother upon the prairie, was carried to the antelopes by a coyote, after which a mother antelope, who had lost her fawn, adopted the tiny stranger as her own.

By an ingenious act of the mother antelope the boy was surrendered again to his real human mother; for when the circle of the hunters grew smaller around the herd, the antelope took the boy to the northeast, where his mother stood in a white robe. At last these two were the only ones left within the circle, and when the antelope broke through the line on the northeast, the boy followed her and fell at the feet of his own human mother, who sprang forward and clasped him in her arms.

To acquire a correct pronunciation of this and other Tañoan (or Tehuan) dialects is not a very difficult task for Americans, after they have succeeded in articulating the ɮ, ɬ and ɹ, as sounds pronounced with the teeth closed; the ɹ is uvular besides. ä, ö, ü are softened vowels or Umlaute; â, î, û indicate a hollow, deep sound of a, i, u, and ĕ is the e of *butler, sinker;* 'l is an l pronounced by pressing the fore part of the tongue against the palate; ¯ and ˘ mark length and brevity of vowels.

To give a full glossary and grammatic explanation of the texts is not within the scope of this article. But some of the more necessary elucidations are as follows:

Substantives descriptive of persons, of animals and of inanimate objects seen to move spontaneously, are made distinct in the singular number by the suffix -ide, in the plural by -nin, "many"; while inanimates are in the plural marked by -n, and in the singular show no suffix. In verbs, the ending -ban or -wan points to past tense, -hinap, -hinab, -innap, to a subjunctive or conditional mode, and a final -k to a participle.

The Sun Worship of Isleta Pueblo.

There is so much similarity among the New Mexico Indians in appearance, customs, manners and ceremonial, that we need not be surprised at the equality of sun worship among all their pueblos, which is shared even by the Quéra Indians, who speak languages differing entirely from those of the Tañoan family. So a sketch of the Isleta sun worship will do for all of them.

The town of Isleta now holds about 1040 inhabitants and is divided in two parts by a wide street, called the plaça. The northern portion is inhabited by the Isleta medicine-men or "fathers" (ka-a'-ide, plural

kai'ɹin), the southern by the Laguna medicine men, who are called so for having acquired their art in Laguna, a Quéra pueblo. The differences in the ceremonial of both sections, each of which has a separate medicine house, are slight, and during the ceremonies the two "schools" of medicine-men supplement each other. They are subject to the watchful care of the captains of war, of whom there are four or five in each of the two sections.

There are four annual periods of ceremonial sun worship in their pueblos, and every one of them is followed by a dance. The first of these festival periods occurs in September, the second in December, the third in February, because wheat is planted in the month after; the fourth, less important, a short time after the third. They last four days, not including the dance, and are evidently instituted for the purpose of influencing the sun deity in favor of granting a bountiful crop to the Indians.

Both medicine houses are long-shaped, running from west to east, where the entrance is. The fire burns not in the middle, but at the eastern end, the chimney being to the left of the entrance. In the roof a square opening is left for the sunlight to penetrate. Women are admitted to the house, but everything that is non-Indian is excluded; none of the white man's dress or shoes are admitted; the participants have to enter without moccasins and to wear the hair long.

The ceremony takes place at night, and begins with the following act of worship to the sun (tu'ɹide); each medicine-man carries a short buck-skin bag filled with half-ground cornmeal; he is strewing the contents on the floor before the public, while an allocution is held to the sun, moon and stars. The Indians grasp the meal from the ground, and breathe upon it to blow off any disease from their bodies, for it is thought the meal will absorb or "burn" any disease invisibly present. Then the medicine-men throw the rest of the cornmeal in a line or "road," while "sowing" it on the ground to the sun. When all the meal is spent, they blow again upon their hands and *breathe up health* from them. This is done during four consecutive nights, during which the medicine-men abstain entirely from eating, drinking and sleeping, but are allowed to smoke. The calumet or reed-pipe, which is presented during the above act, is lighted and the smoke puffed first to the east, then to the north, west, south, then to the sky and to the centre of the earth. No moon worship exists among these Indians.

On the fifth day commence the dances, which are held under a large concourse of people and last from eight P.M. to four o'clock in the morning. The medicine-house holds about three hundred people, and nobody is allowed to leave before the above-mentioned hour, when the conjurers allow the people to breathe fresh air.

[In each word of the Isleta text, the emphasized syllable is marked by an *acute* accent standing after the vowel.]

Stated Meeting, December 18, 1891.

Present, 15 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the Académie des Sciences, Cracow; K. Akademie der Wissenschaften, Wien; Schlesische Gesellschaft für Vaterländische Cultur, Breslau; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Geological and Natural History Survey of Canada, Ottawa.

Letters of acknowledgment were received from the Tashkent Observatory (135); Societas pro Fauna et Flora Fennica, Helsingfors, Finland (135); K. Zoologisch-Botanisch Genootschap, The Hague (135); R. Netherland Museum of Antiquities, Leiden (135); K. P. Meteorologische Institut, Berlin (135); Naturhistorische Verein, Bonn (134); Turin Observatory, Académie Royale des Sciences, Turin (135); Prof. William Boyd Dawkins, Manchester, Eng.

Accessions to the Library were reported from the Mining Department, Melbourne, N. Z.; Geological Survey of India; K. Akademie der Wissenschaften, Wien; Académie des Sciences, Cracow; Botanische Verein der Provinz Brandenburg, Berlin; Naturforschende Gesellschaft, Freiburg, i.B.; Verein für Kunst und Alterthum, Ulm; Accademia R. delle Scienze, Turin; Bowdoin College, Brunswick, Me.; Agricultural Experiment Stations at Amherst, Mass., Providence, R. I., New Haven, Conn., State College, Pa., College Park, Md., Fayetteville, Ark., Lafayette, Ind., Starkville, Miss., Topeka, Kas., Lincoln, Neb., Laramie, Wyo., Tucson, Ariz.; Free Public Library, Jersey City; New Jersey Natural History Society, Trenton; Mr. Henry Phillips, Philadelphia; Director of the Mint, Commissioner of Labor, Washington, D. C.

PROC. AMER. PHILOS. SOC. XXIX. 136. 2 C. PRINTED JAN. 12, 1892.

The death of Dom Pedro d'Alcantara, December 4, 1891 (born December 2, 1825), was announced.

The Secretaries presented for the Proceedings a paper by Dr. A. S. Gatschet, entitled, "A Mythic Tale of Isleta," New Mexico.

New nomination, No. 1232, was read for the first time.

The Library Committee presented the following minute:

STATED MEETING, DECEMBER 12, 1891.

On motion of Dr. Greene, the Committee was authorized to report to the Society that in its opinion it was desirable that an appropriation of five hundred dollars should now be made for the purchase of books of reference.

After examining into the condition of the Library, the Committee was of the opinion that the work necessary to place the Library again in order, after its removal and storage, had been satisfactorily performed and was progressing properly. That the work necessary in that connection to be properly performed requires both time and care. That some delay had been occasioned by the necessity of giving greater accommodation for certain classes of the books than had been originally assigned to them.

So much of the communication as related to an appropriation of money was referred to the Committee on Finance.

Curator Morris made a statement referring to the condition of the cabinets of the Society and exhibited a number of objects, including a pantograph belonging to Thomas Jefferson. In conclusion he requested an appropriation of $300 for the ensuing year to enable the Curators to rehabilitate the collection.

On motion, the request was referred to the Committee on Finance.

The President reported that owing to the indisposition of the Treasurer, the Finance Committee had not been able to audit the accounts and to report appropriations for the coming year, but that they would be presented at the ensuing meeting.

Curator Morris moved that the Society request the return of the Poinsett collection from the Academy of Natural Sciences, where it is now on deposit, subject to call, and of the numismatic collection from the Numismatic and Antiquarian Society of Philadelphia.

The matter was discussed, and Dr. Cope raised the point of

order that the Society had fixed 8.30 this evening for the consideration of the Report of the Committee on the Publications of the Society and that the time had passed.

He therefore requested the report should be taken up and considered.

Curator Morris then withdrew his motion.

The report referred to was then presented by Dr. Cope.

The President stated that he had received a letter from the Treasurer on the subject of the finances of the Society, and asked the pleasure of the Society if it should be read.

Dr. Frazer moved that the letter of the Treasurer be read after the debate had taken place.

Dr. Morris rose to a point of order that no report had been presented to the Society or received by it; that before resolutions be considered there should be a report before the Society.

The President stated his impression as to how the matter stood.

Dr. Morris calls for the reading of the report and asks for the information the Committee was instructed to report.

Dr. Cope states that he read to the Society the original report some months ago, since which time amendments have been made to it.

Mr. Dudley stated that in the absence of the Treasurer matters relating to the finances of the Society should not be pressed to a conclusion, and moved that the whole matter be laid over until the next meeting and be made a special order.

Dr. Frazer objects that the motion is not in order.

The President decided, no point of order could be taken pending the motion to postpone.

The vote being taken was decided in the negative, and the yeas and nays being called for, the vote stood for the motion, 4; against, 8. So the motion was lost.

Dr. Morris then called for the reading of the report of the Committee.

Dr. Cope states that the report he makes is the report of the Committee.

Dr. Morris asks if the report is in writing.

The President states all reports must be in writing.

Dr. Morris moves that the report be referred back to the Committee to report to the Society at the second meeting in January, 1892.

The President states that there is no continuous report, no full text, and that the matter as presented by the Chairman was disjointed and likely to lead to misapprehension. That a portion of the resolutions was out of order as affecting the laws of the Society.

Dr. Barker made some remarks.

The question being put on Dr. Morris' motion, the resolution was adopted.

And the Society was adjourned by the President.

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OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

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EXTRACT FROM THE LAWS.

CHAPTER XII.

OF THE MAGELLANIC FUND.

SECTION 1. John Hyacinth de Magellan, in London, having in the year 1786 offered to the Society, as a donation, the sum of two hundred guineas, to be by them vested in a secure and permanent fund, to the end that the interest arising therefrom should be annually disposed of in premiums, to be adjudged by them to the author of the best discovery, or most useful invention, relating to Navigation, Astronomy, or Natural Philosophy (mere natural history only excepted); and the Society having accepted of the above donation, they hereby publish the conditions, prescribed by the donor and agreed to by the Society, upon which the said annual premiums will be awarded.

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2. Persons of any nation, sect or denomination whatever, shall be admitted as candidates for this premium.

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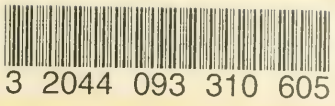
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