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THE TODA VOCABULARY BY THE REV. F. METZ.

(Continued from last Number of the Journal.)

B.

Baby	ಪೋಪೆನ್. *pópen.*
Back	ಉಫ್. *uf.*
Backbiting	ಪಿಕ್ಕಿ. *perkiti.*
Backward	ಪೀಕ್. *bék.*
Badge	ಪಾರು. *páru.*
Bag	ತೀರಂ. *tíram.*
Bail (I am)	ಪೊನ್ನಾಯಿಬಿನಿ. *ponnáyisbini.*
Balance, scales.	ತರಸು. *tarasu.*
Ball of a gun	ತೆರ್ಷ್‌ಗುದ್ದು. *tershguddu.*
Bald	ತೆರ್ಮದ್. *tármadd.* (*litt. open head.*)
Bamboo	ಕೈಲು. *kailu.*
Bat	ಬರ್ಕೊನ್. *barkon.*
Bathe	ನೀರಾರ್ತ್‌ಬಿನಿ. *nírárthbini*, and ನೀರರ್ಷ್‌ಬಿನಿ. *nír-arshbini.*
Battle	ದದ್ದು. *daddu.*
Bark of a tree	ಮೀನ್‌ಪುಟ್. *ménput.*
Bark (verb)	ಕ್ವರ್ತ್‌ಬಿನಿ. *kwarthbini.*
Barley	ಗಾಜ್ಜಿ. *gájji.*
Barren	ಬರಡಿ. *baradi.*
Basket	ಮಕರಿ, ಕೂದು. *makari, gúdu.*
Beat	ಬುರ್ತ್‌ವೆರ್ಷ್‌ಬಿನಿ. *burthvershbini.*
Be	ಎರ್ಷ್‌ಬಿನಿ *ershbini.*

Bean ಎವರ್. *evar.*

Bear (noun) ಕಾರ್. *kár.*

Bear (verb) ಹೊರ್ತ್ಸಿಬಿನಿ. *hottsbini.*

Beard ಮೊಯಿ. *moyi.*

Beast ಮುರ್ಕಿತಿ. *murkiti.*

Bee ಜೆಂಗ್ಗೂರ್. *jéngúr.*

Bee's wax ಕರ್ರ್. *karr.*

Bedstead ಕೆಟ್ಟ್ಸ್. *kett'hs.*

Before ಮುದ್ದ್. *mudd.*

Beg ಬೆಡ್ವರ್ಷ್ಬಿನಿ. *bédvershbini.*

Beggar ಬೆಡಿಗಾರ್. *bédigár.*

Behead ಮೊರ್ರ್ಅಟ್ಸ್ಬಿನಿ. *morr-attsbini.*

Behind ಹಿಂಡಾಡು *hindádu,* & ಪಿಂದಲ್ಕ್. *pindalk.*

Believe ನಬ್ಬರ್ಷ್ಬಿನಿ. *nabbvershbini.*

Below ಎರ್ಕ್. *erk,* ನೆಶ್ಕ್. *neshk.*

Belly ಬಿರ್. *bír.*

Between ನರ್ತ್ಕಾಶಿ. *narthkási.*

Be it so ಅತ್ತನಮ. *attanama* (*means also*) *enough.*

Bell ಗೊಂಗ್. *gong.*

Bend ಬರ್ತ್ಸವರ್ಷ್ಬಿನಿ. *batsvershbini.*

Beyond ಆತಡು. *átadu.*

Beware of ಅತೈಖಿರ್. *ateikhir, litt. be at that side.*

Big ಎತುದ್. *etud.*

Bile ಪಿತ್ತ. *pitta.*

Bind ಕಟ್ಟ್ಸ್ಬಿನಿ. *katt'hsbini.* ಕಟ್ಟಿಖೆನ್. *katt'hikhen.*

Bird బిల్ట్. *bilt.*

Bird cage బిల్ట్‌గూడ్. *biltgúd.*

Bite (and bark) క్వర్థ్‌బిని. *kwarthbini.*

Bison అమోఫ్. *amof.*

Bitter కత్‌స్టుది. *katstudi.*

Black కర్థ్‌తి. *karthti.*

Blackberry ఏల్పోం. *élpóm.* మిల్పోం, *milpóm.*

Blind కణ్ణు కాణది. *kaṇṇu káṇadi.*

Bliss సుగ్గం. *suggam.*

Blood బాఖ్. *bákh.*

Board, plank ళ్ళా. *tzhá.**

Bog, swamp కెంగ్నేర్. *kennér.*

Boat అరిగిలు. *arigilu.*

Born (I was) బెర్థ్‌బిని. *bert'hbini.*

Boil పుణ్ణు. *puṇṇu.*

Boils (it) బుకితి. *bukiti.* & బుల్‌క్‌థ్‌తి. *bulkthti.*

Bold ఎల్‌థి. *elthi.*

Bone ఎల్ఫ్. *elph.*

Bottle పుట్టిహి. *puṭṭ'hi.*

Boundary తెవ్వర్. *tevvar.*

Bow (a) బిర్ష్. *birsh.*

Bowels గుర్ర్. *gurr.* గ్వుర్ర్. *gvurr.*

Box పెట్టిహి. *peṭṭ'hi.*

Boy మోఖ్, *mokh,* మోఖ్‌ష్, *mokhvarsh.*

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* The (ళ) is the peculiar Toda sound something like the tamil ழ, which is usually rendered by *zh.*

Breast [illegible], *nejji guddi*, woman's breasts. [illegible], *mosh*, [illegible]. *morsh.*

Bracelet [illegible]. *tonalpadi.* & [illegible]. *tukoadi.*

Bramble [illegible]. *amadi.*

Branch of a tree [illegible]. *tavar.*

Brass [illegible]. *pitali.*

Break [illegible], *mirdhs verabbini*, [illegible], *nodadverabbini.*

Breath, life [illegible]. *ti.*

Breathlessness [illegible]. *uppuj.*

Breed [illegible]. *huttidden.*

Bribe [illegible]. *lohdadi.*

Bring [illegible], *taddden*, [illegible]. *taddbini.*

Brook [illegible]. *pu.*

Brother (elder) [illegible], *anna*, [illegible], *annan*; younger brother [illegible], *narvol.*

Brother in law [illegible]. [illegible]

Brow (eye) [illegible] *kannguirmar.*

Buffaloe [illegible]. *ir.*

Build [illegible] *kattbini.*

Burden [illegible]. *pore.*

Burn [illegible] *suttk verabbini.*

Business [illegible] *kelsa.*

Butter [illegible]. *benne.*

Butter milk [illegible]. *mosh.*

Butterfly ಕಪ್ಪಾನ್. *kappán.*

C.

Cage, trap ಗೂಡ್. *gúd.*

Calf ಕರ್ರ. *karra.*

Call ಬಿಷ್ರ್ ಎಷಿರ್ಬಿನಿ. *birsh ershbini.*

Calumniator ಜಾಡಿಕಾರನ್. *jádikáran.*

Camel ವೊಟ್ಟಿ. *vot't'hi.*

Carriage wheel, potter's wheel, ಬಂಡಿ. *bandi.*

Cast away ತಲಿಬುಟ್ಸ್ನಿಬಿನಿ. *talibut't'hs bini.*

Castle, Bungalow of Europeans ಕ್ವಾಟ್. *kwát.*

Cat ಕೊತ್ತಿ. *kotti.*

Catch ಪಾರ್ವತ್ಥ್ಸಿಬಿನಿ. *parvatthsbini.*

Centre ನದುವ್. *naduf.*

Chaff ಕ್ವಸ್ತ್. *kwast.*

Chain ತಕೊಳ್. *takól,* ತಗರ್ಷ್. *tagarsh.*

Chalk, Chunam ನೂರ್. *núr.*

Chat ಅರ್ವೊರ್ಬಿನಿ. *árvotbini.*

Cheap ಎತಿಯಾದಿ. *etiyadi.*

Cheat ಮೊಸಮಾಡ್ವರ್ಷಿಬಿನಿ, *mósamádwershbini.*

Cheek ಅನೊಗ್. *ánog.*

Child ಪೊಪನ್. *pópan.*

Chin ಮಿಡ್. *mid.*

Claw ಕುಲೂರ್. *kulúr.*

Clean ನಾರ್ತ್ *nárth,* is it clean ನಾರ್ತೆರ್ಷ್ಕಾ, *nárthershká.*

Cloud	మజ్జు. *majju.*
Climb	యెత్త్శ్బిని. *yettsbini.*
Club	కుండ. *kunda.*
Coal	కరి. *kari.*
Cob	త్వాలజంగుడు. *twálajangúdu.*
Cocoanut	తెంగొకాయి. *tengokáyi.*
Cold, feverish cold	పెర్త్కి. *pertkti.*
Cold, from cold weather	క్వొర్త్కి. *kwortkti.*
Colour	సాయ. *saya.*
Come	వస్క్కెన్. *vaskken.* ఫస్క్కెన్. *faskken,* బద్త్బిని, *badthbini.*
Command	అప్పె. *appene.*
Conjurer	పిలికారన్. *pilikaran.*
Companion, friend	యెకాళ్. *yekál.*
Comprehend	అర్త్బిని. *arthbini.*
Consent	వొబ్బెర్ష్బిని. *vobbershbini.*
Corn, grain,	బత్తం. *battam.*
Corner	మూలె. *múle.*
Corpulent	బల్బిర్. *balbir.*
Cotton	పత్తి. *patti.*
Cough	పుటిటి. *putiti.*
Count	యెనిష్బిని. *yenishbini.*
Countenance	కొణ్ మున్న. *konmunna.*
Country	నీర్. *nír,* సీమె, *síme.*
Courage	ఎలుథి. *eluthi.*
Cowries	నెర్పులి. *nerpuli.*
Cover, hide	ముచ్వెర్ష్బిని. *muchvershbini.*
Cow	దనం. *danam.*

Crab ಟೆಗುಳಿ. *teguḷi.*

Cream ಫ್ಹತ್. *p'hatha,* ಬೆಂಣ್ಣು. *beṇṇu.*

Cripple ಕುಟ್ಟಿನ್. *kuṭṭ'han.*

Crooked ಟೊಕ್ರ್. *tork.*

Crow ಕಾಕ್. *kák.*

Cry ಅಡ್ತ್ಬಿನಿ. *adthbini,* ಕಣ್ಣಿನಿಕ್ ಹಾಕ್ಸ್ಬಿನಿ. *kaṇṇa nír haksbini.*

Cultivate ಕಾಳ್ಗೆರ್ಷ್ಬಿನಿ, *kazhgershbini,* ಉಳ್ಸ್ಬಿನಿ, *uzhsbini.*

Curse ಬರ್ತಿವೆರ್ಷ್ಬಿನಿ. *bartivershbini.*

Custom house ಸುಕ್ಕಕಟ್ಟ್. *sukkakaṭṭ'h.*

Cut ಅರ್ತಿವೆರ್ಷ್ಬಿನಿ. *artivershbini,* ಏಸ್ವೆರ್ಷ್ಬಿನಿ, *éswershbini.*

D.

Dance ಆಡ್ಸ್ಬಿನಿ. *áḍsbini.*

Dark ಯಿಜ್. *yizh.*

Daughter ಕುಖ್. *kukh.*

Daughter in law ಮಾಟೆದ್ತ್. *matveth.*

Day ನಾಳ್. *náḷ.*

To day ಎದ್ದು. *eddu.*

Day after tomorrow ಪೀರ್ನೇರ್. *pérnér.*

Deaf ಕಿವಿದು. *kividu.*

Death ಕೇದು. *kédu.*

Debt ಕದನ್. *kaḍan.*

Deceive ಮೋಸಮಾಡ್ಸ್ಬಿನಿ. *mosamáḍsbini.*

Deceiver ವೊಲಾದಿ. *voládi.*

Deep ಕೀನು. *kínu.*

Demon ಬೂತ್. *bút.*

Deny ಆಡದ ಬಯೆದ್ದ್ ಎಶ್ತ್ಸಿಬಿನಿ. *ádadiyeddeshtsbini.*

Depart ಪೋಕೆನಿ. *pókeni,* ಪೊಯಿಸಿಬಿನಿ. *poyisbini.*

Deride ಕರ್ತ್ಹಿಬಿನಿ *karthbini.*

Desert, forsake ಬುಟ್ಟ್ವೆಶ್ಹಿಬಿನಿ. *butt'hvershbini.*

Descend ಯ್ಜಾಖ್ಖಿಬಿನಿ. *yízhkhbini.*

Desire ಆವೆಲು. *ávelu.*

Diarrhœa (I have) ಬಿರ್ವಸ್ಬಿಸ್ಚಿ, *birvasbischi.*

Difference ಹೆಚ್ಚ್ಕದಿಮಿ. *hechkadime.*

Dig ಅದೆಶ್ಹಿಬಿನಿ. *adershbini.*

Diminish (neutre) ಎತ್ತಿಗದೆಶ್ಹಿಬಿನಿ. *ettigadershbini.*

Die ಕೆದಿಖೆನಿ. *kédikheni,* ಕೆದವೆಶ್ಹಿಬಿನಿ. *kédavershbini.*

Dirt ಅಶ್ಹಿಬಿದ ರ್. *arsh bidar.*

Dirty (I make) ಕಶ್ಹಿಕೆವೆಶ್ಹಿಬಿನಿ. *karshkevershbini.*

Dishonour ನಾನಿಪೆಮ್. *nánipém.*

Disappear ಕಾಣವೆಶ್ಹಿಬಿನಿ. *káṇavershbini.*

Dismiss ತಳಿವೆಶ್ಹಿಬಿನಿ. *taḷivershbini.*

Dispute, debate ಕುದ್ವೆಶ್ಹಿಬಿನಿ. *kudvershbini.*

Ditch ಕುದಿ. *kudi.*

Divide ಪಾಲ್ಮಾಡ್ಸ್ಬಿನಿ. *pálmádsbini.*

Dog ನೊಯಿ. *nóyi.*

Door ಪಶಾಜ್. *pasházh.*

Drive ವೊದಿವೆಶ್ಹಿಬಿನಿ. *vódivershbini.*

Drink ಊಡ್ಸ್ಬಿನಿ. *údsbini.*

Drown ಮ್ಜುಗಿವೆಶ್ಹಿಬಿನಿ. *mzhúgivershbini.*

Drum ಬರ್ರ. *barra.*

Drop ಕಾಟ್ಚಿ. *kátchi.*

Drum, verb ಬರ್ರಗೆರ್ಷ್ಬಿನಿ. *barragershbini.*

Dry ವೊನುಗೆರ್ಷ್ಬಿನಿ. *vonugershbini.*

Dull ಪೆರಾದ್. *péráḍ.*

Dumb ಮೂಗನ್. *múgan.*

Dung ಗೊಪಾರಂ. *gopáram,* ಕಾರ್ಷ್. *kárṣh.*

Dwarf ಕುರುಡಮೊಖ್. *kuruḍamokh.*

E.

Eagle ಪಥು. *pathu.*

Ear ಕೆವ್. *kev.*

Earth, soil ಭೂಮಿ. *búmi.*

Echo (it is) ನೆಪೆರ್ತ್ಚಿ *néperthchi.*

Eat ತಿನ್ಸಿನಿ. *tinsbini,* ತೆದ್ಸಿನಿ. *tedsbini.*

Eclipse ಗ್ರೆಂದಚಿ. *grendachi.*

Egg ಮೊಟ್ಟೆ. *mott'he.*

Elegant ನಾರ್ತಿ. *nárthi.*

Eight ಎಟ್ಟ್. *ett'h.*

Eighteen ಪೋಟ್. *bót.*

Eighty ಎಂಬೊತ್. *emboth.*

Enemy ಅಖ್ಗಾರನ್. *akhgáran.*

Enough ಅತ್ತನಮ. *attanama,* ಕನಂ. *ganam.*

Elbow ಗೊರ್ಮಗೈ. *gormagai.*

Elephant ಆನ್. *án.*

Elk ಮೋಫ್. *móf.*

Embrace ಉಲ್ಕಟಿಷ್ಬಿನಿ. *ulkaṭershbini.*

Empire	ಶೀಮೆ. *śíme,* ನೋರ್. *nór.*
Equal	ಸರಿ. *sari.*
Ever	ಎಕ್ವನೆಟ್ವನ್. *etvanetvan.*
Excrement	ಕಾರ್ಷ. *kársha.*
Expel	ತಳಿವಿಟ್ಸ್ಬಿನಿ. *talivitsbini.*
Expenditure	ಸಲ್ಲಂ. *sallam.*
Eye	ಕಣ್ಣು. *kaṇṇu.*
Enchanter	ಪಿಲಿಕಾರನ್. *pilicáran.*
End (verb)	ಈರಿಸ್ಬಿನಿ. *íirisbini.*
Enter	ಒಳ್ಪೋಕೆನಿ. *olpókeni.*
Envy	ಹೊಟ್ಟಿಕಿಚ್ಚ್. *hoṭṭ'he kichch.*
Error	ಕ್ವರ್ರ್. *kvarr,* ತಪ್ಪ *tapp.*
Evening	ಏಕಾರ್. *ékár.*
Every	ಎಲ್ಲಾ. *ellá.*
Excise	ಸುಕ್ಕಂ. *sukkam.*

F.

Fall	ಬುಡುದುವೆಶ್ಬಿನಿ. *bududuvershbini.*
Face	ಕೊನ್ಮುನ್ನ. *konmunna.*
Falsehood	ಪೆರ್ಕಿತಿ. *perkiti.*
Family	ಪಾಲ್ತಿಆಳ್. *páltiál.*
Faith	ನಂಬಿಕ್. *nambik.*
Fat	ಬೆಖಿತಿ. *bekhiti.*
Fane, temple	ಗುಡಿ. *gudi,* ದೇರ್ಮನೆ. *dérmane.*
Far	ಬಧ್ಖ್. *badhkh.*
Farmer	ವೊಕಲಿಖೆನ್. *vokalikhen.*

Father ಐಯನ್. *aiyan.*

Fatherless ತೊಬ್ಬಾರಿ. *tobbári.*

Fault ಕ್ವರ್ರ. *kwarra.*

Fault (to commit) ಕ್ವರ್ರಗಿಸಿವೆರ್ಷ್ಬಿನಿ. *kwarragisiversh-bini.*

Fault it is a ಕ್ವರ್ರಬುದಿವೆಸ್ಚಿ. *kwarrabudiveschi.*

Fear ಅಜ್ಬಿನಿ. *ajbini.* I fear not ಅಜ್ಜೀನಿ. *ajjeni.*

Feast ಹಬ್ಬಂ. *habbam.*

Feather ತೂಫಿ. *túfi.*

Fever (I have) ಬಿಷ್ಕೆವೆರ್ಷ್ಬಿನಿ. *bishkevershbini.*

Five ಯಿಚ್. *yich.*

Field ಕಾಜ್. *kázh.*

Fill ಬುರ್ದ್ಸಿಬಿನಿ. *burdsbini.*

Finger ಕೈವೆಜ್. *kaivezh.*

Fire ದಿತ್ತ್. *ditth.*

Fireplace ವರ್ರ್ಷ್. *varrsh.*

Firewood ಬೆರ್ಖ್. *berkh.*

Firestone, flint. ತಿತ್ಮುಕ್. *titmuk.*

Fish ಮಿನ್. *mín.*

Fist ಕೆಪೊಟ್. *kepot.*

Fife ಕ್ವೆಜ್ಷ್. *kwézhsh.*

Flea ದೆಲ್ತ. *delta.*

Flee ವೋಡ್ಸಬಿನಿ. *vódsbini.*

Flesh ಬುವದ್. *buvad.*

Floor ನೆಲ್ಲು. *nellu.*

Flour ಹಿಟ್ಟ್. *hitt'h.*

Flower ಪೂವ್. *púf.*

Fly (a noun) ಏಪಿ. *épi.*

Fly (verb) ಪಾರ್ಥ್‌ಬಿನಿ. *párthbini.*

Foam ಬುಕ್ಕು. *bukku.*

Fog ಮಜ್ಜು. *majju.*

Fool ಪುಟ್ಟ್. *putth.*

Fore head ನೆತ್ತಿ. *netti.*

Forest ದ್ವಾರ್ಷ್. *dwársh,* ಮೇನ್. *mén.*

Four ನಾಂಕ್. *nánk.*

Fourteen ಪಾಂಕ್. *pánk.*

Forty ನಾಜ್‌ಬೊತ್. *názhboth.*

Forward ಮುದ್ಕ್. *mudk.*

Foot ಕಾಲ್. *kál.*

Foreigner ಪರದಾಸ್. *paradás.*

Forget ಮರೆದ್ವೆರ್‌ಶ್‌ಬಿನಿ. *maredwershbini,* ಕೂಬಖರಿ ವೆರ್ಷ್‌ಬಿನಿ. *túbakhariversbini.*

Forgive ಉಲ್ತ್‌ಮಾಡ್‌ಸ್‌ಬಿನಿ. *ultmádsbini.*

Fowl ಕ್ಸ್ಹೂದಿ. *kzhúdi.*

Fox ನರಿ. *nari.*

Friend ಏಕಾಲ್. *ékál.*

Frog ಕಪ್ಪುನ್. *kappun.*

Frost ಪನಿ. *pani.*

Fruit ಪೋಂ. *póm.*

Fruit tree ಪೋಮ್ಮೇನ್. *pómmén.*

Funeral	ಕೇದು. *kédu.*
Fur	ತೂವಜ್. *túvazh.*
Fart	ಬುರ್ಕ್. *burk.*

G.

Gain	ಉಳಿವಲ್. *ulival.*
Gall	ಪಿತ್ತ. *pitta.*
Gallows	ತೂಕ್‌ಮೀನ್. *túkmén.*
Garden	ತೂವಟ್. *túvaṭ.*
Garlics	ಬೆಳೂಳ್ದಿ. *beḷúḷdi.*
Gather	ಕೂಟ್ಸ್‌ಬಿನಿ. *kútsbini.*
Gate	ಪಶಾಜ್. *pasházh.*
Gem	ಕಲ್ಮುತ್ತುರು. *kalmutturu.*
Ghee	ನೇಯಿ. *néyi.*
Ghost	ಬೂತ್. *bút.*
Giant	ಅರ್ಕೊತಶ್. *arkotash.*
Girl	ಕೂಖ್. *kúkh.*
Give	ಕೊಟ್ಟ್‌ಸ್ಬಿನಿ. *koṭṭ'hsbini* ತಶ್ಕೆನ್. *táshken.*
Go	ಪೋಖೆನಿ. *pókheni.*
Glow worm	ಮಿನ್‌ಪೂಫ್. *minpúf.*
Goat	ಆಡು. *áḍu.*
God	ದೇರ್. *dér.*
Gold	ದಿಸ್ನ. *disna.*
Goldsmith	ತಟ್ಟನ್. *taṭṭ'han.*
Good	ವೊಳ್ತಿ. *voḷti.*
Gooseberry	ತೌಟ್‌ವೋಮ. *tóuṭvóm.*

Grain	ಬತ್ತ್ಂ, *battam.*
Grandfather	ಪಿಯೆಂಕ್. *píyen.*
Grandmother	ಪಿಯವ್ವ್. *píyavv.*
Grandson	ಮರ್ಮೊಖ್. *marmokh.*
Grass	ಪುಲ್ಲು. *pullu.*
Grasshopper	ಮಟ್ಟಿ. *maṭṭ'he.*
Gray	ನರೆ. *nare.*
Great	ಎತುಡ್. *etuḍ.*
Green	ಪಚಿ. *pachi.*
Grief	ದುಕ್ಕಂ. *dukkam.*
Grind	ವೊರ್ರಿಕಲ್ಲೆರ್ಷ್ಬಿನಿ. *vorrigallershbini.*
Grindingstone	ವೊರ್ರಿಕಲ್. *vorrigall.*
Groan	ಬಾರಾಟ್ಸ್ಬಿನಿ. *bárátsbini.*
Ground	ನೆಲ್ಲು. *nellu.*

H.

Hailstone (hailrain)	ಕಜ್ಝಮೆ. *kazhzhmá.*
Hair	ಮಿರ್. *mír.*
Half	ಅದಂ. *aḍam.*
Hand	ಕೊಯ್. *kóyi.*
Hard	ಕಗಾಲ್. *gagál.*
Hare	ಮಿರ್ಷ್. (*mürsh.*) *mírsh.*
Harlot	ಸ್ಜುಯಿ. *szhúyi.*
Hate	ಅಖ್ವೆರ್ಷ್ಬಿನಿ. *akhvershbini.*

Hatred	ಅಖ್. *akh.*
Halt	ಕಾಲೆಟ್ಟ್‌ಸ್ಬಿನಿ. *kaleṭṭ'hsbini.*
Hammer	ಕುಟುಪಾದಿ. *kuṭupádi.*
Handle a	ತಿರ್ಶ್. *tírsh.*
Hang (suicide)	ಮೊರಕಟ್ಟ್‌ಸ್ಬಿನಿ. *morakaṭṭ'hsbini.*
Hang (another)	ಕೂಕ್ವರ್ಶ್‌ಬಿನಿ. *túkvershbini.*
Harken	ವೋರಾಟ್ಸ್ಬಿನಿ. *vórátsbini.*
Hatchet	ಕುರ್ವಾತ್. *kurvál.*
Haughty	ಗ್ವೋವಿರ್ಶ್‌ಬಿನಿ. *gwóvershbini.*
Hawk nose	ಪತ್ಮಿಕುಫ್. *pathmituf.*
Head	ಮದ್ದ್. *madd.*
Hear	ಕ್ಷೆಟ್ಸ್‌ಬಿನಿ. *kzhéṭsbini.*
Heart	ಕೆಂಡಿ. *gendi.*
Heat	ಬಿಹ್. *bíh.*
He	ಅದುಂ. *adum.*
Heap	ಕೂಧಲ್. *gúdhal.*
Heaven	ಆಮುನೋರ್. *ámunór,* ಮೆಲ್ಲೊಕ್. *méllókh.*
Herd	ಕುಪ್ಪಿ. *guppi.*
Heavy	ಕೂಕಡೆ. *túkade.*
Here	ಯಿಲ್ಲ್. *yill.*
Hew	ಏಸ್ಬಿನಿ. *érsbini.*
Herb	ಕೂರ್. *túr.*
Hiccup	ಎಷ್‌ಕೂರ್. *eshkúr.*

Hide (reflexive) [illegible]. *oolackoorshkini.*

Hide (active) [illegible]. *kertikini.*

Hill [illegible]. *ditt'ka.*

Hire [illegible]. *sumbolu.*

Hog [illegible]. *pakki.*

Hoof [illegible]. *kipu.*

Hook [illegible]. *dork.*

Hold [illegible]. *pattikokini.*

Honey [illegible]. *tén.*

Honour [illegible]. *mánam.*

Horn [illegible]. *kuorr.*

Horse [illegible]. *kudore.*

Horse gram [illegible]. *kúti.*

Hot [illegible]. *kaiti,* it is hot [illegible]. *karurichi.*

House [illegible]. *ode.* Badaga house or milk house [illegible]. *palti.*

How [illegible]. *ettuk.*

Howl [illegible]. *arukini.*

Hungry [illegible]. *kervthiki.*

Hundred [illegible]. *nunnár.*

Hunt [illegible]. *bettaikokini.*

Husband [illegible]. *al.*

Humbug [illegible]. *pilurat.*

(To be continued.)

II. *Brief notices of Pelagian Mollusca collected on a voyage from England to Madras, during the months of April, May and June* 1856. *By* WILLIAM TRAILL, M. D.

IN throwing together the following observations it was my first intention to describe the various Mollusca met with, in the order of their classification, beginning with those highest in the scale, but on further reflection I did not think it would answer any useful purpose to do so. They are too few in number to represent the gradation of the different classes, which may be more clearly understood by a glance at any systematic work on the subject. By adhering rigidly to classification I should have very frequently, to reverse the succession of events. Moreover, authors are by no means agreed as to the exact position in the animal economy, which each group should hold: PTEROPODS for example according to the varying opinions of different authors, having successively occupied no less than three of the six Classes into which MOLLUSCA are usually divided. Upon the whole therefore, I thought it better to note down zoological facts and deductions in the order of their occurrence as being a method easier to myself and probably more intelligible to my readers.

In remarking on these animals, I have not been so much actuated by the belief that some of the species are new to science, as by the fact that Pelagic Molluscs in general, and PTEROPODS in particular, are comparatively little known. Although the indefatigable labours of such men as M. M. Rang, Quoy and Gaimard have greatly added to the number of ascertained species, yet in our knowledge of their specific distinctions and affinities much remains to be accomplished.

PTEROPODS are rarely seen either in public museums or private collections; their mysterious haunts in the unknown depths of the ocean render them peculiarly inaccessible to the majority of collectors; even the experienced voyager, without some previous knowledge of their habits, would fail to detect any indication of their

presence. As most of them are crepuscular or nocturnal animals, they rarely if ever make their appearance in the bright sun light, but no sooner does the twilight approach, than different species successively come to the surface, and they may then be readily captured in the towing net.

I have appended a chart* showing the different localities where we met with any Molluscs, as I conceive that by collecting and comparing the experience of different voyagers, not only may our acquaintance with the nature of these animals be greatly extended but it may add a link to our imperfect knowledge of the geographical distribution of animal life, a subject, the importance of which, can hardly be overrated.

It is only by comparing a sufficient number of such charts that the facts they convey can be made practical use of; there are obvious reasons why one voyager may not meet with success in latitudes where another may have been eminently fortunate. Alternation of season, change of temperature, or currents prevailing at different times and places, must greatly influence the movements of these creatures and may often occasion their involuntary migration: again PTEROPODS and other MOLLUSCA may at times be present in abundance without the voyager being able to capture a single specimen. This happens when the speed of a ship exceeds 9 or 10 knots an hour, a circumstance of frequent occurrence on the present voyage, as our ship, an American built clipper, sometimes attained a speed of 15 and 16 knots an hour, when any attempt with the towing net involved immediate destruction of the net, if not loss of the towing line.

The first part of our voyage, which we commenced in the latter part of March, was very stormy, and therefore peculiarly unfitted for the prosecution of any researches in Natural History. We could however watch the "stormy Petrels" following the ship for stray garbage, while an occasional shoal of porpoises or other CETACEA varied the scene by their fantastic gambols; at night the wake of the ship and the crests of the waves shone like luminous vapour, with

ıere and there brighter specks intermixed. This appearance we afterwards ascertained was partly, if not wholly, caused by multitudes of phosphorescent marine animals, chiefly CRUSTACEA and many of them, microscopic. By the 7th April in Lat. 31·11 N. Long. 17·28 W. the wind having abated, many *Physalias* harbingers of calm weather, floated past, catching the wind by means of their purple crests. Meanwhile we proceeded to prepare our towing apparatus which was simply a bag made of double mosquito gauze of a conical shape as in the accompanying wood-cut Fig. I. It was 1½ foot long, the widest end open and made to fit a circular iron hoop of 8 or 9 inches in diameter, to this was attached 15 or 20 fathoms of cord the size of a ship's log line. This form we found well adapted to use in light winds, but in anything of a breeze it too quickly filled with water which as rapidly regurgitated and carried with it all the contents of the net. To remedy this defect we constructed another net of the form shown in the annexed wood-cut Fig. II. which retained its contents better than the other in windy weather. Macgillivray, Naturalist to the surveying Expedition of H. M. S. *Rattlesnake*, thus describes his net; "not having seen a description of this useful instrument I may mention that the kind used by Mr. HUTLEY and myself consisted of a bag of 'bunting' (used for flags) 2 feet deep, the mouth of which is sown round a wooden hoop 14 inches in diameter. Three pieces of cord a foot and a half long are secured to the hoop at equal intervals, and have their ends tied together. When in use the net is towed astern, clear of the ship's wake by a stout cord secured to one of the quarter boats or held in the hand. The scope of line required is regulated by the speed of the vessel at the time and the amount of strain caused by the partially submerged net." In Darwin's voyage of H. M. S.

Fig. I.

Fig. II.

Beagle he alludes to a towing net of "bunting," but he does not mention how it was kept open. Not having tried a net with a *wooden* hoop, I cannot pronounce on their respective advantages, I observed that with the iron hoop our net was generally half submerged, and it would thus probably have more scope for the capture of specimens than a net with a wooden hoop, which would oftener skim the surface without dipping sufficiently, but the strain was very great with the iron hoop as we not unfrequently lost both net and hoop. We generally examined our net every quarter of an hour as we soon found that when it was left too long, its contents were very apt to be damaged by friction.

On the 8th of April in Lat. 29·32 N. Long. 18·56 W. we made the first trial of the net, but the speed of the ship immediately tore it. For the next two or three days we essayed with nets made of "gunny bag," a kind of coarse brown cloth of open texture, but they retained too much water and owing to the dark color of the cloth it was difficult to see if there was anything in the net; finally we returned to the use of *white* mosquito gauze, the only objection to which was, that it too often required to be repaired or renewed.

April 18th, Lat. 7·6 N. Long. 24·55 W.* At night we passed a few *Pyrosomas*, these animals the most brilliant of noctilucent molluscs, belong to the 6th Class or TUNICATA. They are cylindrical, cartilaginous bodies, 3 or 4 inches long, open at one end, tuberculated, hyaline or almost transparent; they rise to the surface only at night, and although but few were seen on this occasion, yet during a former voyage, when near the same Lat. and Long. our ship for eight successive nights passed through countless thousands of them. They evidently floated a little below the surface, as we could not manage to enclose any in the net, but by means of several large fish hooks tied together and dragged astern we were enabled to secure two fine specimens for examination. When first taken in the hand in the dark, they shone like molten metal, in color a pale but

* It must be borne in mind that the Latitudes and Longitudes mentioned, always refer to the actual position of the ship at noon, but by referring to our course traced on the accompanying chart, our position at any given time may be inferred with sufficient accuracy.

vivid green, but when the animal died it quickly faded. Some authors affirm that each of the tubercles with which their surface is studded, constitutes a distinct animal; but while admitting its compound nature I should feel rather disposed to compare these tubercles or gemmules to the buds on a tree; in short I consider it as one of these remarkable instances where the animal kingdom closely approximates to the vegetable, and is in some measure regulated by the same laws. In their native element they diffuse a strong phosphorescent light for a distance of several inches from their bodies, and their aggregate numbers so illumined the stem of the ship, that moderately large print could be read at midnight.

As we neared the equator a succession of calms temporarily put a stop to our towing experiments, the ship making no perceptible way through the water.

April the 29th in Lat. 22·1 S. Long. 38·7 W. After so many fruitless attempts we were gratified to-night by taking in the net three different species of *Hyalæa* and two specimens of another genus "*Cuvieria*" Fig. 26, the flat *Hyalæa* Fig. 12, was first caught about twilight, the other, Figs. 13 and 14, were taken after dark until 8 P. M. when the wind became too high.

Both of these genera belong to the PTEROPODA, a class the position of which has much distracted the opinions of naturalists, some assigning them a rank second only to the 1st class or CEPHALOPODA, while others have variously considered them superior or inferior to the GASTEROPODA, or degraded them below the level of the ACEPHALOUS bivalve. PTEROPODS being provided with fins can traverse the ocean, a faculty they possess in common with CEPHALOPODS, and in this particular they might be considered superior to the creeping GASTEROPOD, but when we compare their interval conformation, habits and instincts, the GASTEROPOD is seen to exhibit proofs of a much higher state of development than the PTEROPOD, which being destitute of feet or prehensile organs, cannot creep or attach itself to floating objects. Nor is the power of swimming "per se" an indication of high organization, it is in fact possessed by some of the GASTEROPODS

in their earlier stages of existence. I have watched the young of several species of *Cypræa* when first disengaged from the egg or nidamental capsule. The foot of the animal then unadapted for crawling is expanded into two slender fins by means of which these little creatures swim with rapid jerking movements and having little or no voluntary power of directing these motions, they are carried by a blind instinct or rather in obedience to the laws of the great author of nature, wherever they can insure safety from enemies and a sufficiency of their proper sustenance.

I have been much struck with the resemblance the PTEROPOD bears to the rudimentary GASTEROPOD, in its simple organization and in the random jerking manner in which it effects locomotion, apparently with little or no exercise of volition. Their chief use in the animal economy seems to be, to afford food to the whale and to various oceanic birds, most of which being night feeders, the PTEROPODS readily become their prey. It has been already observed that PTEROPODS, with very few exceptions, shun the light. The different species have their regular periods for approaching the surface of the water, where they actively sport about for a given time and then retire from view, to be succeeded by other species which also play their part on the surface and then likewise disappear. The cause or object of these periodical visits is unknown, nor has it been ascertained to what depth they subsequently retire. It may be safely assumed that they never reach the bed of the ocean. In the parts where they chiefly abound, the enormous depth of water would forbid this supposition. Being creatures extremely sensitive to light, it is probable that they merely retire to a depth sufficient to enable them to enjoy the required amount of shade or obscurity, besides which their specific gravity differs so slightly from that of the surface water, that each species when in a state of repose, would probably retain its proper level without requiring the exertion of any voluntary effort.

The *Hyalæas* when placed in a vessel of water, displayed considerable activity, especially the more globose species represented in Fig. 13, which darted about in all directions by rapidly flapping its fins, which in shape were not unlike a butterfly's wings. The shell

was clear as glass, with various patches of pale rust color. The animal was purple and could be seen through the transparent shell. Fig. 14 was a solitary specimen with well marked characters, a small shell of compressed form with the aperture narrowed into a canal, posterior spine somewhat imperfect, color purple. The animal was dead and could not be satisfactorily examined. The flask-shaped *Cuvieria* Fig. 26, when in motion, usually propelled itself in a straight course with the open part of the shell forward. It is provided with fins very similar in form and situation to those of the *Hyalœas* but more elongated. Between the fins is a slight projection which may be the head, but it seemed to me more like a continuation of the mantle or membrane which forms the fins. The shell which is well represented in Fig. 26, is colourless and transparent as the clearest glass; in several of the specimens the rounded extremity of the shell shows marks as though it had formerly been prolonged into a point, which probably becomes deciduous when the animal approaches maturity as is the case with several of the GASTEROPODOS. In the net along with these were several specimens of *Erichthus* and other CRUSTACEA so transparent as to be invisible in water, all except their eyes which appeared like insolated blue specks.

April 30th, Lat. 24·44 S. Long. 37·41 W. this evening about 5½ P. M. in daylight we put over the net and soon got many specimens of a small *Creseis* Fig. 23, the shell is of a spicular form, and longitudinally carinated at one side where the open end of the shell is prolonged into a sharp point. The animal is a PTEROPOD of a pale purple color, they move briskly by means of two fringed fins, between which is a fringed projection or plume, which appears to be a continuation of the expanded membrane forming the fins.

As twilight set in, we caught more of the *Hyalœas* Figs. 9 and 13, already described. The former made its appearance first, and when darker still, the latter species again rewarded our efforts, and it was interesting to observe that each kind was taken at about the same hour as on the previous evening, although we had in the interval sailed a distance of nearly 170 miles. Another PTEROPOD captured this evening was *Cleodora*, Fig. 22, a beautiful hyaline shell,

marked transversely with broad undulating sulci or furrows. The aperture is somewhat triangular and produced into three spines; the shell had but a fragment of the animal adhering to it and was so much mutilated, that I cannot vouch for the representation being quite accurate. A little before 8 P. M. we took in the net two species of *Atlanta* Figs. 6 and 7. The animal is endowed with natatory powers like the PTEROPOD but is possessed of a much more complex organization. It is classed with the GASTEROPODS and has like them a true foot which however is not fitted for progression in the usual manner on a plane surface, but is cleft into two fleshy expansions, which the animal uses very effectively as fins. Attached to the foot is a calcareous operculum, which in Fig. 7, shows very peculiar striæ indicating that the nucleus of the operculum has been situated at the *outer* part of the aperture of the shell, from which the marks of increment proceed in successively increasing wavy lines towards the inner part of the aperture.

It will be seen by a reference to Fig. 7, that the inner whorls of this shell appear as if chambered or divided into septa. This is entirely due to a peculiar joint-like formation of the viscera of the animal, visible through the transparent shell which is in reality unilocular.

The animal has two tentacula and a proboscis, behind which are placed the eyes which do not project externally but are visible under a thin layer of integument. On dissecting out one, and subjecting it to a high magnifying power, I found it to possess a crystalline lens of spherical form, partly imbedded in a black cushiony mass, which appears to serve the purpose of absorbing the rays of light and is somewhat analogous to the *pigmentum nigrum* in the human eye. The magnified eye in its dark chamber is represented in Fig. 7 *a*. The shell is transparent and colorless, discoidal, spiral, in shape not unlike some of the smaller species of *Planorbis*. An expanded keel is attached to the outer circumference of the shell and extends to the space between the last and penultimate whorls, which it connects together. The general form of the shell is extremely elegant. *Atlanta* Fig. 6 of which we obtained only a solitary specimen, is a very remarkable and interesting shell, it is

completely enveloped in a strong membranous epidermis which extends considerably beyond the mouth of the shell and is at its outer edge prolonged into a keel, situated as in Fig. 7, but wholly membranous and only extending over half the circumference of the shell. On the inner whorls the epidermis is marked with spiral dotted lines. The shell is not so flattened in the whorls as Fig. 7, but is, like it, provided with an operculum, otherwise it seems to answer to the description of Sowerby's *Limacina* which he defines as "a thin fragile, spiral, discoid shell, umbilicated on both sides and carinated on the back and below, with a membranaceous lamellar keel," and he adds that it has externally much the appearance of a very diminutive umbilicated *Nautilus*. The *Limacina* however is a true PTEROPOD which this animal is not, it likewise differs from *Limacina*, in the shell being carinated, possessing an operculum, and having the aperture dextral. During the next few days the wind was too high, we got nothing, and our nets were repeatedly torn.

On the 3rd of May, Lat. 30·34 S. Long. 30·51 W. a species of *Loligo* or *Sleeve fish* called by the sailors a flying squid, fell on the deck of the ship. This animal belongs to the CEPHALOPODS the highest class of MOLLUSCA which in their more complicated internal organization, and in the possession of organs of sight and hearing, and a distinct brain, approximate to the VERTEBRATA. The fact of this mollusc having alighted on the deck of the vessel, is remarkable and instructive, for it is alleged that the MOLLUSCA not having members sustained by jointed and solid levers, cannot make rapid springs, whereas it is evident that some have the power of leaping or springing a considerable height out of the water. This fact has been observed by Bennet and others. I have repeatedly noticed other species of CEPHALOPODS that had fallen on the deck of a ship or in the chains and this in calm or moderate weather, so that they could not have been thrown up by the agency of the winds or waves, and I have also been informed by several officers of ships, that they may be often seen to execute a sustained flight, like the flying fish when pursued by its enemies. They are said to accomplish this movement with the head backward and the tail or arrow-shaped extremity advanced, which I

believe to be true, as it is quite in accordance with its mode of locomotion in water. The internal dorsal plate being elastic is probably of service to the animal in making these extraordinary bounds. The specimen above mentioned was about 6 inches long and of a purple color with ten arms or tentacles surrounding the mouth, two of them longer than the others and all furnished with suctorial disks. The general form of the animal was much like that figured as Bank's *Onychoteuthis* and the resemblance also extended to the shape of the elastic dorsal plate but it did not possess the tentacular hooks characteristic of that species.

May 5th, Lat. 30·19 S. Long. 27·40 W. from 5 to 8 P. M. took nothing in the net although the rate of sailing was only from 4 to 5 knots; between 9 and 10 P. M. we got a few *Atlantas*, Fig. 7, and one or two specimens of a small compressed *Hyalæa*, the form of which is well delineated in Fig. 15. The shell when in good condition is perfectly transparent. Habits of animal the same as those already described. This species we afterwards found had a wider range than any of the other *Hyalæas* taken by us during the voyage. In the net with these were some very small globose CEPHALOPODS with prominent eyes and several kinds of small fish and CRUSTACEA. One minute species in particular of the latter class, was of a brilliant blue color. For several successive nights we continued to capture specimens of *Hyalæa*, Fig. 15, and occasionally *Atlanta*, Fig. 7. On the 9th May Lat. 34·4 S. Long. 20·42 W. at 1 P. M. in very calm weather and the sky rather overcast we took in our net another species of *Cresèis*, Fig. 24. It differs from the first kind in having no keel to the shell which is also much more elongated posteriorly and the fins of the animal are not fringed. Later in the day we found in the net several specimens of *Glaucus*, a GASTEROPODOUS MOLLUSC of singular form. It has on each side of an elongated body, bunches of digitated filaments, by some supposed to be branchiæ, by others swimming organs. Fig. 27 was the most perfect specimen I could get for illustration. It was about 1 inch long. The structure of these animals is so delicate that when dragged astern in the net they are quickly destroyed by contact with other bodies. All the others when taken from the net had shrunk up into shapeless masses and did

not again resume their natural form. Fig. 28 which is placed here for the sake of comparison, is copied by permission of the Honorable WALTER ELLIOT from his valuable collection of colored drawings of NUDIBRANCH MOLLUSCS. Mr. ELLIOT has suggested to me that my specimen may have lost all the digitated appendages and this seems probable, for the animal in question, though it lived several days in a vessel of water, (thereby proving that the supposed missing organs were not branchiœ) yet it showed no power of swimming or even of moving, beyond curving its body into various contortions when touched. It appears that the species of *Glaucus* are not as yet well determined, which may account for the apparently contradictory statements as to their habits, &c. One author affirms that the *Glaucus* "swims with great quickness," others describe it as being remarkably torpid and sluggish in its movements. *Glaucus*, Fig. 28, which was taken by Mr. ELLIOT, in the bay of Bengal near Vizagapatam, at no great distance from the shore,* differs from my specimen not only in the number of the lateral appendages, but in the form and disposition of the blue lines on its surface. Both species are remarkable for the brilliancy of their color, which is generally attributed to their feeding on the beautiful blue *Velellas* and *Porpitas*, animals very low in the scale of animate objects, which are met with abundantly in these seas. This conclusion appears to me illogical. Most of the Pelagic animals we met with, were remarkably devoid of color, and such as had any were generally blue. Indeed with the exception of an occasional tinge of purple, I do not remember that we met with them of any other tint; so that I think we must look elsewhere for the cause of this color prevailing so remarkably in Pelagic and other marine animals. It seems to me not improbable that Iodine, a powerful coloring agent, universally prevalent in sea water, may be partly instrumental in producing it.

May 21st, Lat. 40·51 S. Long. 24·57 E. After dark we took in the net myriads of minute CRUSTACEA not much larger than cheese mites, of a pale blue color, and in the dark

* The perfect specimens of this *Glaucus* when first captured moved with considerable rapidity. The branched appendages appeared to be very brittle and were easily broken when attempting to catch the animal—W. E.

a mass of them appeared like liquid fire of a bluish yellow color. Most of the CRUSTACEA we have caught are luminous, especially their eyes. After 9 P. M, we caught in the net three small *Hyalæas* one of them, Fig. 15, already described, the other kind delineated in Fig. 16, had a more expanded aperture and the posterior extremity was unusually lengthened and curved so as to give the shell somewhat the form of a cornucopia. Another interesting shell of which we obtained several specimens this evening, much resembled a minute sinistral *Helix*, transparent, glossy, discoidal, with the spire slightly elevated; it is well represented and magnified in Fig. 8. I could not well distinguish the animal. It was extremely minute and none of those I placed in water showed any signs of vitality. I believe the shell to be a *Limacina* or *Spiratella*. These names are by some authors considered synonymous, though others take them to represent two different genera. The shell has likewise been confounded with *Atlanta*; and consequently the various descriptions of this shell, are most conflicting and contradictory. On this account I regret the more, my not having been able to record the appearance of the animal. However the figures of this and indeed of all the species illustrated in the accompanying plates are executed with such fidelity as to render it a comparatively easy task for a Naturalist in command of the requisite means, either to pronounce a species new, or to identify it with such as have been already described. The animal is probably a PTEROPOD. We took a few more specimens of it, the following night, after which we saw no more of them.

Our course was now south easterly for a considerable time, during which our experiments with the net were almost barren of results, and it was not until we approached higher and warmer latitudes, that we again fell in with MOLLUSCA. However, hardly a day passed that our net did not reveal varied and novel forms of animal life, with which the ocean seems to be teeming,—beautifully marked fish, singular CRUSTACEA and a variety of ACALEPHÆ, as *Beroe*, *Diphyes* and *Cuboides*, the two latter perfectly transparent and angular, like animated crystals. Many of these animals would live for days when placed in a vessel of sea water and the study of their habits in this manner, was always interesting and well calculated to while away a vacant hour.

June 3rd, Lat. 31·25 S. Long. 84·15 E. We took in the net several *Creseis* of a different form from those we had hitherto met with, the posterior part of the shell terminating in a curved point. This is shown in Fig. 25. Fig. 25 *a.* shows the position of the shell when the animal is in motion, which it effects much in the manner of those already described except that the convexity of the curve is always directed backward, in this respect resembling the *Hyalæas*. And I may here observe, that some authors consider *Cleodora*, (of which *Creseis* and *Cuvieria* are by them reckoned only sub-genera) so closely allied to *Hyalæa*, that it is impossible to draw the line between them, and in support of this anology they advert to the fact, that the animals, in their internal structure, differ but little from each other. Now although the analogy is undoubted, yet the differences seem sufficiently marked to warrant the present arrangement of genera and even species, at least the analogy is not stronger than that observed among other MOLLUSCS, the anatomical distinctions between which, are almost imperceptible, and yet they have been established into species and genera by the common consent of Naturalists. It is worthy of observation that the three species of *Creseis* were all captured in daylight, only one species, Fig. 23, having been ever taken by us at night. In this respect they contrast remarkably with the *Hyalæas* which, as far as we could ascertain, are strictly nocturnal or crepuscular animals. We continued working at the net all day, but were not successful in getting any more of this species until 7th June, Lat 26·0 S. Long. 87·9 E. *a little after* 12 *o'clock noon*, when we took two or three specimens alive. In the evening a little after dark we got two specimens of *Hyalæa* Fig. 9. This species much resembles *Hyalæa* Fig. 12 but differs from it in the direction of the lateral spines. It is also considerably larger. The animal has the power of withdrawing entirely into its shell, but often when at rest it kept its fins extended as in Fig. 11; when in motion the triangular membrane observable between the fins in the above figure was doubled over the aperture of the shell as represented in Fig. 10, the dark blotches are the viscera of the animal as seen through the shell. In the net with these we found a *Hyalæa* Fig. 17, differing from any previously met with in being more angular in form and in having the anterior part of the shell deeply grooved horizontally;

color white or nearly transparent; animal slightly tinged with purple; habits, so far as can be observed, do not appear to differ from those of the *Hyalæas* already described. On this evening we also obtained several *Cuvierias*; a genus we had not met with since April 29th in Lat. 22·1 S. Long. 38·7 W; all these were taken before 8 P. M.

9th June, Lat. 22·40 S. Long. 84·27 E. a little before 5 P. M. we took from the net several *Cuvierias* and one *Hyalæa*, Fig. 12. This species of *Hyalæa* we have always got earlier than any other but never before in daylight as on this occasion, which was half an hour before sunset: later this evening we got no more PTEROPODS but great numbers of *Atlanta*, Fig. 7, already described, and a considerable number of a GASTEROPODOUS MOLLUSC "*Ianthina exigua*" the characteristic striæ of which are well shown in Fig. 3. Most of them were empty shells and none had the animal alive.

On the following evening about 6 P. M. in Lat. 21·5 S. Long. 83·46 E. we got a few more *Ianthina exigua* in a similar condition and with them two *Cuvierias* and a few specimens of *Hyalæa*, Fig. 12. For the next few days we met with tolerable success but got nothing new.

On the 16th June in Lat. 4·32 S. Long. 80° 4 E. a little before 8 P. M. we took in the net a species of *Hyalæa*, Fig. 18, somewhat resembling Fig. 13, but more globose and with its spines less developed. The most part of the shell is transparent and colorless, but the anterior surface is claret colored deepening in color towards the aperture; animal nearly white with a tinge of purple; mode of progression similar to those already described.

June 17th, Lat. 2·15 S. Long. 79½ E. at dusk we caught in the net several small *Cleodoras* about a quarter of an inch long triangular, wedge-shaped and pointed as represented in Fig. 20. The animal is of a pale milky color and moves actively by means of its two expanded fins, between which is visible a slight projection which appears like a head; with these we found several *Atlantæ* and a *Hyalæa* similar to that obtained on the previous evening. Later in the evening when quite dark, we took in our net two specimens of a brown *Hyalæa*, Fig. 19, which I am not prepared to say is specifically distinct from Fig. 13, as a difference in locality is known

to produce such remarkable aberrations in species; it is however more elongated in form, and its lateral spines are less produced. Its deep brown color is worthy of note among shells most of which are of glassy transparency. In the net with these were several specimens of *Ianthina exigua* and three or four *Cleodoras*, larger and of a more elegant and curvilinear form than the last. Their general appearance is well depicted in Fig. 21. The animal is provided with two alar appendages of considerable size and moves rapidly.

June 18th, Lat. 1.12 S. Long. 78·44 E. This evening just before dark many specimens of *Ianthina fragilis* floated by the ship. What first attracted our attention was the *dead white* appearance of their vesicular floats which we could thus readily distinguish from the particles of foam caused by the motion of the ship, we soon captured in our net a considerable number of them in very perfect condition, [see Fig. 4.] the shell is covered with a very delicate epiderimis the animal when handled exudes a purple stain; when in a state of repose on the surface of the water the shell is entirely submerged the float only being above the surface except that it occasionally raises its proboscis and mouth armed with numerous slender curved teeth visible to the naked eye; the float is attached to the foot of the animal from which it could be readily detached or peeled off, apparently without injuring the animal. Most of the specimens taken were the *I. fragilis* but among them were three examples of the *Ianthina globosa* Fig. 5. This shell is in color a deeper blue and it wants the carinated form of *I. fragilis*. The floats of these molluscs have been repeatedly described and commented upon by authors. It was observable that the float of *I. globosa* was more loosely constructed and of a more irregular form than that of *I. fragilis*. One of the former had the lower part of its float studded with egg capsules, having the appearance of a cluster of small pendulous blue vesicles, each of which, when examined under a microscope, was found to contain numerous minute ovules of a pale blue color. Shortly after 8 P. M. we got several additional specimens of *Cleodora*, Fig. 21 and about 9 P. M. a small specimen of *Argonauta*, Figs. 1 and 2—not the *Argonauta argo*, but an allied species of a horn color, having a broader keel and fewer tubercles. The animal belongs to the CAPHALOPODA, already mentioned as the highest class

of Mollusca approaching in their physical conformation and instincts to the VERTEBRATA. This superior intelligence was exhibited by the animal in question. When taken out of the towing net it had artfully folded its limbs over the shell so as to resemble a nodulous mass of brown sponge, which indeed I at first supposed it to be, but when placed in a tumbler of sea water and left undisturbed, it cautiously began to creep about the bottom of the tumbler, head downward, it then repeatedly darted against the sides of the tumbler and while doing so, it often changed color rapidly from pale brown to dark purple, apparently with the double object of concealment and escape. In swimming the animal effected locomotion not only by the rapid contraction and expansion of its arms but by the forcible expulsion of water through its syphon. The tubular extremity of the syphon is seen in Fig. 1. At the approach of death the animal underwent some convulsive movements which appeared to disengage it from its shell, after which it ceased to move and quickly died; another specimen taken on the following evening exhibited precisely similar phenomena when dying. Naturalists were long divided as to what animal was the true possessor of the *Paper Nautilus*, some throwing doubts on the CEPHALOPOD being the original inhabitant of the shell. Even at the present day authors are at variance upon this point, some even asserting that the *Argonaut* is not a shell but merely an envelope for containing the eggs of the CEPHALOPOD found in it. This scepticism in the public mind appears the more extraordinary, from the well established fact, that this animal (and no other) has been found in this shell in all various stages of growth, as has been fully proved by the interesting experiments of Madame Power. Professor Owen has also demonstrated that the *pearly Nautilus* and other allied shells, recent and *fossil*, appertain to CEPHALOPODS. Much more might be adduced to prove that this animal is the legitimate owner of the shell but it has already been done by abler hands. However I conceive that as the matter stands at present, every circumstance should be noted that may tend to remove obscurity, either by imparting new facts or by corroborating those already recorded.

Our voyage was now near its close and notwithstanding that we continued to ply our nets assiduously, we did not succeed in cap-

turing any more MOLLUSCA, although many interesting forms of CRUSTACEA rewarded our efforts, a description of which is hardly within the scope of these pages, which however, I trust, have sufficiently shown, how the monotony incidental to a sea voyage may be relieved by giving attention to Zoology, facilities for which present themselves much oftener than might be imagined by those who have not practically pursued such investigations.

References to plates IX., X., XI. *and* XII, *illustrating Mr.* TRAILL'S *paper.*

[We had hoped to receive a synoptical table of the species collected by Mr. TRAILL, but as he finds himself unable from the want of books of reference to assign the trival names of the several specimens or to pronounce with certainty which of them may be considered new, the following list has been added to facilitate references to the Plates.]

PLATE IX.

Genus ARGONAUTA.

Dorsal arms (of the female) webbed at the extremity, secreting a symmetrical involuted shell. *Mantle* supported in front by a single ridge on the siphon.

Fig. 1. Animal of *Argonauta sp.*? detached from the shell. Color light brown or horn color with crimson spots.

Fig. 2. The Shell.

a. Front view.

b. Lateral view.

All of the natural size.

Genus IANTHINA.

SHELL thin, trochiform; *nucleus* minute, sinistral; *aperture* foursided: *column* tortuous; *lip* thin, notched at the outer angle; *color* violet at the base becoming white on the spire.

Fig. 3. *Ianthina exigua* (magnified).

The small figure shows the natural size.

Fig. 4. *I.* ——— *fragilis.*

Fig. 5. *I.* ——— *globosa.*

Genus ATLANTA.

SHELL minute, glassy, compressed and prominently keeled; *nucleus* dextrally spiral; *aperture* narrow, deeply notched at the keel; *operculum* ovate, pointed.

Fig. 6. *Atlanta* ——— (magnified).

The small fig. shows the natural size.

Fig. 7. *Atlanta* ——— (magnified.)

The small figures show the natural size.

a. With the animal, exhibiting the bifid foot employed in swimming.

b. The eye magnified.

Genus LIMACINA.

SHELL subglobose, sinistrally spiral, umbilicate; *umbilicus* margined; *operculum*, none.

Fig. 8. *Limacina?* —— (magnified) front and lateral view.

PLATE X.

N. B.—The large figures represent the shell magnified—the smaller ones the natural size.

Genus HYALÆA.

SHELL globular, translucent; dorsal plate rather flat, produced into a hood; *aperture* contracted, with a slit on each side; posterior extremity tridentate.

Fig. 9. *Hyalæa*——.

Fig. 10. The same showing the animal with its alar appendages in a state of rest.

Fig. 11. The same showing the appearance of the animal when in motion.

Fig. 12. *Hyalæa*——.

Fig. 13. *Hyalæa*——: Quite transparent, with rust-colored patches; animal purple.

Fig. 14. *Hyalæa*——: Shell compressed, animal purple.

Fig. 15. *Hyalæa*——.

Fig. 16. *Hyalæa*——: Shell with posterior extremity elongated, curved, aperture more expanded.

Fig. 17. *Hyalæa*——: Shell deeply grooved, and purplish.

Fig. 18. *Hyalæa*——: Shell globose, claret colored.

Fig. 19. *Hyalæa*——: Shell of a deep brown color.

PLATE XI.

Genus CLEODORA. SHELL pyramidal, 3 sided, striated transversely; *aperture* simple, triangular, with the angles produced, apex acute.

Fig. 20. *Cleodora* ——: (magnified) *shell* triangular elongated, wedge shaped, pointed; animal of a pale milky color.

Fig. 21. *Cleodora*——: (magnified) *shell* triangular, compressed.
a. Front view.
b. Posterior view.
c. Section of aperture.
d. Natural size.

Fig. 22. *Cleodora*——: double the natural size; *shell* hyaline, with broad undulating transverse sulci.
a. Lateral view.
b. Front view.
c. Transverse section at the aperture.
d. Natural size.

Genus CRESEIS,

SHELL as in *Cleodora* but slender, conical, straight or curved

Fig. 23. *Creseis*——: (magnified) *shell* elongated, carinated, pointed, straight; *alæ* of the animal fringed.
a. With the animal as when swimming; natural size.

Fig. 24. *Creseis*——: (magnified), appears to differ little from Fig. 23, *alæ* of the animal rounded, simple.
a. With the animal, natural size.

Fig. 25. *Creseis*——: (magnified) *Shell* curved at the point.
a. With the animal, natural size.

Genus CUVIERIA.

SHELL cylindrical, transparent; *aperture* simple, ovate; apex acute in the young, afterwards jointed and often deciduous.

Fig. 26. *Cuvieria*——(magnified).
a. With the animal, natural size.

Genus GLAUCUS.

Animal elongated, slender; *foot* linear, channel-led; *tentacles* four, conical; *branchiæ?* supported on 3 pair of lateral lobes.

Fig. 27. *Glaucus*——: natural size. Taken 34 S. Lat. 20 W. Long.

Fig. 28. *Glaucus*——: natural size. Taken near the shore 17·42 N. Lat. 83 W. Long.

PLATE XII.

Chart of the track of the American Clipper *Blue Jacket* showing the localities at which the different specimens of *Molluscs* as indicated by their numbers, were captured.

III. *On a Photographic Printing Process. By Captain* TRIPE, *12th Regt. N. I.*

[This paper which was read at the Meeting of the Photographic Society, has been received from the Secretary to that Society, for publication in the Journal.]

BANGALORE, *22nd September*, 1856.

GENTLEMEN,—I have much pleasure in laying before you this paper which Dr. SCOTT will read to you. There is a value in the Printing process, that I am about to describe which, coupled with the fact, that I do not obtrude on you uninvited, will acquit me of presumption in doing so.

My facilities for acquiring experience in this branch of the art, have been great, and there are few, to whom this will be read, who have the requisite leisure, to practice the various processes, from time to time put forward, and so decide for themselves, which would be the *simplest*, as to manipulation, the *safest*, as to permanence, and the *best*, and *most certain*, as to results. I have followed many methods—and, keeping in mind all their several advantages, I have no hesitation in recommending for your use, though it is by no means, the *simplest* in manipulation, a Process published by Mr. SUTTON of Jersey, in which Hyposulphite of Gold is used as a toning agent. The Council of the Society are, I believe, about to notify the opening of an Exhibition to be held at Madras during February next, and, as it is only through *successful Printing*, that the Photographer's skill is properly represented, *this* may be no inappropriate occasion to bring to your notice a process, not as yet generally followed, but which will show itself *superior*, it is to be hoped, over "*Old Hypo*" at the forthcoming Exhibition.

Thin French negative Paper, albumenized, is what I find best for my purpose. To albumenize, use

10 oz. Albumen,
20 oz. Dist. Water,

300 grs. Muriate of Ammonia,
240 grs. Sugar-candy.

Float the paper on this for half a minute. Hang up and dry—Ironing this paper before sensitizing seems quite unnecessary.

To sensitize use,

60 grains Nitrate of Silver,
12 minims Acetic Acid,
1 oz. Dist. Water.

Float it on this for 4 or 5 minutes—hang up to dry.

Expose in the pressure frame until the lights are a shade or two darker than they ought to be in the finished picture. When printed sufficiently—wash all traces of the aceto-nitrate out of the paper—in a darkened room. Dissolve off the Albuminate of Silver in a bath of Hyp. 1 to 8 of water, or of liquor Amm. 1 drachm to 1 pint of water, in the former about 8 minutes—in the latter the action is more violent and practice only will enable the operator to judge of the time.

The Print must be well washed after this bath and then immersed in the toning bath composed of

10 grains Chloride of Gold,
30 oz. Distilled water,
30 grains Hyposulph. Soda,
30 minims of Hydrochloric acid *if* the chloride of Gold be *neutral.*

Mix the Gold and the Hypo. each in 15 oz. of water, and pour the former into the latter gradually stirring the white. Then add the acid if necessary.

Keep the picture in this, till the shades are a deep purple, and the lights, a pleasing grey. Then pass through water—(not for more than a minute or two as the lights are yellowed by longer washing,) into the second fixing bath of Hypo. 1 to 8 of water to ensure its perfect fixation. It should remain in this from ten to fifteen minutes. Wash as usual.

A good method of washing is to take up a dishful of pictures (8 or 10) and let them drain on a piece of plate glass slanted, for a minute or two, then lay it flat and with a glass roller express the liquid from the papers as well as you can, replacing the mass in a dish of fresh water and let them separate of themselves which they will do after some shakings of the dish. This should be done after a few washings after fixing—and repeated once or twice—during the changing of water which ought to be every quarter of an hour for twelve hours or so.

MEMO.

Throw down the Nitrate of Silver in the first washings—great saving of the silver salt will result from this.

The same economy can be practiced with regard to the toning bath—by recovering the unused gold.

I have found that 1 grain of Chloride of gold tones three pictures 14 × 12.

It would be economical to make Chloride of gold for oneself—a half sovereign will give 86 grains of Chloride—and the cost will be about 6 Rs.

Put the half sovereign into a glass stoppered bottle and pour upon it six drachms of Aqua Regia—made of

1 part nitric
5 „ mureatic } acids.
6 „ water.

Let it dissolve gradually adding acid when necessary. When dissolved dilute, and throw down the gold by protosulph. iron (6 to 1 of gold)—

Re-dissolve (after thorough washing) and evaporate on a water bath.

A convenient form of drying apparatus can be made by two sticks 12 feet long 3 inches broad and 1¼ thick slanted against a wall—long (according to the wishes of the Photographer) rods squared and veneered with deal or other soft wood should have their

ends lodged in squared hooks at intervals of 10 inches on the sticks —the rods fitting the hooks—I have on a space of wall 12½ feet long dried 143 papers almost daily for months and find it most convenient.

In conclusion I would mention what seem to me to be the advantages of the Process I have described.

First.—The saving of time in not overprinting as required by the old Hypo. processes.

Second.—The agreeable tone of the picture—its firmness and the preservation of its half tones.

Third.—The comparative certainty of its working.

Fourth and most important.—The permanence. Prints sulphuretted have been proved to be not so safe from fading as Prints coloured by Gold. In this Process the toning is by Gold only—and with subsequent care in washing this seems to be as safe as Photographic Printing can be.

I must not close without reminding you that nearly all of this is given in Photographic works—and that I am merely bringing the subject to your notice that you may benefit by it as I have done.

The subjoined Table of "Formulæ for preparing Albumenized Paper," was communicated by Captain J. D. SCOTT, of the Madras Artillery.

"Similar Tables" he observes "might be drawn up for the "Fixing and Toning Baths" &c. &c.

"In England 1 Egg gives an ounce of Albumen, but in this country, when the Eggs are very much smaller, I find that 24 Eggs give about 16 ounces of Albumen, i. e. 1½ Eggs are required to give 1 ounce."

FORMULÆ FOR PREPARING ALBUMENIZED PAPER.

Number.	Name of Operator.	Albumen.	Distilled Water.	Chloride of Soda.	Muriate of Ammonia.	Muriate of Baryta.	Iodide of Potassium.	Time to float on Solution.	To Excite. Nitrate of Silver.	Water Dis.	Glacial Acetic Acid.	Time to float on solution.	Authority.
		Ounce.	Ounce	Grains	Grs.	Grs.	Grs.		Grains	oz	Ms.	Mins.	
1	Horne.....	1	1	20 or	20	0	0	A few minutes	40	1	0	10	Thornthwaite's "Guide to Photography," 9th Ed. page 66
2	Dr. Diamond	1	1	5	5	0	0	3 or more ,,	40	1	0	3 to 5	"Notes and Queries" for 1853
3	Delamotte .	1	1	20	0	0	0	3 or 4 ,,	60	1	0	4 or 5	"Practice of Photography" 3rd Ed. page 53.
4	Pollock.....	4	1	100	0	0	0	4 ,,	90	1	0	.....	London Photographic Journal Vol. 1 page 85
5	Lyte.....	1	1	0	0	72½	0	5 to 10 ,,	120	1	0	.....	Do. Vol. 1 page 116
6	Spencer	1	1	16	0	0	0	1 to 10Secds.	90 or 100	1	0	A few	Do. Vol. 1 page 204
7	Hardwich...	½	1	15	or 15	0	0	1 Minute ...	60	1	0	3	Photographic Chemistry, 2nd Ed. page 197
8	Hennah	1	1 drs.	0	32	0	1	1 ,, ...	50	1	2	2 or 3	"The Collodion Process" 4th Ed. page 51
9	Long..... ..	1	2	5	0	0	0	3 ,, ...	50	1	0	.....	"Practical Photography" page 46
10	Highley	1	1	240	0	0	0	2 or 3 ,, ...	120	1	0	.....	Journal Microcopic Soc. 1853, page 191
11	Cundall.....	8	10	Sat Sol 6 drs. (a)	0	0	0	2 ,, ...	60	1	0	.....	"Photographic Primer" page 26
12	Sutton....	Whites of 2 doz. Eggs.	10	480	0	0	0	10 Seconds....	ounces 2½	20	drs 4	5	"Calotype Process" page 53
13	How.	1	1	12	0	0	0	5 to 10 Minutes	50	1	0	3	"On the Production of Positive Proofs" page 9
14	Howlett	1	1	40	0	0	0	1 ,,	60	1	0	1	"Howlett on Printing" page 8

N. B. The Salt is to be dissolved in the water, then add the Albumen—then with a bundle of Quills tied together beat the whole into a *perfect* froth—allow it to stand for several hours and subside—then pour into a Tray for use.

(a) And acetic acid 51 Minims.

IV. *Entomological Papers, being descriptions of new Ceylon Coleoptera with such observations on their habits, etc., as appear in any way interesting.* By JOHN NIETNER, *Colombo, Ceylon.*

No II.

[N. B. In No. I. species 1 to be cancelled, being synonymous with *Chlænius nitidulus*. Dej.

Spec. 2. ditto: syn. *C. xanthophilus*. Wieden.]

TRIB. LEBIIDÆ.

Anchista. n. g. N.

Corpus depressum, ovatum. Mentum dente magno obtuso, lobis parum breviore, his extus rotundatis, apice acuminatis. Palpi robusti, maxillares art. ultimo magno ovato, apice obtuso, labiales art. ultimo valde securiformi. Ligula cornea apice obtuse acuminata, labri marginem anteriorem attingens. (Paraglossæ mihi non dissectæ.) Labrum transversim quadratum. Mandibulæ simplices apice arcuatæ et acuminatæ. Antennæ robustæ art. 1° mediocri, 2° brevi, 3° quarto paulo longiore, 4-10 subæqualibus, 11° penultimo parum longiore. Thorax longitudine latior, angulis anticis rotundatis, medio obsolete angulatus, basi angustatus, angulis rectis. Elytra apice quadrate truncata. Fedes robusti tarsis art 4° profunde bilobo, unguibus fortiter pectinatis.

12. *Anchista modesta. N.*

A. brunneo-testacea, elytris (maculis 2 obsoletis subhumeralibus exceptis) obscurioribus abdomine piceo. Long. corp. 4 lin.

Caput fronte medio leviter uni-impressa. Thorax linea media longitudinali divisus. Elytra apicem versus parum dilatata, striato-punctata, ad striam 2^m^ punctis 2 majoribus subapicalibus, cum thorace marginata.

Prope Colombo nocte ad lumen cepi.

The characteristics of this new genus are those of the g. *Calleida* (between which and *Cymindis* I place it) excepting the ligula which

in this case is obtusely acuminated, the last joint of the maxill. palpi which is obtuse at the apex and the thorax which is not as in *Calleida* longer than broad but the reverse. From *Cymindis* it would differ principally in the deeply bilobed 4th tarsal joint, and in some other minor points, but it is difficult to say what the true characteristics of this genus (which appears for this reason to require a careful revision) are, if even Lacordaire uses the particle "ou" not less than five times in the diagnosis he gives of it in his g. d. Col. However, I feel justified in separating *Anchista* from *Cymindis* as well as from *Calleida*. The name "*Anchista*" has reference to the affinity of the insect to the two genera just mentioned, whilst the specific name "*modesta*" refers to its inconspicuous colors. Amongst its peculiarities weight ought to be laid upon the plumpness of the palpi, in fact all other parts of the mouth and even the whole head, which was very striking to me.

Like many of my best CARABIDÆ I found this insect at night on the table whither it had been attracted by the light, I may mention that the single specimen which came thus into my possession has an oblong shallow impression on either elytron, perhaps accidental, perhaps a peculiarity. The anterior tarsi are dilated and furnished with hairy brushes below, longest at the apex of the lobes of the 4th joint.

Elliotia. n. g. N.

Corpus subconvexum, ovatum. Caput mediocre, oculis maximis. Mentum leviter transversim emarginatum, edentatum, lobis acuminatis. Ligula sub-membranacea apice truncata, paraglossis connatis marginem anteriorem parum superantibus, obtusis. Palpi elongati, art. ultimo elliptico, acuminato. Labrum magnum transversum, integrum, mandibulas, fere obtegens. Maudibulæ validæ, edentatæ. Antennæ robustæ, filiformes, humeros superantes, art. 1° mediocri, 2° brevi, 3° quinti prope longitudine, 4° præcedente breviore, 2-4 obconicis, 5-10 æqualibus, cylindricis, 11° præcedente tertia parte longiore, 4-11 pilosis. Thorax parvus, capite minor, transversus, longitudine duplo latior; antice leviter emarginatus, lateribus elevato-marginatus, ab apice ad medium lateribus rotundatus, medio fortiter angulatus, a medio ad basin valde abrupteque

angustatus, basi truncatus, subtus cylindricus. Scutellum leviter excavatum. Elytra ovata, marginata, apice sat fortiter truncata. Pedes omnes subæquales, simplices, tenues, tarsis cylindricis art. 3-4 magis minusve trigonis, unguibus simplicibus. Prosternum carinatum.

In honorem Dom. Hon. Walteri Ellioti (Madaraspatani), naturalistæ diligentissimi, meritissimi, nomen imposui.

13. *Elliotia pallipes. N.*

E. supra nigra-nitida, thorace scutelloque rufo-testaceis, labro elytrorumque limbo atque sutura brunneo-testaceis; subtus piceus, pectore rufo-testaceo, pedibus albidis, his geniculis oreque (palpis obscurioribus exceptis) testaceis. Long. corp. 2¼ lin.

Caput ad antennarum insertionem et inter oculos utrinque profunde impressum. Thorax basi rugosus, ante medium utrinque uni-impressus, linea media longitudinali divisus. Elytra punctato-striata, infra humeros leviter impressa.

In ripis lacus Colombensis sub veget. putrescent. mens. Jul. non infrequenter legi. Agilis est et avolare semper expeditus.

A pretty and very interesting little insect, about whose systematic position I am not quite satisfied, however I provisionally place it towards the end of the true LEBIIDÆ. I find it most to agree with the descriptions of the g. *Pentagonica* S. G. and *Rhombodera* R. with neither of which, however, it is identical. The head is distinguished by the large and prominent eyes and four deep impressions, two larger ones at the root of the antennæ, two smaller ones between the eyes, also by a very distinct neck which connects it with the thorax; the labrum is large, transverse and entire with the angles rounded off and the base narrowed; the mentum is but slightly transversely emarginated, edentate; the ligula is truncated at the tip, the paraglossæ adhere to it, reach a little beyond it and are obtuse at the apex; the palpi are rather long with the last joint elliptic, acuminate; the antennæ are strong, filiform and reach beyond the shoulders, joints 5-10 are of equal length and cylindric, 4-11 are pilose. The most remarkable part of the insect is, however, the thorax which is of a sub-rhomboidal shape, trans-

verse, smaller than the head, as broad again as long, it has two strong lateral angles at the middle, each furnished with a strong bristle, the anterior part has the sides rounded, the posterior abruptly obliquely contracted, at the base it is cylindric. As a specific distinction of the thorax I mention moreover, that in the present species, it is impressed with two deep punctures before the middle and that it is rugose at the case. The abdomen is slightly peduncled. The scutellum is slightly excavated. The elytra are oval, rather convex and impressed with rows of punctures. The legs are simple and weak, apparently equal in both sexes. The anterior tarsi are a little stouter than the rest, but not dilated nor furnished with any additional clothing below, the anterior tibiæ are deeply notched. As to the color: the head and wing-covers are black, the latter with the suture and margin of a light brown and highly polished, the thorax is reddish and the legs are whitish. The insect is very agile and ever ready to take to its wings. It is of quite a peculiar appearance, imparted to it by its large eyes, small curiously shaped thorax and rather plump elytra and abdomen. I may further mention that I have observed the 4th joint of the maxillary palpi to collapse when the specimens become quite dry, so as to give them a different, spoonlike, appearance apt to mislead any one who has not examined fresh specimens.

14. *Harpalus advolans. N.*

H. æneus, clypeo, labro, antennis mandibulisque brunneis, his apice nigris, subtus testaceus, lateribus obscurior, pedibus flavis, tarsis geniculis spinulisque brunneis, ore testaceo. Long. corp. $4\frac{3}{4}$—$5\frac{1}{4}$ lin.

Caput læve. Mandibulæ unidentatæ. Palpi art. ultimo elongato, apice truncato. Menti dens simplex, obtusus. Ligula apice quadrate truncata, angulis acutis leviter productis, paraglossis inflatis marginem anticum parum superantibus. Thorax longitudine sesqui latior, dorso anticeque lævis, basi rugoso-punctatus, 2-impressus. Elytra striata, cum thorace anguste marginata. Variat colore testaceo-ænea.

Nocte ad lumen, sed adhuc non usquam alibi, non infrequenter cepi.

I have taken this species not unfrequently at night on my table but have never found it anywhere else as yet. It is not very remarkable, for which reason I have mentioned the parts of the mouth in the description, these being moreover not very constant in this genus. The insect is of the usual oval, *Harpalus*-form, of a dark metallic green on the back and more or less yellowish or light brown below, the color of the back changing occasionally to a brownish green.

15. *Oodes piceus. N.*

O. ovatus, subconvexus, piceus, tarsis, palpis antennarumque articulis 3 primis castaneis, palpis apice flavis. Long. corp. 4 lin.

Caput parvum, inter antennas linea latitudinali abbreviata impressum. Labrum integrum, punctis 3 impressum, puncto intermedio bi-lateralibus uni-setigeribus. Mandibulæ validæ prominentes. Palpi art. ultimo elongato-ovato, apice leviter truncato. Menti dens apice truncatus leviterque sinuatus. Antennæ art. 3° quarto æquali nisi paulo breviore. Thorax amplus basi elytris applicatus, apicem versus angustatus, angulis posterioribus subdepressis translucentibus, ante scutellum leviter sinuosus, ante sinum obsolete latitudinaliter impressus. Elytra striata, cum thorace angustissime marginata Pedes validæ, ant. tibiis apice intus uni—,intermed. et post. bi-calcaratis.

Specimen singulum f. in ripis lacus Colombensis sub vegetab. putrescent. legi.

As already one species with a bifid mentum tooth (*O. pulcher*) has been received in this genus I have waived the hesitation I should otherwise have felt to refer to it the present one, the tooth of which is of a similar description. I have not seen the *O. pulcher*, but as it is said to be an inhabitant of this part of the world it may possibly be identical with my species. If not, they might, as the g. is otherwise pretty constant in its characteristics, be separated under a new name as types peculiar to India. Besides the abnormal mentum tooth the insect has not much to distinguish it from others of the genus. The labrum is, however, peculiar being entire, or even very slightly produced in the middle, with the angles rounded off, it is impressed near the anterior margin, with three deep punc-

tures, the central one of which is furnished with two—the lateral ones with one strong bristle each. The anterior tibiæ are but slightly notched. The prosternum is largely developed, reaching beyond the anterior coxæ, obtusely acuminated and received in a deep excavation of the mesothorax. But I doubt that the development is sufficiently large to entitle the insect to a place in the g. *Lonchosternus* Laf. which however I have not seen in nature.

16. *Trichopterys cursitans*. N.

T. ovata, subconvexa, pubescens, supra obscure ænea, elytris æneo—brunneis, subtus picea, pedibus oreque testaceis, antennis art. 3-11 nigrescentibus. Long. corp. $\frac{1}{2}$ lin.

Antennarum clava art. 2 primis ovatis, ultimo conico, acuminato. Thorax amplissimus, elytris tertia parte minor, convexus, angulis acutis, basi humeros amplectens, apice angustatus. Elytra subdepressa, subquadrata, apicem versus parum angustata, truncata, abdominis 3-4 segmenta ultima non obtegentia. Tibiæ medio incrassatæ. Coxæ posticæ maxime dilatatæ. Mesosternum carinatum.

Sub veget. putrescent. exsiccescentibus in prov. occid. copiosa.

A rather large species commonly met with in this part of the Island under rotting vegetable substances somewhat dried up. It is very agile and ready to take to its wings which are of the beautiful typical construction, about twice the length of the body and in dead specimens frequently produced behind. These insects vary a little as to shape, some being more narrowed behind than others, and also as to the exact number of the abdominal segments left uncovered by the elytra. The head is large but exhibits nothing abnormal or extraordinary; the thorax is very large, emarginated in front and behind, with the angles acute, the basal ones enveloping the shoulders; the wing-covers are subquadrated with the angles rounded off and a little narrowed behind; the legs have the tibiæ incrassated in the middle and the posterior coxæ very much dilated and distant from each other, in all other respects they are typical. The shape of the body is that of an egg, broadest at the shoulders, gently narrowed towards the apex of the abdomen, and rounded off towards the head.

17. *Trichopteryx immatura. N.*

T. præcedenti similis, differt tamen colore supra æneo-testacea subtus testacea, antennarum art. 3-11 nigrescentibus; differt etiam, corpore crassiore, magis quadrato, capite paulo majore, thorace minus convexo, parum ampliore, elytris abdomen totum vel fere totum obtegentüs. Pedes, antennæ etc. omnino præcedentis. Long. corp. $\frac{1}{3}$ lin.

In præcedentis societate specimina nonnulla legi.

Of somewhat the appearance of an immature individual of the former but sufficiently distinct to be formed into a new species. The insect is altogether of a different appearance imparted to it by the greater general plumpness of the body, the larger head, the less convex but at the same time possibly still ampler thorax, the altogether more quadrated shape, etc. The remark regarding the exact number of abdominal segments left uncovered by the elytra, applies to this and all other species as well. The present one has generally the last two segments uncovered.

18. *Trichopteryx invisibilis. N.*

T. ovata, subdepressa, subparallela, pilosa, supra obscure ænea. subtus picea, pedibus, abdomine, antennis oreque testaceis. Long. corp. vex $\frac{1}{4}$ lin.

Thorax amplus, elytris sesqui minor, convexus, angulis posticis humeros vix superantibus. Elytra oblonge quadrata angulis rotundatis, subdepressa, truncata, abdomen totum vel fere totum obtegentia. Coxæ posticæ approximatæ. Tarsi typicis minus elongati, art. 3° præcedentibus haud multo longiore.

Cum *T. cursitante* victitat; frequenter legi.

A very pretty and very distinguished species. Its most striking peculiarity consists in the posterior coxæ which are as little distant from each other as those of the anterior legs, and almost touch each other, and also in the shortness of the tarsi. The head with the antennæ, the mesosternum, the tibiæ, which are incrassated in the middle, the posterior coxæ with regard to the enlargement are quite typical. However, the thorax and elytra differ again from those of *T. cursitans*, (which in every respect may be looked upon

as the typical representative of the family in Ceylon and which is here referred to as such) the former by the shortness of the posterior angles which can hardly be said to envelope the shoulders, the elytra by being less or not at all narrowed behind, giving an oblong rather than an oval shape to the insect. Although in length only about one half shorter, it is in bulk certainly one-fourth smaller than *T. cursitans*, and, although probably the smallest Ceylon beetle, it is distinguished at first sight.

19. *Ptilium subquadratum. N.*

P. subquadratum, subconvexum, pilosum, obscure æneotestaceum, thorace dilatiore. Long. corp. $\frac{1}{4}$ lin.

Caput mediocre. Antennarum clava art. 1° inverte conico, 2° subcylindrico, ultimo elongato-ovato. Thorax convexus, angulis basalibus humeros fortissime amplectentibus, apicem versus valde rotundatus, apice leviter sinuatus. Elytra quadrata, abdomen non totum obtegentia. Scutellum parvum. Pedes robusti tibiis apicem versus incrassatis, tarsis art. 3° primi secundique longitudine, his subbilobis subtus penicillatis, coxis posticis simplicibus distantibus. Mesosternum non carinatum.

Ubi præcedentes sed infrequenter occurrit.

The g. *Ptilium* is the repository for all the anomalies of the family, its characteristics therefore are very vague, but if the absence of the mesosternal carina and the simplicity of the posterior coxæ are the determining features amongst them, the present species, in spite of a variety of anomalies exhibited in other respects, belongs to it. The head is of middling size; the antennæ robust with the 1st joint of the club of the shape of an inverted cone, the 2nd rather cylindrical, narrowed at the base and the last elongate, ovate. The thorax is of very different structure from that of the foregoing species of the family, the basal angles being unusually far produced beyond the shoulders, towards the head it is strongly and rapidly rounded off, being thus altogether of a semicircular shape, at the apex it is merely slightly sinuated, and the head is inserted rather below than in this sinuosity, the whole thorax moreover is very convex whilst the elytra are depressed. The wings vary from the

typical form by being fringed with short simple cilia instead of those long feathery appendages, they are moreover without a distinct peduncle but still folded in the manner characteristic of the family. The legs are stout with the tibiæ thickest at the tip, the 3rd tarsal joint is of the length of the preceding two, the latter are somewhat bilobed and hairy below. The posterior coxæ are simple and distant. The mesosternum without a carina. The whole shape of the insect is quadratic rather than otherwise.

20. *Ptenidium macrocephalum. N.*

P. ellipticum, subconvexum, nitidum, sparsim pilosum, supra piceo-æneum, subtus piceum, pedibus oreque testaceis. Long. corp. ¼ lin.

Caput maximum. Antennarum clava elongata articulis ellipticis. Thorax subquadratus antice posticeque angustatus, basi punctis 4 magnis profunde impressus. Elytra ovata, medium versus leviter inflata, apice obtuse acuminata, abdomine longiora et ampliora, punctulis lineis dispositis obsoletissime impressa. Alæ corpore plus duplo longiores. Tibiæ fortiores spinulosæ. Tarsi breviores. Prosternum carinatum.

In præcedentium societate frequenter lectum.

This is perhaps the prettiest of the five species of the family just described and at first sight recognised by the shape of its body and the polished back. The head is very large. The thorax is narrowed in front and behind, at the latter place impressed with 4 deep not to be overlooked punctures. The wing-covers are oval, a little inflated about the middle, rounded at the apex and longer and wider than the abdomen. The prosternum is carinated.

It affords me much gratification to be enabled to publish representatives of three genera of this highly interesting and probably very extensive and widely distributed family of pigmies, the Asiatic representatives of which have hitherto been entirely unknown. I have no doubt that even this Island is the abode of a great many more species.

21. *Stenus barbatus. N.*

S. elongatus, æneo-niger, nitidus, punctatus, sparsim pubescens, pedibus palpisque albidis, ore coxisque testaceis, antennis brunnescentibus. Long. corp. 2½ lin.

Caput thorace tertia parte latius, fronte costis 3 abbreviatis, antice albido-pubescens. Antennæ art. 3° sequentium 2 fere longitudine, 3 ultimis elongatis, ellipticis. Palpi max. elongati apice densius pubescentes. Thorax cylindricus medio leviter incrassatus, basi subquadratus. Elytra thorace paulo longiora, sed fere duplo latiora, convexa, ovata. Abdomen immarginatum. Pedes elongati tenues, tibiis apice tarsisque fortiter setosis, his art. 4° profunde bilobo.

In lacus Colomb. ripis specimina nonnulla legi.

This as well as the following species belongs to Erichson's division II. B. of the g., both having the abdomen immarginate and the 4th tarsal joint bilobed. Everything about this species is elongated. The head is about one-third broader than the thorax, the forehead is slightly excavated with 2 elevated ridges running from the root of the antennæ a short distance upwards, a third runs from the crown of the head down towards the centre of the two former,but all three reach only to about the middle of the head. The part below the antennæ is covered with white hair. The antennæ have the 3rd joint much elongated and the terminal club composed of elliptic joints. The thorax is rather slender, incrassated at the middle, gradually narrowed in front but nearly quadratic behind. The elytra are longer than the thorax, about double its breadth and oval being slightly narrowed at the shoulders and the apex. The legs are long and slender, hairy at the apex of the tibiæ and the tarsi, the latter very much so on the inner side. The insect is of a metallic black color highly polished, the legs, palpi and the first 2 antennal joints are whitish, the tibiæ and the apex of the palpi being, however, rather darker, joints 3-11 of the antennæ are brownish, the coxæ and the mouth are yellowish, the tarsi have a brown spot at the apex of the first 3 joints, the claws are black. The insect is punctured all over, but less so on the abdomen, the apical segments of which are indeed nearly smooth, and sparingly covered with small white hairs.

22. *Stenus lacertoides. N.*

S. robustus, nigro-æneus, dense profundeque punctatus, subtus sparsissime pubescens, pedibus palpisque testaceis, femoribus apice nigrescentibus, antennis oreque castaneis. Long. corp. 1½ lin.

Caput thorace quarta parte latius, fronte 2-costata. Antennæ robustæ art. 3° quarto paulo longiore, 9-10 globosis, 11° conico. Thorax cylindricus, medio fortius incrassatus, latitudine quarta parte longior, margine anteriore elevato, basi subquadratus. Elytra thorace longiora, convexa, humeris prominentibus. Abdomen immarginatum. Tarsi art. 4° profunde bilobo.

In prov. occid. stagnorum ripis rarius occurrit.

About this species everything is robust. It is well distinguished by the rounded club-joints of the antennæ, the elevated anterior margin of the thorax, the prominent shoulders and its general shortness and plumpness. The forehead is rather more depressed or excavated than in the former, the 2 antennal ridges are shorter, the vertical one is altogether obsolete. The palpi are robust. The 3rd antennal joint is about one-third longer than the 4th. The thorax is shorter and plumper than in the former. The elytra are less oval, having the shoulders more prominent and only the apex rounded off or narrowed. The legs are similar to those of the former, but more robust, less hairy and have the tarsi more cylindric. The insect is of a blackish metallic color, the legs and palpi are yellowish, the tibiæ, however, the apex of the palpi and also joints 1-2 of the antennæ rather darker, the femora are blackish towards the end, the mouth and joints 3-11 of the antennæ are chestnut and the coxæ pitch color. The animal is densely and deeply punctured all over, very sparingly covered with small greyish hairs, nearly obsolete on the back but more distinct below. It is less highly polished than the former. I have known this species for a long time and specimens of it must exist at the Mus. Berol.; the former I have met with but lately.

I may mention that in dissecting these two species I have observed the same remarkable production of the œsophagus with the ligula, characteristic of the g. and noticed in many of the European kinds.

23. *Anthicus quisquiliarius. N.*

A. castaneus, capite, abdomine elytrisque piceis, his pilorum niveorum fascia media transversali interrupta maculisque concoloribus 6 humeralibus obsoletis, parce pilosus. Long. corp. $1\frac{2}{3}$ lin.

Caput globosum supra subtusque profunde punctatum, oculis parvis. Thorax nodoso-pyriformis, infra medium constrictus, parte anteriore crassiore lin. long. med. profunde divisa, subcordiformi. Elytra elliptica.

Sub veget. putrescent. victitat, prope Colombo rarius legi.

This insect looks uncommonly like an ant. It is easily distinguished from all other species of the Island partly by this resemblance, partly by the sculpture of the thorax and the white fascia across the elytra. The antennæ are robust, thickened towards the tip, the three last joints forming a club. The legs have the femora very much incrassated, the tibiæ at the apex bicalcarate and the tarsi, especially of the anterior pair, very hairy below, the 4th joint appears to be slightly cordiform. The white marks of the shoulders and the fascia across the wing-covers are composed of white hairs, the former are rather an interrupted row of these than true maculæ, the fascia consists of two halves, one in either elytron, reaching neither the external margin nor the suture. The insect is of slow motion.

24. *Anthicus insulanus. N.*

A. testaceus, abdomine obscuriore, capite thoraceque rufotestaceis, elytris fasciis 2 nigris, parce pilosus. Long corp. 1¼-1⅓ lin.

Caput globosum oculis mediocris. Thorax pyriformis, cum capite supra punctata. Elytra ovata. Tarsi art 4° bilobo.

Prope Negombo in pratis sat copiosus.

In some of the specimens before me the anterior femora are furnished with a strong thorn inside having at the same time the tibiæ of the same pair of legs slightly emarginated inside near the apex —I have reason to believe these individuals, if the distinction be a sexual one, to be females not males.

25. *Meligethes orientalis. N.*

M. ovatus, subconvexus, pilosus, supra nigro-æneus, subtus piceus, pedibus, antennis palpisque maxill. dilutioribus, tarsis palpisque labial. brunneo-aureis. Long. corp. 1-1⅓ lin.

Mentum transversum planum, punctatum, lobis apice depressis excavatis, glabris, obtusis Palpi lab. art. ultimo inflato, ovato;

maxill. art. ultimo apice angustato levissime truncato. Mandibulæ unidentatæ. Thorax amplus angulis acutis, antice emarginatus, postice pluries sinuatus, subtus punctatus. Elytra ovato-quadrata, angulis 4 apicalibus rotundatis, pygidium haud obtegentia. Pedes validæ. femoribus tibiisque incrassatis; anteriores tibiis apice intus unispinosis, tarsis art. 1-3 fortiter dilatatis, 1-2 subæqualibus transversis, profunde reniformibus, 3° minore, cordato, 4° minimo, subcylindrico; intermed. et post. tibiis extus spinulosis, tarsis anterioribus similibus sed art. 1-3 minus dilatatis, cordiformibus. Prosternum marginatum, punctatum, obtuse acuminatum. Mesosternum antice carinatum.

Variat magnitudine et colore æneo-brunnea.

Prope Colombo in floribus per occasionem frequentissime legi.

Of the usual shape and color, but larger than usual, varying, however, in this respect—some individuals being fully one-third smaller than others. These small individuals, which occur in the proportion of about 1 to 20, are moreover nearly always of a brownish metallic color instead of a blackish green. I have been unable to discover any other distinctions. I was much interested by the discovery of these insects, having missed them for years amongst the abundantly represented *Nitidulidæ* of the Island. They appear of local occurrence or attached to certain plants, which is nearly the same. I find them in abundance in the beautiful bell shaped blossoms of the *Argyreia argentea* and one or two other plants in my garden. The species appears to differ from the typical *Meligethes* in the following points: the structure of the mentum, which I have sufficiently described above, the last joint of the lab. palpi which in this case is not truncated, and the first of the antennæ which is externally incrassated as in *Epuræa*. The antennæ are otherwise robust, the club is firm and hairy. The thorax is very ample, thinly ciliated along the upper part of the anterior margin, rather strongly below. The prosternum is largely developed, marginated, punctured and obtusely acuminated, overlapping the anterior part of the mesosternum which (the anterior part) is cylindric and carinated. Joints 1-3 of the tarsi are strongly penicillated below, the penicilla being composed of glanduliferous hairs of a fine golden color.

26. *Georyssus gemma. N.*

G. pygmæi statura et magnitudine, supra purpureo æneus, irides-cens, subtus piceus; *alatus*. Thorax subsemiorbicularis infra apicem constrictus, sulco med. long. divisus, lateribus, basi apice-que excavatus, impressionibus 3 majoribus dorsalibus, 2 minoribus lateralibus. Elytra fortissime costata, costis obtuse dentatis, in interstitiis transversim punctato-impressa, ad humeros profunde excavata, infra medium leviter sinuata. Tibiæ extus spinulosæ, intus sparsim ciliatæ.

In prov. central. montibus Kotmaliensibus alt. 3,500 ped. in ri-vulorum ripis non infrequenter legi.

Lacordaire and others characterize the g. *Georyssus* as having the elytra soldered together and being destitute of wings. *In the present species, however, the elytra are unconnected and cover wings proportionately larger than in any other beetle, I can at present think of.* They are elongated and comparatively narrow, resemb-ling in shape very much those of a *Libellula*, have a few veins at the base and are ciliated at the margin. I have moreover occasion-ally taken insects of this g. *flying* about the light at night, but I am not quite sure at present whether it was this species or another. The sculpture of the thorax is complicated and difficult to describe, however, the leading features in it are these: a subapical sinuosity on either side; a longitudinal furrow; excavated sides, base and apex; 3 larger dorsal depressions (1 central, 2 obliquely basal) and 2 smaller lateral ones at the subapical sinuosities—a short elevated ridge at the centre of the base separating the two basal impressions and being itself divided by the longitudinal furrow; two elevations separating the anterior part of the basal impressions from that of the central one (at the middle these three depressions are connect-ed); two small rugosities near the anterior margin, one on either side of the longitudinal furrow.

The sculpture of the elytra is less complicated: they have a deep cavity at the shoulder, a large, but not deep, sinuosity below the middle and are obtusely acuminated. The costæ of the back are 11 in number, the suture lying in the central one. The half of this central costa and the exterior margin form an elevated border

round either elytron. The first and second on either side run towards the apex but come to a stop (very abrupt in most, but less so in some specimens) before reaching it, the third after having been interrupted near its base by the subhumeral cavity runs on but does not reach as far as the former, the 4th does not leave the region of the shoulder, the last on either side is very prominent at the base but soon forms an abrupt declivity and runs on as a low ridge to below the middle. The back of all these costæ is obtusely dentated. The interstices are marked with large, shallow, transverse impressions. The head of the insect is rather large and even. The mandibles are furnished with an obtuse subapical tooth, the two lower thirds are ciliated. The maxillæ have the apex of the outer lobe externally enlarged, rounded off and furnished with three strong teeth replaced by cilia on the inside, the inner lobe is conic and similarly provided with teeth and cilia, however, much thinner and finer. The maxill. palpi are robust, the last joint is inflated at the base. The antennal club is hairy, dark (whilst the remaining joints are yellowish), conic and somewhat securiform, the 6th joint being inserted on one side of the 7th. The legs are robust, the tibiæ slightly curved, obliquely truncated at the end, furnished with spines along the outside and with distant cilia along the inner.

27. *Hydrochus lacustris. N.*

H. elongatus, subdepressus, supra metallicus, iridescens, subtus piceus, pedibus, antennis, palpis elytrorumque margine magis minusve brunneis, mento cyaneo. Long. corp. m. 1 lin., f. multo major atque robustior.

Palpi maxill. robusti, art. ultimo elliptico leviter inflato. Mandibulæ apice bifidæ. Antennarum clava dense pilosa. Thorax oblonge quadratus basin versus angustatus basi medio productus, cum capite profunde punctata. Elytra ad humeros oblique truncata, apicem versus sat fortiter angustata, profunde striatopunctata. Tibiæ extus spinulosæ.

Specimina nonnulla in lacu Colomb. legi.

The head is robust, broader than the thorax, the eyes large and prominent.

The femora, the last joint of the maxill. palpi, the mandibles and the tarsal joints are dark towards the apex. The last abdominal segment of the f. is furnished with a bifid hairy appendage.

28. *Hydrous rufiventris. N.*

H. ovatus, convexus, supra oleagino-niger, subtus obscure ferrugineus, pedibus dilute piceis, labro æneo, reliquis oris partibus cum clypeo testaceis. Long. corp. g. lin.

Palpi maxill. articulis apicem, versus abruptius incrassatis, art. 3° quarto sesqui longiore. Antennæ art. 7-8 fortiter perfoliatis, ultimo acuminato. Caput antice utrinque punctulorum serie subsemicirculari et ad oculorum marginem interiorem impressum. Thorax punctulorum seriebus 4 lateralibus, 2 subapicalibus obliquis abbreviatis signatus. Elytra subtiliter striato punctata. Tarsi omnes unguibus basi fortiter unidentatis. Carina prosternalis cultriformis.

Specimen singulum f. nocte ad lumen cepi.

As far as my resources allow me to ascertain a very anomalous species having the perfoliated antennæ and toothed claws of a *Hydrophilus* and the cultriform prosternal carina and the elytra of a *Hydrous*. I have placed it in the latter g. on account of the sharp edge of the prosternal carina, in which the great distinguishing character of this g. seems to lie, the same being deeply grooved in *Hydrophilus*.

The insect at once attracts attention by the reddish color of its abdomen. It is of a blackish olive color on the back, having however the clypeus and the anterior margin of the labrum of a yellowish brown, the latter being otherwise of a somewhat metallic color. The remaining parts of the mouth are more or less yellowish. Joints 1-6 of the antennæ are yellowish too, with the exception of the 2nd which is dark, joints 7-9 are blackish and pubescent. The legs are of a light pitch color. The lower part of the head is impressed with two rather semicircular series of punctures, similar punctures occurring along the internal margin of the eyes. The thorax is marked with six series of them and on the elytra they are arranged in lines. The sternal carina is well developed, the

prosternal part has a sharp edge, whilst the mesosternal one is obtuse on the back and the metasternal part depressed and slightly grooved.

29. *Hydrous inconspicuus. N.*

H. præcedente minus convexus, supra oleagino-niger, subtus rufo-piceus, ore testaceo. Long. corp. 4½ lin.

Palpi maxill. art. 2° et 4° subcylindricis, 3° apicem versus sensim incrassato, sequente tertia parte longiore. Antennæ art. 7-8 sub-globosis, 9° magno, ovato. Caput, thorax et elytra ut in præcedente sculpta et signata.

In lacu Colomb. mens. Jun. non infrequenter cepi.

This is in every respect a normal species. The prosternal carina has a sharp edge, the claws are simple, the antennal club is composed of rounded joints, the elytra are of the typical structure etc. In the latter respect as well as with regard to the various series of punctures upon head, thorax and elytra, it resembles the former, the punctures of the elytra are, however, less distinct. Joints 1-6 of the antennæ are yellowish, the club being dark and finely pubescent. The maxill. palpi have joints 2 and 4 subcylindric but the intermediate one thickened towards the tip.

In the month of June, I have not unfrequently taken the pupæ of this species on the banks of the Colombo lake and hatched them at home. I found them about one inch under ground and often as far as 12 feet from the edge of the water but still in muddy places. The imago is very active, perhaps more so than any other species of the g.

No. III.

GENERAL REMARKS ON THE SCYDMÆNI DESCRIBED BELOW.

In the first number of these papers I have described a winged species of *Œdichirus*, a g. supposed to be without organs of flight; in the second number I have given publicity to the more important discovery of wings in the single g. which forms the family of the *Georyssi*, also hitherto supposed to be apterous; at present I am about to announce to some and to confirm to others, the existence

of these organs in the family of the SCYDMÆNIDÆ, a fact, although incomplete, of more importance than either of the former considering the extent of the family and the difference of opinion which appears to exist on the subject amongst the most eminent entomological authorities. It is this importance which induces me to enter more fully on the subject.

I am not acquainted with the famous monograph of the family of the SCYDMÆNIDÆ by Dr. Schaum; however, from the manner in which it is quoted by Lacordaire in his g. d. Col.—I should infer that these two celebrated authors agree in all the vital points. In Lacordaire's diagnosis of the family these insects are described as having (with the exception of the American g. *Brathinus*, of which Lacordaire is not quite sure that it belongs to the family) the elytra soldered together and being destitute of wings. Now, although it is scarcely credible that on a point so easily ascertained as this, any difference of opinion should exist, still Westwood in his Modern Classification of Insects, in describing the same family makes statements which imply the contrary. However, Lacordaire's description being fifteen years earlier, in fact the most recent book on the subject, is from this reason alone entitled to be considered before all others, and looking upon it in this light, that is as the essence of all former observations, I shall for the present occupy myself with it alone. According to this description, as mentioned above, the insects referred to, *have the elytra soldered together and are destitute of wings.* This being the case, I was startled to find that out of the 13 species described below, 9 or 10 which I examined in this respect, had neither the elytra soldered nor were they destitute of wings—*on the contrary the elytra were unconnected in the middle and the wings were nearly double the size of the whole insect and could not possibly be overlooked.* I would willingly suppose that the 100 species of this family contained in European collections, and principally derived from Europe and N. America, agreed with Lacordaire's description and that the Ceylon species formed exceptions to the general rule, were it not that Westwood's observation alluded to above corroborates my own and renders me suspicious that some unaccountable mistake or oversight may have occurred. That this mistake cannot consist in

a slip of the pen or a misprint in the g. des Coléoptères quoted above, is clear from the obvious care which has been bestowed upon every part of that work, and from the same remarks being repeated in different words. To attempt to discover how this mistake occurred, and upon what grounds it rests—would under my circumstances be useless. However, it appears certain to me that some more detailed and positive remarks on the subject cannot be superfluous, and must be new to some Entomologists. Placing the fullest confidence, as every one naturally would do in the infallibility of the description of the Belgian author, it was not likely that I should have looked for wings at all in the SCYDMÆNIDÆ (a family to which I have not until lately paid much attention) had I not been struck by seeing the elytra of my *S. alatus* open, when handling it with a fine paint brush in a drop of water, it being at the time quite out of the question that the opening could have been effected by pressure. On opening the elytra fully I had no difficulty in discovering the wings. Rendered extremely curious by this discovery—diametrically opposed as it was to the distinct statement of so great an authority, I now examined other species, and all with the same result, most of them opening the elytra without my assistance in the same manner as the *S. alatus*, and I have not the slightest doubt that when a sufficient number of specimens shall enable me to examine the rest it will still be with the same result. That these insects use their organs of flight may be gathered from the following fact: At a former period I lived in a house situated on a small eminence and overlooking extensive groves of Cocoanut trees, Cinnamon gardens, Paddy fields and patches of jungle. Here I collected large numbers of PSELAPHIDÆ, especially *Euplectus*, in thin, scarcely visible spider webs with which the white walls of the house were covered in certain places—thus forming one large trap for anything small flying about. That these had been caught when on the wing there could be no doubt, but I was much surprised to find with them (what is so common in more congenial localities, here also) a considerable number of SCYDMÆNI, especially my *S. advolans* and *pubescens*, a family pronounced by the most recent authority to be unable to fly, in a position which they could not well have found

themselves otherwise but by flying. From some reason or other, I am ashamed to say, I did not follow up the matter at the time, but I am now certain on the subject. Indeed to remove all doubt and to settle all disputes I have just been so fortunate as to take my *S. advolans* actually on the wing flying in my garden in the evening at sunset.

Having gone so far, I will (in spite of some slight misgivings of being laughed at for telling an old story with so grave a face) add a few descriptive words about the organs in question: The wings of my SCYDMÆNI are ample, about double the size of the whole insect, oblong, having the margin beautifully ciliated and, with the exception of a few yellowish veins at the base, without any visible organs of this kind.

In spite of the difference in their shape etc. I believe the species described below to be all genuine SCYDMÆNI as restricted at present. Being, however, unacquainted with the sexual distinctions of these insects (which indeed I believe not to have been satisfactorily pointed out by any one, and to differ in different species) I should not be surprised if one or two of my species were eventually ascertained to have been separated upon these grounds alone. However, having been very reluctant to admit new species, it is just as likely that individuals may hereafter be found united in one which ought to be separated into two species. But I trust that neither contingency may happen. The species were all collected by myself in the immediate neighbourhood of Colombo. I have, however, no doubt that they occur all over the S. W. part of the Island, which is of an uniform physical character, and they may perhaps occupy a still larger portion of it. None of them are very common, on the contrary, of nearly half of them I possess only one or two specimens. My *S. femoralis* I found under the soft, rotting bark of an Erythrina indica. *S. Ceylanicus* and *ovatus* I found dead in spiderwebs. *S. graminicola, glanduliferus* and *pyriformis* I have hitherto taken exclusively in the sweeping net on the lawn of my garden about sunset, the other species I have met with indiscriminately in spiderwebs, under rotting vegetable substances and in the grass.

After this preamble, which I trust may not be deemed quite superfluous, I now enter upon the description of my species, previ-

ously drawing attention to the three very natural and very distinct groups which they form and the characteristics of which will at once be perceptible from the headings given below. With regard to the first group (A. I. spec. 30-34) I may mention that the elongated legs, largely developed posterior trochanters and often distant posterior coxæ give the insects belonging to it a staggering motion when walking,which together with their oblong,subdepressed body distinguishes them at a glance. I have subdivided them from the cultriform or grooved mesosternal carina. The second group (A. II. spec. 35-41) is equally well characterized as the former by the more robust, pyriform and subconvex body of the insects. *S. pselaphoides* in the former and *S. advolans* in the present group, form connecting links between the two, especially *S. pselaphoides* which in general appearance rather belongs to the second, upon closer examination however is easily ascertained to be an anomalous member of the former. I have divided the second group into two subdivisions distinguished by the rounded or narrowed occiput giving preference to the distinctions to be drawn from this part of the body rather than to those derived from the thorax, which from the variety of shapes it assumes would naturally suggest itself for that purpose, but the gradations between the principal forms appear to me too many, too fine and therefore too indistinct to adopt them. As to the third group (B. spec. 42) the insect which alone forms it amongst those described below, is so different from any of the others that its peculiarities must strike any one at first sight.

A. Species with a thick neck, abruptly formed and immersed in the thorax.

I. Fourth joint of the maxill. palpi not acuminated; head subquadrato—ovate; eyes middling or small, finely granulated, little or not at all prominent; antennæ subapproximate at the base; posterior trochanters elongated, incrassated at the apex; thorax obovate; body elongate, subdepressed.

(a.) Mesosternal carina slight, simple.

30. *Scydmænus. alatus. N.*

S. dilute brunneus, pedibus antennisque dilutioribus, tarsis palpisque testaceis; pubescens; long. corp. $\frac{2}{3}$ lin.

Antennæ art. 1 apice haud incrassati. 2-4 subæqualibus, 5 præcedente majore, 6 longissimo inter 4 et 5 ovato, 7-8 subæqualibus, 9 majore, 7-9 *apice compressis, rubiginosis*. 10-11 ovatis, clavam formantibus, vel art. 9 gracili, 8-11 clavam formantibus. Palpi maxill. art. ultimus minimus apice truncatus. Mandibulæ dente bifido munitæ basi fortiter excisæque dilatatæ. Thorax fovels basalibus nullis. Pedes elongati tenues art. 3-5 subæqualibus.

I include in this species individuals with a two and others with a three-jointed external club. The latter are further distinguished by having a slight sinuosity in the rounded outline of the basal angles of the thorax, by having the posterior part of the metathorax and the base of the abdomen sensibly incrassated, and the head rather less quadrate than the former. However, the individuals thus distinguished being in all other respects exactly like those with the two-jointed club, I cannot help looking upon all these distinctions as sexual ones and uniting the insects in the same species.

The head from the eyes to the neck is of a transverse subquadrated form merging into oval by the angles being rounded off, the anterior part is narrowed. And this is the typical sculpture of the scull in all the five species of this group. The eyes in the present species are middling. The antennæ are rather approximated at the base and inserted in the centre of the front under a ridge which runs across it from eye to eye. The first joint is biruminated at the apex, the 5th is longer than the adjoining ones, joints 7-9 in the individuals with the two-jointed and 7-8 in those with the three-jointed club are of a peculiar construction being narrowed at the apex and fitting into each other like the tubes of a spyglass. The club joints are ovate, flat at the base, the last is large and obtusely acuminated. I consider the principal distinguishing character to lie in the remarkable structure of joints 7-9 of the antennæ. The maxill. palpi have joint 2 rather strongly incrassated at the apex, joint 3 obovate, narrowed at the base, joint 4 very minute, truncated at the apex. The mandibles are furnished with a bifid tooth and are strongly and abruptly dilated at the base. The thorax is of an obovate or obcordato—ovate form being rather strongly rounded off before the middle and gradually narrowed below it; the usual basal impressions are wanting, the pos-

terior margin has 2 slight sinuosities, the posterior angles are rounded off or obliquely truncated. Scutellum obsolete. Elytra furnished with a very short elevated ridge at the shoulder. Legs elongated; coxæ large, the 2 posterior ones rather distant from each other; 2 posterior trochanters much elongated, incrassated at the tip; apex of tibiæ subcylindric, but not narrowed, and hairy, especially in the 2nd pair; joints 2-3 of the tarsi of equal size, the first longer, the 4th a little shorter, the two anterior tarsi slightly contracted, 2nd and 3rd pair more and more elongated. Penultimate segment of abdomen with a strong longitudinal groove on the back.

31. *Scydmænus femoralis. N.*

S. statura et magnitudine præcedentis; testaceus. Antennæ art. 3-4 subæqualibus, 5 præcedente longiore, 6-8 gradatim minoribus, subglobosis, 7-8 apice fortius oblique truncatis, 9-11 gradatim majoribus, subglobosis, clavam formantibus. Palpi maxill. art. ultimo minimo semigloboso. Thorax magnus obovatus, basi rotundatus, 4 foveolatus. Elytra *apice truncata*, 2-*sinuata*. Pedes *femoribus 2 posticis medio constrictis*, tarsis art. 1-4 gradatim minoribus.

Of the general appearance of the former but of a light yellowish color and well distinguished by the large thorax, truncated elytra and abnormal construction of the 2 posterior femora. Antennæ with joints 7-8 rather strongly obliquely truncated at the apex, 9-11 forming a club, subglobose, flat at the base, the last acuminated and slightly cut away or even excavated on the inside at the apex. Last joint of maxill. palpi semiglobose, these otherwise the same as in the former. Thorax and elytra of S. *alatus*, the former however, larger, rounded at the posterior margin and with 4 basal impressions the latter slightly truncated at the apex and with a slight sinuosity in the truncature on either side of the suture. Scutellum very small. Legs with the tibiæ slightly bent at the base, the apex as in the former: tarsi with joints 1-4 gradually decreasing in size, first pair contracted and furnished with brushes on the inside. The 2 posterior legs inserted rather distant from each other, the basal part of abnormal construction: the trochanters are much elongated and incrassated at the tip whilst the femora are at the place of the juncture rather abruptly narrowed, bent and slightly compressed, they

being at the same time thinner than the adjoining apex of the trochanter the constriction is very striking.

32. *Scydmænus Ceylanicus. N.*

S. alati colore, sed major et magis depressus; long. corp. $\frac{3}{4}$ lin. Caput magnum, robustum, thoracis latitudine. Antennæ basi non approximatæ, art. 3-4 et 5-7 inter se subæqualibus, *arcum formantibus*, 8-10 gradatim majoribus, subglobosis, depressis, apice oblique truncatis, 11° magno, conico, 8-11 longius pilosis, clavam formantibus. Palpi maxill. art. 4° minimo, semigloboso. Thorax ovatus, foveis basalibus nullis. Elytra apice singulatim rotundata. Pedes validi tarsis art. 1-4 subæqualibus, 2 anterioribus art 1° *subtus acumine sat forte producto.*

An anomalous species, especially with regard to the antennæ which are much less approximated at the base than those of the rest of the species belonging to this group, and with regard to the 2 posterior coxæ which on the contrary are more approximated than in any of the species just referred to. The insect is of the light brown color of the two former but larger and more depressed. The head is strikingly large and heavy, of the width of the thorax, in its hind part, which is strongly transverse, the oval form prevails over the square. Eyes small. Antennæ inserted under two strong protuberances rather than under a ridge, their club 4-jointed, joints 3-7 forming an inwards bent section of a circle, joints 8-10 strongly compressed, obliquely truncated (subperfoliated) 11 large, conic. The 3rd joint of the maxill. palpi is of an oblongo-ovate shape, the external basal angle is prolonged into a small peduncle inserted in the apex of the 2nd joint, the 4th joint about the semiglobose shape of which I am not quite satisfied appears to be obliquely inserted in the tip of the preceding. Thorax oval, of a similar shape to that of the former, anterior margin slightly emarginated. Scutellum obsolete. Elytra with the traces of a humeral costa, separately rounded off at the apex. Legs strong, 2 posterior coxæ not more distant from each other than the 4 anterior ones; tibiæ elongated, bent at the base and apex, at the latter place slightly narrowed, subcylindric and hairy; tarsi with joints 1-4 subequal, in the first pair strongly contracted, joint 1 of this pair produced in a spine on the inside.

(b.) Mesosternal carina middling, grooved.

33. *Scydmænus intermedius. N.*

S. alati statura sed major et robustior, colore obscuriore ; long. corp. ¾ lin.

Antennæ art. 1° apice biacuminato, 2 et 5, 3 et 4, 7 et 8 inter se subæqualibus, 6 quarto paulo minore, obovato, 7-8 subglobosis apice oblique truncatis, 9-11 gradatim majoribus, obovatis, clavam formantibus, 11 acuminato. Palpi maxill. art. 3° obovato, 4° minimo semigloboso. Thorax subrotundatus, basi 4-foveolatus. Elytra apice singulatim rotundata. Pedes tarsis art. 1-4 gradatim minoribus vel 2-3 subæqualibus, 4 anterioribus intus pilosis. Mesosternum sat fortiter carinatum, *carina dorso deplanata, fossulata apice acuminata.*

This species stands in the middle between *S. alatus* and *pselaphoides*. To the former it is allied by its general appearance rather than by anything else, differing from it very much in the structure of the antennæ and the mesosternal carina. To the latter on the contrary it is allied by similarity in the structure of the said carina, differing, however, from it in general appearance. The color is that of *S. alatus* but a shade or two darker, the insect, being at the same time larger and altogether more robust. The eyes are small. Antennal club 3-jointed, the joints forming it gradually increasing in size, obovate, flat at the base, the last acuminated. Scutellum obsolete. Elytra with 2 slight basal impressions, the traces of a humeral costa, separately rounded off at the apex. Legs elongated as usual ; 2 posterior coxæ distant, tibiæ straight, subcylindric but not narrowed at the apex, the 4 anterior ones hairy ; tarsi with joints 1-4 almost imperceptibly decreasing in size or perhaps 2-3 equal, the anterior ones slightly contracted, these and the intermediate ones hairy on the inside. Mesosternal carina middling, flat on the back with a shallow, but very distinct, longitudinal groove or excavation, anterior part projecting, acuminated.

34. *Scydmænus pselaphoides. N.*

S. subpyriformi—ovatus, subconvexus, magis minusve brunneus, pedibus antennisque subtestaceis, femoribus apice nigrescentibus, tarsis palpisque testaceis ; flavo-pubescens long. corp. 1-1½ lin.

Antennæ art. 1° mediocri, apice biacuminato, 2-4 sensim minoribus, 5 et 2, 6 et 3, 7 et 8, 9 et 10 inter se subæqualibus, 9-11 clavam formantibus, 6-11 basi rotunde truncatis, 6-8 apice oblisque truncatis, 7-8 compressis, 9-11 obovatis. Mandibulæ dente bifido munitæ, basi dilatatæ et ciliatæ. Palpi maxill. art. 3° inverte conico, 4° minimo apice truncato. Thorax obovatus, latitudine quarta parte longior, basi 4 foveolatus. Elytra apice singulatim rotundata. Pedes validi, tarsis art. 1-4 gradatim minoribus, anterioribus dilatatis, his cum intermediis subtus fortius pilosis. Mesosternum præcedentis.

An anomalous species with regard to its general appearance which differs considerably from that of the rest of the group, and makes it, as I remarked above, the connecting link between this and the following group. This is the largest species I have hitherto met with. The system of coloration is the usual one: more or less deep brown, legs and antennæ lighter, tarsi and palpi quite so. Eyes middling. Antennæ with a 3-jointed club, the joints subglobose, flat on the base, the last large, conic, joints 6-8 are slightly truncated at the apex, 7 and 8 being at the same time strongly compressed have a subperfoliated appearance. The mandibles are furnished with a bifid tooth. The 3rd joint of the maxill. palpi is of the shape of an inverted cone, the 4th minute and truncated at the apex. The thorax is of an obovate form, about one-fourth longer than broad, rounded off before and gradually narrowed below the middle, subquadrate at the base impressed with 4 foveæ or pits, the posterior angles rounded off. Scutellum minute. Elytra with 2 short humeral costæ, separately rounded off at the apex. Legs stout; 2 posterior coxæ distant; tibiæ slightly bent at the base, subcylindric at the apex, the 4 anterior ones hairy; tarsi with joints 1-4 gradually decreasing in size, the anterior ones dilated, the joints transversely triangular, the intermediate pair hairy on the inside. Mesosternum of the preceding. Metasternum with a slight longitudinal depression down the middle. Penultimate abdominal segment grooved on the back as in S. alatus. The enlargement of the anterior tarsi (as in other beetles) indicates undoubtedly a sexual distinction, since it is not equally

strong in all individuals. I may mention here that upon some of the individuals I found ticks (some g. allied to *Ixodes* but not a *Gamasus*) fastened, one of them having made a wound such as, supposing it to be inflicted at a corresponding place and on a proportionate scale, few animals of a higher order, I think, would have survived—still this little beetle appeared perfectly at its ease. The parasite alluded to had fastened itself right in the centre of the forehead and the wound it had inflicted in this, one should imagine most dangerous place, was a deep hole or pit with a callous border. The latter led me to infer that the injury was an old one, and the tick being at the time fastened in it (and this so firmly that I had some difficulty in detaching it) I felt sure it had been in this position for months. The injury was observable under a slight magnifier and I think to compare it to one inflicted by a rifle-ball would be greatly underrating its importance.

II. Fourth joint of the maxill. palpi acuminated; mesosternal carina strongly developed; eyes large, prominent, coarsely granulated; antennæ distant at the base; 2 posterior trochanters simple; thorax variable; body robust, pyriform; subconvex.

(a) Occiput rounded.

35. *Scydmænus advolans. N.*

S. long. corp. $\frac{2}{3}$ lin. Antennæ art. 3 et 4,5 et 6 inter se subæqualibus, obovatis, 7 majore, subgloboso, 8-10 subglobosis, basi rotunde—, apice oblique truncatis, cum 11° conico clavam formantibus. Palpi maxill. art 3° elongato, inverte conico, 4° mediocri. Mandibulæ tenues, medio acuminate 1-dentatæ, basi abrupte dilatatæ. Thorax ovato-rotundatus, apice fortius angustatus, basi leviter 2-sinuatus, 4-foveolatus. Elytra apice singulatim rotundata. Tarsi art. 2-3 subæqualibus.

The insect is of brown color, the antennæ lighter, the legs still more and the tarsi and palpi quite so, the femora are dark towards the apex, the head, thorax and suture are occasionally of chestnut color; it is as usual pubescent. The sculpture of the head in this and the following species is not, as in the preceding, based upon the oblong square or the oval, but rather upon the form of a ball

which in a more or less compressed state is always perceptible; in some instances it is narrowed on one side. In the present species the head is heavy and subglobose. The eyes are large, prominent and coarsely granulated. The antennæ are inserted distant from each other under two protuberances of the anterior part of the forehead. The club is 4-jointed, the joints composing it, being flat at the base, and, with the exception of the last, obliquely cut away at the apex, the last itself being conic. The maxill. palpi have joint 3 rather elongated and of the form of an inverted cone, joint 4 middling, acuminated. The thorax is of a rounded oval shape and rather strongly narrowed towards the apex. The scutellum is obsclete. The elytra have the usual rudimentary costæ at the shoulders and are separately rounded off at the apex. The legs are middling, 2 posterior coxæ inserted close together, trochanters all simple, tibiæ slightly bent at the base, narrowed and subcylindric at the tip, the 4 anterior ones hairy, tarsi with joints 2-3 subequal, the first a little longer and the 4th shorter, the 2 anterior ones slightly contracted. I include in this species some individuals which slightly differ from the foregoing description, being more robust, covered more densely and with longer hair, especially on the occiput and thorax, with the latter rather obconico-ovate and the costæ of the elytra more distinct, and moreover occasionally of a chestnut color.

36. *Scydmænus pubescens. N.*

S. præcedente graciliot; long. corp. $\frac{2}{3}$ lin. Antennæ art. 3 et 4, 5 et 6 inter se subæqualibus, subcylindricis, 7° secundo paulo minore, *fortiter cylindrico*, 8-10 subglobosis, cum 11° conico clavam formantibus. Palpi maxill. art. 3° inverte conico, 4° minuto. Mandibulæ tenues, medio obtuse obsoleteque unidentatæ, basi abrupte dilatatæ. Thorax conicus, latitudine haud longior, basi 4-foveolatus. Elytra et pedes præcedentis, tibiis tamen apice leviter arcuatis.

Less robust than the former and further distinguished from it by the 7th antennal joint (the one preceding the club) which is of a strongly cylindric shape, by the minuteness of the last joint of the maxillary palpi, the obtuse and nearly obsolete tooth of the man-

dibles, the short-conical form of the thorax and the tibiæ which are slightly bent at the apex.

37. *Scydmænus pygmæus. N.*

S. statura et colore præcedentis sed longius pubescens et sesqui minor; long. corp. ½ lin. Antennæ art. 3 et 4, 5 et 6 inter se subæqualibus, 7° majore, ovato, 8-10 subglobosis, fortius compressis, cum 11° clavam formantibus, hoc magno, obconico, apice obtuso. Palpi maxill. art. 2° tenuiore, 3° inverte conico, 4° minuto. Mandibulæ obsolete unidentatæ. Thorax conicus latitudine parum longior, elytris fortiter applicatus, basi 2-sinuatus et 4-foveolatus. Pedes et elytra præcedentis, his tamen amplioribus.

Strongly allied to the two preceding species, still very much smaller, more compact and covered with longer hair—thus of rather a different appearance regardless of its size. From *S. pubescens* this species would principally differ in the shape of the 7th antennal joint, also in that of the three first club joints which are much more compressed and more hairy in *S. pygmæus*. The thorax of the latter is more firmly applied to the base of the elytra, the latter have a fuller, more robust appearance about them, the palpi are more slender and the tooth of the mandibles is pointed. From *S. advolans* it would principally differ, besides in the generalities mentioned above, in the shape of the thorax and in some of the points in which it differs from *S. pubescens*.

(*b*) *Occiput narrowed.*

38. *Scydmænus glanduliferus. N.*

S. robustus; long. corp. ¾ lin. Antennæ art. 3-7 sensim majoribus, 8-10 globosis, fortiter compressis, cum 11° *glanduliformi* clavam formantibus, longe ciliatis. Palpi maxill. art. 2° tenuiore, 3° inverte conico, 4° mediocri. Thorax conicus latitudine basali haud longior, elytris fortiter applicatus, basi 2-impressus, in impressionibus 2-foveolatus. Tarsi art. 2-3 subæqualibus.

Of the size of *S. advolans* and the plump shape and color of *S. pygmæus* the latter being rather lighter than that of *S. advolans*; it has the longer (especially on the occiput and thorax) hairy vesture of the former. The occiput is slightly narrowed behind. The

antennal club is composed of 4 joints, the 3 first of which are strongly compressed, the 4th being plump and of the shape of an acorn with its cup, all are strongly ciliated. The thorax is conic, firmly applied to the base of the elytra as in the preceding species, depressed and with 2 pits at the base, posterior margin with 2 sinuosities. The shoulder-ridges of the elytra are short but rather strongly marked. The tibiæ are narrowed, subcylindric and hairy at the apex. Joints 2-3 of the tarsi are subequal, the anterior pair more, the intermediate less contracted.

39. *Scydmænus graminicola. N.*

S. gracilior; long. corp $\frac{2}{3}$ lin. Antennæ art. 3 et 4, 6 et 7, 9 et 10 inter se subæqualibus 5° adjacentibus paulo longiore, 3-7 subcylindricis, 8 subgloboso, 9-10 fortiter globosis cum 11° clavam formantibus. Palpi maxill. art. 3° inverte conico, 4° mediocri. Mandibulæ apice arcuatæ, medio acuminate 1-dentatæ, basin versus *sensim dilatatæ*. Thorax obconicus basi depressus, 2-sinuatus et 2 foveolatus, rectangulatus. Pedes *tibiis elongatis* basi apiceque arcuatis.

Of the usual brown color, legs and antennæ lighter, tarsi and palpi quite so, femora nigrescent at the apex, hairs of occiput and thorax rather long. The former slightly narrowed behind, the head thus of a somewhat rhomboid form. Antennal club composed of 3 joints, the 2 first of which are strongly globose, the last being acuminated and slightly cut away on one side at the apex. The mandibles are furnished with an acuminated tooth at the middle, bent at the apex and, what is rather uncommon in this g., gradually enlarged towards the base. The thorax is obconic, rather longer than broad. The elytra are somewhat more stretched than usual in this group, the rudimentary humeral costa are rather prominent and they are separately rounded off at the apex. Tibiæ more or less elongated, slightly bent at the base and apex, at the latter place subcylindric and hairy. Tarsi with joints 2-3 subequal, first pair slightly contracted. A sexual distinction appears to be expressed in the length of the tibiæ which are less elongated in certain individuals which are at the same time less

robust than the others. The insect is easily distinguished by its general appearance.

40. *Scydmænus pyriformis. N.*

S. supracastaneus, subtus brunneo-testaceus, pedibus antennisque dilutioribus, tarsis palpisque flavo-testaceis, antennarum clava nigricante; long. corp. $\frac{1}{3}$ lin.

Antennæ art. 3-8 fere subæqualibus excepto 5° parum longiore, 8° subgloboso, minore, 9-10 subglobosis majoribus, cum 11° acuminato clavam formantibus. Palpi. maxill. art. 3° inverte conico, 4° minuto. Thorax obovatus, basi 2-foveolatus. Pedes coxis 2 posticis distantioribus; tibiis 2 anterioribus basi apiceque leviter arcuatis, reliquis subsimplicibus; tarsis art. 2-3 subæqualibus.

A pretty little species, at once distinguished by its color which is chestnut, darker at the base and suture of the elytra, and light, more or less brownish or yellowish, below, the antennæ being of the latter color with a nigrescent club. The occiput is slightly narrowed, the head altogether plump, heavy and transverse. The antennal club is composed of 3 subglobose joints the last of which is acuminated and slightly cut away on one side as in some of the preceding species. The thorax is obovate, broadest below the middle and gradually narrowed towards the apex. The elytra have the usual two shoulder-ridges and are rather strongly dehiscent at the apex. The posterior coxæ are rather distant at the base; the tibiæ are slightly angustated and subcylindric at the apex, the 4 anterior ones hairy, the first pair moreover slightly bent at the base and apex, but the rest nearly straight.

41. *Scydmænus angusticeps. N.*

S. castaneus, antennis pedibusque dilutioribus, tarsis palpisque testaceis; long. corp. 1 lin.

Caput magnum subtrigonum, occipite *fortiter angustato*, hoc cum thorace longe pilosis. Antennæ art. 3 et 4, 5 et 6 inter se subæqualibus, 7-11 gradatim majoribus, vel 9-10 subæqualibus, subglobosis, 8-10 leviter depressis, cum 11° clavam formantibus. Palpi maxill. art. 2° tenuiore, 3° inverte conico, 4° mediocri, conico-acuminato. Thorax obconicus basi subquadratus, 2-sinuatus et 4-foveolatus. Elytra costis 2 fortioribus abbreviatis. Tibiæ subrectæ.

A handsome species of more or less deep chestnut color with lighter legs and antennæ. The head is large, heavy and from the eyes to the neck strongly triangular, the occiput and thorax are covered with long hair, which adds much to the peculiar appearance of the insect. The antennæ are thick and robust, the club 4-jointed. The thorax is subquadrate at the base up to the middle and conic towards the apex. The punctures or pits at the base are four in number. The scutellum is small. The humeral costæ are stronger developed than in any of the other species and traceable to the middle of the elytra. The tibiæ are nearly straight, subcylindric at the apex, the 4 anterior ones hairy. The tarsi have joints 2-4 nearly subequal.

B. Species without a neck.

42. *Scydmænus ovatus N.*

S. ovatus, convexus, brunneus; long. corp. $\frac{1}{3}$ lin.

Caput subquadrato-ovatum. Antennæ art. 3-11 sensim incrassatis, 9-11 subglobosis, depressis, cum 11° magno, conico clavam formantibus. Palpi maxill. art. 4° minuto acuminato. Thorax *amplus semiorbicularis*, margine posteriore medio producto, basi 2 foveolatus. Tarsis art 1-4 subæqualibus.

The color of this insect is as usual shaded off from brown to light yellow; however, in other respects it differs materially from all the preceding species. The body is regularly oval, thorax and elytra convex, pubescent. The head is subquadrato-ovate; the eyes rather small, but prominent; the neck is altogether wanting. The antennæ are at the base as distant from each other as they can be being inserted below the eyes; the club is 3-jointed; the joints increase gradually in size from the 3rd to the 11th. The maxill. palpi have the 2nd joint slender, the 3rd rather pearshsped, the 4th minute and acuminated. The thorax is very ample, semiorbicular, of the shape and nearly the size of the apical half of the elytra, the basal angles are acuminated and slightly envelop the shoulders, the posterior margin is prolonged in the middle, towards the scutellum the foveæ or basal impressions are 2 and rather distant from each other. Scutellum obsolete. Elytra with 2 depressions at the base. Tibiæ straight; tarsi with joints 1-4 subequal or very nearly so. Mesosternal carina middling.

V. *Memo. on the subject of Rain Gauges for the Provinces of Madras. By* W. H. BAYLEY, *Madras Civil Service.*

THE Rain Gauge now in use is a Funnel of Copper, 12 inches in diameter, and is inserted in a chatty or any kind of vessel. When rain has fallen the water is emptied out into a copper cylinder, 8 inches deep, and 3 inches diameter.

As the diameter of the Funnel is 4 times that of the cylinder, the area of the former is 16 times that of the cylinder, so that when the rain water is poured into the cylinder, every inch deep shows $\frac{1}{16}$ of an inch of rain fallen, and a cylinder *full*, or a "measure" denotes $\frac{8}{16}$ or $\frac{1}{2}$ an inch of rain.

A dipping stick divided to inches and tenths is used to measure portions of the cylinder. One inch in the cylinder as before stated denotes $\frac{1}{16}$, or ·0625 of an inch of *rain* and $\frac{1}{10}$ of an inch deep in the cylinder denotes $\frac{1}{160}$ or ·00625 of an inch.

The Talook Officers are directed to enter in their Books, Measures, Inches and Tenths. And these are to be *reduced* in the Board's Office to inches and decimals of rain, by using the following Multipliers.

Suppose the Return is.

Measures.		Inches.	Tenths.
13		7	8
13 × ·5	=	6·5.....	Inches of rain.
7 × ·0625	=	0·4375.....	do.
8 × ·00625	=	0·0520.....	do.
		6·9875	Inches of rain fallen.

The objections to this plan are two;

First, the apparatus is made much larger than is required, one-tenth of an inch in the cylinder denotes $\frac{1}{160}$ of an inch fall of rain, whereas $\frac{1}{160}$ of an inch is the *utmost* we can want from such country Registers as these. In the next place, if there is at

all, a heavy fall of rain, the receiving vessel must be a large one, if the Funnel diameter is 12 inches. No ordinary bottle (which is the cleanest and best receptacle) will do, and the consequence is a chatty is used, which is porous, easily broken and awkward to pour from into a narrow cylinder.

The second objection is, that the Register is not intelligible generally to those who keep it, and the orders of the Board that the Registers are to be sent to them to reduce "Measures," "Inches" and "Tenths," give the idea, that the inches and tenths, are inches and tenths *fall of rain* which is not the case. It will also be seen that the reductions are tedious when they come to extend over several Reports. Every "measure" has to be multiplied by 5, every inch by ·0625, and every "tenth" by "·00625.

Now I venture to suggest a form of Rain Gauge which will register accurately to 100th of an inch fall of rain, and which will be free from every objection urged against the present one. The Funnel is 4·97 inches in diameter, and its area is therefore, 17·33 *square* inches, therefore a fall of rain of one inch, is 17·33 cubic inches in the reservoir, which is simply a common quart bottle. The rain water is poured out of the bottle into a little tin vessel holding one fluid ounce, and each of these full denotes that $\frac{1}{10}$ of an inch of rain has fallen. A stick notched to a 10th of the depth of the little cylinder, will show how many *tenths* of water there are in the said cylinder, and each of these is equivalent to $\frac{1}{100}$ of an inch of rain, though for country work, a 10th of an inch (each cylinder full being $\frac{1}{10}$ of an inch) may be sufficient.

The diameter of the Funnel, is theoretically, 4·697 inches; but in practice, 4·65 is found sufficient. This is a little smaller than the theoretical diameter, because it is impossible to expect Native workmen to bend the mouth of a tin funnel, to a *true* cylinder.

The tin funnel is much cheaper than a copper one.

A wooden Gauge might be sent from Madras to each Cutcherry, to which the funnel might be fitted.

The quart bottle is more convenient than a chatty or earthern ware pot, and is quite large enough to suit any fall of rain in the Carnatic. It will run over if the fall is above 3½ inches, but this

is a fall that hardly ever occurs even in a heavy monsoon in 24 hours, and the Rain Gauge is, of course, measured every 12 hours. The bottle is cleaner, more easily poured from than the vessels now in use, and always obtainable.

The small measuring cylinder was fixed at one fluid ounce, in order that it might be easily tested at any Hospital or Dispensary. A diameter of 1 inch, and depth of 2·2 inches is very suitable. It is very easy to discern its contents to *tenths*, and each tenth denotes the $\frac{1}{100}$ of an inch of rain.

Three or four of these Gauges were tried last Monsoon at the Madras Observatory, and gave results exceedingly near the standard Pluviometer.

I first saw a Rain Guage of this kind at the house of a Native Gentleman of scientific acquirements at Vizagapatam, but it was not quite correct as to dimensions.

Its cheapness, simplicity, and accuracy, should, I think recommend it for general use.

[Report upon Mr. BAYLEY's proposed new Rain Gauge, by Colonel SMITH Mint Master, Madras Engineers.]

The memorandum omits to mention one circumstance which is necessary to a clear comprehension of Mr. BAYLEY's proposal, and that is, that the Imperial fluid ounce consists of 1·733, or more exactly 1·7329625 cubic inches, consequently the fluid ounce measure necessarily represents the tenth part of the bulk of rain falling at the rate of one inch, in any given period, on an area of 17·33 square inches.

With this explanation I trust it will be evident that Mr. BAYLEY's proposed arrangement is as correct as it is scientific, and that its precise accuracy merely depends upon the truth of the workmanship and the care of the observer; which with moderate pains are not likely to cause error to a degree likely to interfere with objects aimed at by the use of these instruments.

In order to any practical trial, it would be necessary that five or six carefully made Gauges of the new pattern should be exposed during rainy weather, in company with a correct standard, and a

comparison of their respective indications made. This could most conveniently be done at the Honorable Company's Observatory, there being no such thing as a standard Rain Gauge in the Mint.

[Agreeably to Colonel SMITH's recommendation, 6 Rain Gauges answering to Mr. BAYLEY's description were ordered to be made up and tested at the Honorable Company's Observatory. The following is an extract of a letter from Major WORSTER, the Honorable Company's Astronomer with reference thereto.]

Several of these Gauges, &c. have already been tried with the standard Gauge of this Observatory, and as there can be no doubt whatever of the accuracy of the result if the rim is truly formed to the given diameter, it would appear to be an unnecessary loss of time in detaining the Gauges here when they could be more usefully employed in the interior.

Tin plate however can scarcely be formed on a mould to a truly cylindrical shape, and it would be far better to form the rims of brass and turned to the given dimensions, the tin funnels being subsequently soldered on to complete the Gauges. The expense of these rings would be but trifling.

Mean Diameters	
No. 1	4·696
No. 2	4·695
No. 3	4·683
No. 4	4·690
No. 5	4·692
No. 6	4·691

The six tin Gauges (with their measures) have been prepared, the diameters of which are noted in the margin.

[In order to judge of the advisability of substituting the improved Gauge for the less convenient pattern in use, letters on the subject were addressed to the different Collectors inviting their opinions thereupon. Colonel FABER, the Chief Engineer, upon the receipt of their replies, submitted to Government a concise narrative of the whole project, of which the following is an extract.]

The Collector of Malabar states that the jars used for receiving the rain water are glazed so that they are not open to the objection of being porous but that he wishes to have one of the new pattern for trial.

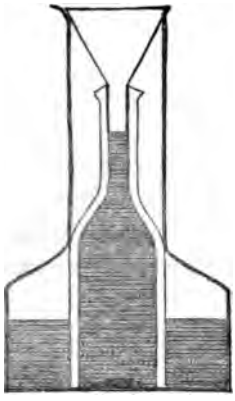
The Collector of Canara states that the new pattern will not answer on the Western Coast as 9 inches of rain have fallen in 24 hours at Mangalore.

The Collector of Nellore has written two letters on the subject; in the first dated 29th April 1856 he states that the Talook Officers are quite familiar with the pattern now in use, that the method of taking and registering the measurements causes no confusion of

thought and that the new gauge will not answer throughout every monsoon, as 8·25 inches fell on the 9th October 1852, and 10·7 inches on the 8th October 1855. He thinks however that a few gauges of the new pattern would be useful and asks for 4.

In his second letter No. 202 dated 8th July, he suggests that Mr. BAYLEY's improvement of dividing his measuring rod into 10ths should be introduced with the present gauges and points out the method of using it.

The total number of the new gauges asked for was 129, but as some of the Collectors who approved of the new gauge did not mention the numbers they required, I have the honor to recommend the manufacture of 180 gauges of the new pattern, substituting however a tin vessel to receive the rain fall instead of the quart bottle; or else placing the bottle in a tin cylinder so that if very heavy rain fall, so as to more than fill the bottle, the surplus water might overflow into the tin vessel as exhibited in the annexed drawing. This would answer very well, as the external diameter of a quart bottle is less than that of the gauge; the former being about 3⅛ and the latter 4·697 inches.



The total cost including that for the tin vessels in which the bottles are to be placed would amount to Rupees 360 for 180 gauges.

It is far from being an uncommon occurrence to receive mistaken values of rain falls from Collectors using the pattern now in use, and I have frequently to send back the returns for correction month after month. The new stick suggested by Mr. Elton alluded to in his letter of the 8th July, and which I beg leave to forward for inspection is however a decided improvement, and to any one giving himself the trouble to think on the subject at all, it is difficult to believe that wrong values can be assigned to the measurements shown by the decimal scale. But it must be admitted that

Mr. BAYLEY's pattern is much to be preferred, and the suggestion contained in para. 10, which I owe to my Assistant Lieutenant O'Connell meets the solitary objection that has been, or probably can be, urged against the new apparatus, namely its insufficiency during the very heavy downpours frequent on the Western Coast, and of occasional occurrence throughout the whole Presidency.

[The Government approved of the new Rain Gauges and sanctioned the manufacture of 180, with the improvement suggested in the Chief Engineer's letter.]

SELECTIONS.

On the introduction of the Cinchona or Bark-tree.

The attention which has lately been paid to the experiment of introducing the *Cinchona* or Bark-tree into India has induced us to re-produce an interesting article on the successful accomplishment of a similar attempt in Java which we have prefaced by a general review of the history of this valuable drug.

Dr. Forbes Royle, so long ago as 1840 had pointed out* that the bark yielding trees might be successfully cultivated in India and indicated the Neilgherry Mountains as being peculiarly suited for a trial.

In 1850 Dr. Grant, Apothecary to the E. I. Company, again drew attention to the subject, and in 1852 the Agri Horticultural Society of Bengal transmitted a paper by Dr. Falconer, Superintendent of the Botanical Garden at Calcutta in which he also urged a trial of the experiment. The proposal was favorably received by the Governor General and recommended to the notice of the Court of Directors, by whose orders a case of plants of *Cinchona calisaya* was transmitted to Calcutta under the charge of Mr. Fortune.

Of the six plants so despatched, five reached the Botanical gardens alive. They were kept for some months but did not ap-

* Prod. Resources of India, pp. 248, 425.

pear to thrive, and the cuttings taken from them all died. On the approach of the cold weather they were sent to Darjeeling, but three only reached the station alive and these survived but a short time, having been killed by the cold of the winter.

This can hardly be deemed a fair trial. The plants were too few in number. They were detained many months in the uncongenial climate of Lower Bengal. They were weakened by cuttings and change of place and then suddenly transported at the approach of winter to an elevation 6,000 or 7,000 above the plain in which they had passed the hot season and the rains. Accordingly the Medical Board of Bengal again addressed the Government of India† urging the prosecution of the experiment upon amore extended scale and recommending that it should be undertaken in situations better adapted to the natural habits of the tree, such as the Neilgherries and the hilly regions of Sylhet, Chittagong and the Tenasserim Provinces.

Of the result of this application we are not informed.

About the same period, the subject of the *Cinchonas* attracted the attention of the French Government. In 1843 M. de Castelnau having been appointed to conduct an expedition for scientific purposes into Central South America, M. Weddell was associated with him at the instance of the Musee D'Histoire Naturelle for the prosecution of researches in Natural History. His attention was directed to the investigation of several interesting subjects of botanical inquiry among which the history of the *Cinchona* occupied a prominent place. After working in concert with M. de Castelnau for two years, he separated from him and pursued an independent course of inquiry until 1848. It was during this period in 1845-47 that he obtained the valuable information regarding the *Quina* yielding trees which he has given to the world in his *Histoire Naturelle des Quinquinas* which forms the standard as well as the most recent work on the subject.

In the introductory chapter Mr. Weddell gives a sketch of the history of the drug previous to the period of his own discoveries.

† Indian Annals of Medical Science, III. 250.

The *Quina* Bark was first brought to Europe in 1640 by Juan de Vega, physician of the Conde de Chinchon to whom it had been sent in 1688 by an officer in the interior of the province, the Corregidor Don Francesco Lopez Canizares, but for a long time the tree which produced the drug remained unknown. In 1735 the Academy of Sciences having obtained the appointment of the commission to measure an arc of the meridian at the equator under the direction of M. de la Condamine, Joseph Jussieu was attached to it as Naturalist. He visited the forests of Loxa and Upper Peru from which the largest quantity of the febrifuge bark was exported and first ascertained that it was produced by the tree which has since been named *Cinchona Condaminea* by Humboldt. But unfortunately the results of his researches were never published. He did not return home till 1771 and then in a state of mental incapacity which totally unfitted him for literary labor. La Condamine however gave a general account of their discoveries in 1738.

For a long time the market continued to be supplied from this single source, but so great was the destruction of trees, 25,000 having, according to Humboldt, (1779,) been destroyed in one year, that the *C. Condaminea* became extremely scarce and the dealers having taken to adulterating the article with other barks, it fell into disrepute. The trade gradually diminished and Loxa itself sank into decay.

A new source of supply was opened by the discovery of several kinds of *Cinchona* in the forests of New Granada and a trade in barks sprung up at Carthagena after the middle of the last century.

The Marquis de la Vega appointed Viceroy of New Granada in 1760 was accompanied by Don Jose Celestin Mutis who earnestly applied himself to develop the resources of the province. He made known the existence of bark yielding trees in the vicinity of Santa Fe de Bogata and was appointed to the charge of the forests in which office he was found by Humboldt when he visited that part of S. America.

A few years later the Spanish Government having organized an expedition to explore the productions of their American possessions Messrs. Ruiz and Pavon were appointed to accompany it in the

capacity of Botanists together with M. Dombey, an able French physician. After continuing their labors for 11 years they published the results in the Flora Peruviana and in the Quinologia which appeared subsequently from the pen of Don Hippolito Ruiz. Their researches tended greatly to enlarge the existing knowledge of the subject. They established several additional species of the genus *Cinchona* and opened a new source of supply from the forests of lower Peru and Chili.

Much however still remained to be discovered and although additions to the stock of information left by them were contributed by Humboldt and Bonpland, Lambert, Pöppig, and others, it remained for M. Weddell to bring the subject in a comprehensive form before the public.

His first journey in search of the Cinchona trees commenced in August 1845. Proceeding through the Chequito country in the province of Bolivia he directed his course southwards towards the Rio Grande, crossed the Cordilleras to Tarija which he reached in January 1846 and determined the most southern limit to which the genus reaches, near the 19° of S. Lat. where it is represented by the *C. australis*. He then after the rains crossed the Andes to La Paz, the emporium of the bark trade of Upper Peru and in the course of his journey, identified for the first time the tree producing the *Calisaya* bark which he named *C. calisaya*. In the latter part of 1847 he explored the eastern slopes of the Andes and came upon some of the richest forests of *Cinchona* he had yet met with particularly those on the Rio Ayopaya and in the province of Yungas.

It was here that he obtained the most precise information of the mode of discovering, felling, barking, transporting and selling the *quina* barks, his account of which is well worth quoting.

"The name of *cascarilleros*," says M. Weddell, "is given to the men who cut the cinchonas in the woods; an appellation equally applying to those who are specially engaged in this commerce. The former, and of these alone I will speak here, are in general men who have been brought up to this laborious occupation from their infancy, and are accustomed by a kind of instinct to guide them-

selves in the midst of the forest. Without any compass but that intelligence peculiar to man in a state of nature, they guide themselves as unerringly in these labyrinths as if they were surrounded by an open horizon. But how often does it happen that those less experienced in this art lose themselves and are never more heard of!

"The only period which is not suited for the collection of cinchona bark is the rainy season, which in duration corresponds in some respects with our winter. If some persons contend that the period of the ascension of the sap is the best for stripping the trees, their precepts are certainly not practically adopted, for even during the rainy season the collection of the bark is only suspended on account of physical obstacles to its continuance.

"The cutters are not generally engaged on their own account, but are mostly in the service of some merchant or small company. A confidential person is sent with them into the forests who is called the *major domo*. It is his duty to receive and examine the barks which are brought to him by the different parties in the forest, and to superintend the distribution of the provisions.

"The first thing done by those who engage in this kind of speculation in a region previously unexplored is to have it examined by experienced *cascarilleros*, who are called *diestros* or *practicos*. The duty of these is to penetrate the forests in different directions, and to ascertain to what points they may be profitably explored. They are expected to state whether there are any cinchonas, and in what quantity; also to point out the direction in which the trees are to be found, and to report on the quality of specimens of the bark obtained.

"This preliminary investigation is very important, and requires the possession of much sagacity, patience, and experience, in those who are engaged in it. It is upon their report that the chances of success are calculated. If it be favourable, a road is immediately commenced up to the point which is to form the centre of the operations; and from this time all those parts of the forest adjacent to the road become provisionally the property of those who have formed it, and no other *cascarilleros* can work there.

"On the arrival of *major domo* with his cutters in the neighbourhood of the part to be explored, he chooses a favourable site for his encampment, as near as possible to a spring or river. He constructs a hut or slight house to shelter the provisions and the produce of the cuttings; and if he anticipates having to remain for some time in the same locality, he commences the cultivation of maize and a few vegetables. Experience, indeed, has shown that an abundant supply of provisions is one of the most important conditions of success in this class of undertaking. The *cascarilleros*, during this time, are distributed through the forest, one by one, or in small parties, each carrying under a small cloak, and suspended at his back, provisions for several days, and the coverings which constitute his bed. In this way these poor beings have occasion to put in practice all their courage and patience in order that their work may prove fruitful. Obliged to have the hatchet or knife continually in his hand, to disembarrass himself of the numerous obstacles which arrest his progress, the *cascarillero* is exposed, from the nature of the circumstances by which he is surrounded, to an infinity of accidents which too often endanger his life.

"The cinchonas rarely constitute an entire forest, but form groups more or less compact, distributed in different parts of it. The Peruvians give these the name of *manchas*. In some cases, and most frequently, they grow separately. However this may be, it is in discovering them that the skill of the *cascarillero* is principally exerted. If the position be favourable, the tops of the trees first attract his notice; a slight movement peculiar to the leaves of certain species, a particular colour of the foliage, the aspect produced by a great mass of inflorescence, enable him to distinguish the cinchonas from a great distance. Under other circumstances he confines his inspection to the trunks, of which the external layer of the bark, or *enves* as it is called, presents remarkable characters. Very frequently the dry leaves which he finds on the ground are sufficient to indicate to him the vicinity of the object of his search; and if these indications have been brought there by the wind, he knows in what direction to look. An Indian, under these circumstances, is an interesting object for observation. Passing in and out through the narrow pathways of the forest, glancing through the foliage,

and appearing to sniff the earth, he seems to walk like an animal pursuing its prey, and darts forth when he thinks he has discovered the object of his search, nor stops until he has arrived at the foot of the trunk which he had descried from the distance. It is not always, however, that the exertions of the *cascarillero* are productive of such favourable results. Too often he returns to the camp empty handed, and without provisions ; and not unfrequently, when he has discovered on the side of a mountain indications of the tree, he finds himself separated from it by a torrent or ravine. Entire days may then pass before he can attain the object which, during this period, he allows not to escape from his sight.

" In order to strip the tree of its bark it is felled with a hatchet, being cut a little above the root, and the bark previously removed from this part, so that nothing may be lost ; and as at the base the bark is thickest, and therefore most profitable, it is customary to remove the earth from around the trunk, so that the barking may be more complete. The tree seldom falls immediately when cut through, being sustained either by climbing plants or by the adjacent trees ; these are fresh obstacles to be overcome by the *cascarillero.* I remember having once cut the trunk of a large cinchona in the hope of bringing its flowers within reach, and, after having felled three adjacent trees, had the mortification to find it yet standing, being held up by the interlacing creepers.

" When at length the tree is down, and the useless branches have been cut off, the peridermis is removed by striking it, either with a little wooden mallet, or even with the back of the hatchet ; and the inner bark, being thus exposed, is often further cleaned by means of a brush. The bark is then divided by uniform incisions circumscribing the pieces which are to be removed, and these are separated from the trunk with a common knife or some other instrument, the point of which is carried as close as possible to the surface of the wood on introducing it into the incisions previously made ; and if the position of the trunk prevents the operator from removing the whole of the bark by the first operation, it is subsequently divided so as to admit of its being turned. The dimensions and regularity of the pieces necessarily depend more or

less on circumstances ; in general, however, for the convenience of transport and facility of preparation, they endeavour to make them from fifteen to eighteen inches long, and four or five inches wide. The bark of the branches is separated in the same way as that of the trunk, excepting that it is not deprived of its exterior coating or peridermis.*

"* Formerly, with very few exceptions, the bark deprived of its peridermis was not received in commerce ; not that any virtue was supposed to exist in that part, but it furnished distinctive characters, by which it was easily known, and rendered difficult of substitution. The necessity which was thus imposed upon the *cascarilleros* of preserving this, in many cases, frail part, demanded on their part the greatest care. Thus in many places it was the custom to fell the tree two or three days before barking it, so that, desiccation having commenced, the different layers of bark might adhere together.

" I think that the removal of the peridermis from the surface of the thick barks at the time of cutting, is not quite general. Some of the cinchonas of New Granada, which I have recently seen, retained the outer coating. However this may be, we perceive the necessity of studying the bark under both aspects. I am persuaded that many museum specimens, collected at a period when it was customary to preserve the peridermis, would no longer be thought of doubtful utility, if considered in this point of view.

" The process formerly employed for separating the young barks from the wood, also differs much from that which is now practised ; hence there is a certain difference in the formation of the cylinders prepared by the two methods. I have already described the way in which it is now done, and it is easy to understand that by this method the dimensions of the separated pieces may depend on the patience or skill of the *cascarillero*, or on the circumference of the branch or trunk from which they are taken. Formerly, on the other hand, each piece was cut by one operation, the *cascarillero* holding his knife by the two extremities, and drawing it rapidly towards him. The flat pieces obtained in this way necessarily varied in width, according to the size of the trunk from which they were taken, and the quills when dried were frequently no larger than a pen. The pieces also had sharp edges, and they were thicker at the centre. The defect of this method was the immense loss which resulted, for nearly as much bark was left on as that which they removed, the former being considered useless on account of its being deprived of the peridermis. But this loss was as nothing when compared with that which I have next to notice. I allude to the almost entire rejection, for some time, of the bark of thick trunks. The loss resulting from this cause was immense. Many of those experienced in this subject having affirmed that with age the juices disappear by degrees from the bark, and that those barks only are efficacious which are taken from branches of moderate size, four times as many trees were sacrificed as would have been the case under other circumstances. It has been said, it is true, that the *cascarilleros* climbed the trees to

"The details in the process of drying also vary slightly in the two cases; the thinnest pieces of bark from the branches or small trunks, intended to make the quilled cinchona, are simply exposed to the sun's rays, and of themselves take the desired form, which is that of a hollow cylinder; but the bark taken from large trunks, which is to constitute the flat cinchona, or, as it is called, *tabla* or *plancha*, must necessarily undergo a certain degree of pressure during the process of desiccation, without which it would become misshapen, or take a cylindrical form as in the preceding case. To effect this, after first exposing the pieces of bark to the sun, they are placed one on the other in crossed squares, in a similar manner to that practised in timber-yards in the arrangement of the planks of wood, and on the top of this pile a heavy weight is placed. This process is repeated for several days until the bark is completely dried.

"The above process is that most commonly adopted in preparing the cinchonas; but it will be easily comprehended that this must vary, in some degree, according to the locality, or the nature of the tree operated upon. In many places the bark is not pressed at all, or but imperfectly so, and it is then generally out of form or slightly curled. The peridermis is often but partially removed, or simply scraped. Finally, whether it be accidental, or whether it be done with the view of augmenting the weight, there frequently remains a certain quantity of moisture in the bark, which greatly deteriorates it. It thus appears that cinchonas which would have presented the same characters if similarly prepared, may, according to the circumstances, vary very greatly. In any of these cases the labour of the *cascarillero* is by no means ended, even when he

cut off the branches, taking care to leave the terminal branch; but those whom I have known have always candidly confessed that they found the most simple method to be that of cutting the trees down, and this, I believe, has been the uniform practice Thousands of quintals of cinchona bark have been thus left to perish in the forests; and it has only been since the inutility of the practice has been proved by chemical analysis that it has been discontinued. It is not to be considered, however, that the bark of old trees contains as much of the active principle as those which have only arrived at maturity. There are limits between which all are good; indeed, none ought to be rejected.

has finished the preparation of the bark; he has yet to carry his spoil to the camp, and, with a heavy load on his shoulders, to retrace his steps along those parts which, while unburdened, he traversed with difficulty. The labour involved in this part of the operations can hardly be conceived. I have seen more than one district where the bark has to be thus carried for fifteen or twenty days' journey to get it out of the wood from which it was obtained; and considering the amount of remuneration received, I could hardly imagine men so unfortunate as to engage in work so laborious and ill-paid.*

"Something yet remains to be said with reference to the packing of the bark. It is the *major-domo* who performs this duty. As the cutters bring him the bark, the produce of their labour, he submits it to a slight examination, and rejects that which is bad. It is then, if necessary, exposed to a fresh process of desiccation, and formed into bundles of nearly equal weight, which are sewn up in coarse canvas kept for that purpose. In this condition the bundles are conveyed on the backs of men, donkeys, or mules, to the depôts in the towns, where they generally receive an exterior envelope, consisting of fresh hide, which as it dries makes a hard and compact package. In this form the packages are known by the name of *serons*, and it is thus that they arrive in Europe. The usual weight of a *seron* is from 70 to 80 kilogrammes (kilogramme 2 lbs. 3 ozs. avoirdupoise); but the weight is sometimes much less than this. From these details it will be seen how erroneous the notions of some persons still are with reference to the collection of cinchona bark; many having thought that it continues under special surveillance as it was formerly represented to be; and others that the cinchona-trees are cultivated in enclosed parks and treated as the cork-trees of our country. It must be acknowledged that the mode of collecting this valuable product appears to be always under the control of the half-savages by whom it is performed; and if some efficient means

"* In general, before the product reaches the coast it passes through at least three or four hands, and on each occasion its price is augmented; moreover, as carriage is very expensive, it follows that the price charged in Europe will afford no idea of its cost on the borders of the forest. At Pelechuco, for instance, 1 kilogramme (2 lbs. 3 ozs. avoirdupoise) is only worth a franc and a half (fifteen pence), and for this twenty francs are now paid in Paris.

be not discovered of counteracting the ruinous and wasteful method adopted, our descendants will inevitably have to regret the entire or at least partial extinction of the different varieties of cinchona.

"The opinion of those who calculate upon the forests being restocked from seeds, and from suckers thrown out from the stumps of the fallen trees, is more nearly in accordance with truth; but, as will be seen, even this source of renewed supply can only be depended upon to a certain extent. Too often the suckers, recklessly cut down, perish with the trunks to which they were attached; and the young trees, which very slowly attain to a certain degree of development, fall in their turn beneath the hatchet, never again to appear. The same may also be said of the seeds. A supervision and control exercised over the cutters, by means of inspectors, would, to a certain extent check this vandalism, but, unfortunately could not practically be carried into operation. The inspection of the woods in our country is a very different thing from inspecting a forest in the New World, especially if this forest cover 20,000 square miles.

"In fact, it appears to me that there are but two methods which could be adopted for preventing the rapid destruction of the cinchona trees. One is to limit the exportation to a quantity proportionate to the sustainable produce of the forest; the other, that of making the trees objects of regular cultivation. To limit the exportation would certainly be the most efficacious method; but is it not to be feared that the disproportion between the consumption and production is already too great to admit of the balance being thus restored? and moreover, are not our wants too pressing to give way to considerations effecting only the future?* There remains the cultivation, and this must be resorted to. If there be a tree which is worthy of being acclimated in a French colony, it is, certainly, the cinchona, and posterity will be grateful to those who may succeed in putting this plan into execution.

"* In support of this view of the subject we may cite the case of the Company of La Paz, to whom the Bolivian government conceded the monopoly of the commerce of the cinchonas of Bolivia, with the power of annually exporting 4,000 quintals, or 40,000 Spanish pounds. The restriction imposed in this case was

M. Weddell has likewise given interesting details of the present condition of the *Cinchona* forests and of the measures adopted by the Bolivian Government to regulate the trade. The discovery of quinine in 1820 gave a new impulse to the bark trade of Upper Peru from which province alone the *Calisaya* bark, yielding by far the largest proportion of quinine, is obtained. In 1830 General Santa Cruz, then President of the Bolivian Republic attempted to check the wasteful destruction of the forests by a series of ill-digested measures which only tended to aggravate the evil. In 1845 a monopoly was given to a commercial house, a principal condition of which was that the exports should not exceed 20,000 quintals (2,000,000lbs.) during the five years for which it was granted. The stipulation was not observed. Other monopolies followed and in the last two years of M. Weddell's stay (1849-50) the quantity of bark brought into the market from Bolivia alone was 3,000,000lbs. No wonder then that he foretells the utter extinction of the trade at no very distant period. It appears that the bark from the lower part of the tree is more valuable than that growing higher up. Many trees were observed by him in the course of his excursions, to have been barked only as high as the arm could reach. Others which had been cut down were stripped only on the upper side because the *cascarilleros* would not take the trouble to turn them! As a proof of the progressive diminution of the tree he cites the fact that whereas the *Calisaya* was, at a comparatively recent period to be found every where in the neighbourhood of the most populous tracts, it is impossible now to see a tree of 2 or 3 feet in diameter without penetrating several days' journey into the deepest parts of the forests.

never observed, and complaints have been made that the quantity allowed to be exported has been greatly exceeded. What would it be, then, if the restrictions were entirely removed, as they are in most other parts, and especially in Peru, where the exportation, during some years, has attained to an extent which is almost incredible?

"In New Granada, at the time when the commerce of cinchona bark was carried to the greatest extent, that is to say at the commencement of this century, the quantity exported from Carthagena alone amounted in one year, 1806, to the enormous extent of 1,200,000 pounds. In the present day, on the contrary, scarcely any is exported.

It does not appear that the French Government have founded any practical measures on the discoveries and recommendations of M. Weddell. But in 1852 the subject was taken up by the Netherlands Government and measures were adopted which have resulted in the successful introduction of the C. *Calisaya* into Java. The history of the experiment has been published by Professor De Vriese in a pamphlet of 122 pages, the substance of which is contained in the article with which we conclude the subject.

On the Transplantation of the PERUVIAN BARK-TREE *into* Dutch East India; *by* DR. DE VRIESE.*

"Were this notice intended for the learned world alone, it would be necessary to treat the subject more amply than is now attempted, as nothing more is desired than to enable the inquiring reader to understand what Quinquina is, its value to mankind, and the views that have actuated the Dutch in what they have done in this important matter.

"On some points of a scientific nature it has been necessary to be more diffuse than in other respects was desirable, as the greater part of the uninitiated (and who would misinterpret this term?) are not generally acquainted with the specialities of natural and medical science; in other respects, conciseness has been necessary to avoid too great amplification.

"From the earliest scientific information we know that the inhabitants of South America have done nothing to hinder the unlimited collection, we should almost say robbery, of the Quinquina woods. No one thinks of their cultivation, and the Public Authority seems not to be interested in it, or is not able to be so: the latter, we should be disposed to conclude, when we consider, after Weddell, that the Quinquina district covers an extent of 2,000 square miles.

"We notice also that unheard-of quantities are exported; nay, what is more, now and then whole woods are burnt up. It may

* Extracted from a Work entitled 'De Kina-Boom uit Zuid-America overgebragt naar Java. Door W. H. De Vriese. 'S Gravenhage. (Translated by James Perrin, Professor of the English Language at Leyden.) 1855.'

be unknown to the Peruvians and Bolivians less than to Europeans, that the quantity diminishes, and that the trees, which are felled by thousands, are not so speedily succeeded by others that replace them. Whoever descends the Andes, to visit the woods in which the Quinquina grows, finds his way from the sound of the reckless axe of the Cascarilleros, as they mercilessly, in an unexampled manner, hew these beautiful trees. This rough handling is not alone working fatally for the future, but all accounts are unanimous that an incredible quantity of bark is lost in the most reckless manner.

"These circumstances have the sad consequence which De la Condamine foresaw as probable, and that all late travellers confirm, namely that there is a visible diminution in the quantity of Quinquina trees.

"Don Antonio de Ulloa,* thirty years after De la Condamine, uttered a warning against the destruction of the Quinquina woods, and proposed that strong prohibitive measures should be taken against their abuse. This, although very late, sixty-six years after, the Government of Bolivia considered, viz. in January, 1838; it issued an order against the exportation of Quinquina wood for five years.

"Pereira† makes the remark, that as these trees are produced but in one quarter of the world, and no care is taken of their cultivation, it is nowise to be wondered at that, this bark, in the course of time, should disappear from commerce.

"Stevenson‡ declares that if the Government of America do not take care to preserve the Quinquina-tree, either by forbidding the felling of it, or by obliging the authorities of the provinces to take strong measures to prevent the destruction of the tree, it is much to be feared that this excellent production of the New World will be wholly exhausted.

* Writer of 'Noticias Americanas,' vol. i. 1772, 8vo. See also Hooker's 'Companion to the Botanical Magazine,' i. 247.

† 'The Elements of Materia Medica and Therapeutics,' by J. Pereira, ed. 3, vol. ii. part 2, pp. 1605 *et seq.* London, 1853.

‡ Narrative of Twenty Years' Residence in South America, ii. 60.

" Weddell, in the Introduction to his ' Histoire Naturelle des Quinquinas,' says that his attention has been given to all sorts of Quinquinas. These are his words :—' L'immense accroissement pris par le commerce des Quinquinas dans ces parties, rendait en quelque sorte nécessaire un travail à leur sujet. A une époque aussi où la consommation de ces écorces, et surtout de leur principe fébrifuge, la Quinine, devient de plus en plus considérable, je crois qu'il peut être utile d'appeler l'attention sur les écorces qui un jour devront remplacer la Quinquina Calysaya, dont l'épuisement devient de plus en plus imminent. Ces espèces, si elles sont beaucoup moins riches en principes actifs, nous offrent encore, par leur abondance, quelque sécurité, contre la chance prochaine de nous voir privés du médicament le plus précieux du règne végétal.'

" Several Dutch naturalists, whose zeal in advancement of science for the good of mankind and the glory of their country is above all praise, have, for more than twenty-five years, urged upon the Government, both at home and in India, the transplantation of the Quinquina-tree from South America to Java. Those gentlemen have been Messrs. Blume, Korthals, Reinwardt, G. J. Mulder, Miquel, Fromberg, Vrolik, and others.

" It will be superfluous to say that successive Ministers for the Colonies have considered these propositions, and all who were officially called to it, and could throw light on the subject, have shown their interest in, and their desire for, the accomplishment of this object.

" Some of these naturalists have thought it probable that after some years, if the Quinquina-tree should be exhausted in South America, the culture of it might succeed in Java. Others have thought that neither pains nor money should be spared to transplant from Peru to Java a tree which would grow as luxuriantly there as in America.

" The desirableness of the transplanting was continually kept in remembrance ; but the Government supposed the thing impracticable. The wish to obtain seeds of this tree, through the Dutch consuls in different States of America, was disappointed, the difficulty of obtaining them being so great, on account of the distance of their

stations from the woods of the interior of Peru, Bolivia, and New Granada. Seeds and plants were often promised by one and another, but these promises were not realized, although they were continually renewed. It was sufficiently clear that the only means to obtain seeds or plants of the Quinquina-tree was to send thither a proper person to fetch them.

"To find such a person was not easy. Various knowledge, botanical knowledge, and particularly an acquaintance with the Quinquina, were required. A great constancy and intrepidity in danger and in the difficulties of long journeys in foreign countries, and especially a strong constitution, would be requisite in one charged with so important a mission.

"Meanwhile the experience and information obtained by Mr. Weddell, in South America, were not lost to the naturalists of the Netherlands. His fame, but particularly his excellent writings, as well as the barks and dried specimens, collected by him in Peru, were not only known and appreciated here, but came freely into the possession of Dutchmen, and of their scientific institutions. In the Museum of Paris they were submitted to the inspection and research of the professional and interested with a praiseworthy liberality, of which the writer of this communication was able to bear witness during his sojourn in the French capital.

"In the month of June, 1852, the Minister for the Colonies proposed to the King, that a proper person should be sent to South America, to collect seeds and plants, and to transport them directly to Java, and he was empowered to despatch Mr. Justus Charles Hasskarl, late Botanist of the Botanical Gardens at Buitenzorg, Java, on the mission.

"The choice of so competent a man may in all respects be considered fortunate. Mr. Hasskarl, by a long residence on the Island of Java, had become accustomed to the influences of a tropical climate. He had a strong constitution, and was of middle age. For many years he had given evidence of a great love for the science, and a comprehensive knowledge of the Flora of Java. His numerous published writings evince great accuracy, perseverance, and

ndustry. His travels and investigations in India had furnished him with an uncommon measure of experience in travelling, particularly in overcoming the difficulties which so often arise out of the nature of a tropical soil.

"From his sound judgment and caution there was every reason to believe him particularly fit for this mission; it is not to be wondered at, then, that he immediately attracted the Minister's attention who proposed him to the King for this important service. Expectation was not disappointed, as the result has shown, for the object of Mr. Hasskarl's mission to South America has been attained.

"A plan was prepared and proposed, though he was left to his own judgment and prudence, and was only charged not to confine himself to the Calisaya Quinquina plant, but to collect as many as possible of the other sorts of Quinquina, which are found at various heights above the level of the sea. He was to go from Southampton to Charges, and so on over Panama to Guayaquil and Loxa, whence he was to journey inland. To save time, preference was given to the steam-voyage to Panama, above the longer one of doubling Cape Horn, which would have caused a delay of three months at least before the traveller could reach the places from which he would have to direct his course towards the interior of South America.

"On the 4th of December, 1852, Mr. Hasskarl left the Netherlands for Southampton, which he quitted on the 17th of December, on board the steam-boat La Plata, arriving at St. Thomas on the 1st of January, 1853; on the 12th, at Aspinwall, by Chagres; and at Panama on the 14th, just three days too late to continue his voyage by the steam-boat that touches at the ports on the west coast of South America.

"Being thus detained, he on the 25th continued his route to Payta, to go thence to Guayaquil. With the knowledge however that the rainy season would render his journey fruitless, he changed his plan and went to Lima.

"In the beginning of May he ascended the first, and then the second Cordilleras, thence he descended into the lower part of Peru

Here it was that he saw, for the first time since leaving Panama, a luxuriant vegetation, but which however was far from being comparable with that of the last-mentioned country.

"To what difficulties such journeys are subject, may be generally known from the accounts of travellers in the pursuit of natural history; but it may not be uninteresting to the reader to be informed of Mr. Hasskarl's experience in that respect.

"The roads over the mountains of Peru are bad, mostly not broader than a bridle-path, and there are often on one side deep and dangerous precipices; it is impossible for travellers meeting to pass each other. When the crest of the second Cordilleras is passed, the traveller finds steps rather than roads. Here the way must be traversed on foot, the baggage being borne by Indians, if one is so fortunate as to find any. Setting forth on foot by Vitoc to Monohamba and Uchahamba, Mr. Hasskarl had the satisfaction to see the first Quinine-trees in their natural state, although these were not the Calisaya Quinquina, which are found in Southern Peru and Bolivia. Returning from Monohamba, across the second Cordilleras, he went to the capital of the province of Zanja.

"Near Uchuhamba Mr. Hasskarl saw a great number of true Calisaya Quinquina-trees but he was only able to collect a few of the plants and seeds. Of that good sort he collected a large quantity of seed, besides about fifty plants, which, after being packed with much difficulty, were sent from Lima to Holland on the 28th of July, 1853. This packet contained, besides seeds of '*Calisaya*,' four packets of '*Cinchona ovata*,' and a small quantity of '*Cinchona pubescens*.' In a letter to the Minister for the Colonies dated 12th August, Mr. Hasskarl sent a small bladder of seeds of the '*Cinchona amygdalifolia*.' After a voyage of about a month and a half, these objects arrived in a good state at Lima. They were addressed to some one acquainted with their culture, and by him packed in Wardian cases, and despatched to Panama. Owing to a misunderstanding of the carrier, they were detained there; and when, after experiencing the influence of a tropical heat, on arriving at Lima, all were dead. Here we had to lament the loss of the soil in which those plants were set in the cases, which, if it had

been chemically examined in this country or in India, might have thrown some light on the culture. However the seeds arrived safely, and were consigned to the Directors of the Botanical Gardens of the Universities, and at Amsterdam. We shall revert to these seeds later. From Uchuhamba the traveller went more southerly, where the people, who had revolted against the Government, and declared themselves free, not unfrequently threatened his life, for they looked upon him as a spy of the Peruvian Government. Often, and that too in the night, wholly and suddenly forsaken by his guides, was he obliged to wander about, without the most necessary food, to seek his old track, being whole days without seeing a human being.

"The opinion that the Quinquina-trees are found together in woods, growing, as it were, in company, is again, by the experience of Mr. Hasskarl, refuted. They are often scattered, and sometimes, even in the Quinquina districts, very difficult to find. Can the contradiction which, in these statements, exists between the earlier and present writers, be explained by the destruction of the woods, which has taken place during the last half century?

"Arrived in the province of Caraboya, he cherished the hope that he should there find the Quinquina-trees still full of fruit and seed, and *that* from information given him. This hope was disappointed, as the seeds were already scattered.

"In the latter end of September, 1853, Mr. Hasskarl arrived at Cuzco, the old Inca town. Passing from there to Sandia, the capital of the district of that name, where alone the Quinquina, as far as Peru is concerned, is collected, he put himself in connection with some old and experienced bark collectors *(Cascarilleros practicos)*, to obtain information, and to make inquiry concerning the places where the Quinquina-trees grow. Thus he was enabled to see a great number and variety of the Quinquina species, but it was his misfortune to discover that he had come too late to collect seeds, for the fruits remaining on the trees had already dropped their seeds. It may not be improper to remark here that the Quinquina seed is extremely fine and light, and surrounded by an exquisitely fine membrane, so that it is easily blown away and lost, but also,

that to this cause may be traced the wonderful extent of the Quinquina-trees in South America.

"It was even less possible at that time to obtain young plants of those trees. In Caraboya however the trees were very scarce, much scattered, and thus rare, as the Cascarilleros had grubbed up all the old or seed-bearing trees. It is therefore often necessary to cross the great river, and thus to go over the boundary of the country of the wild Indians, with a faint hope of success, to look for these trees, and find scattered here and there in the woods, young plants that have grown up from seeds.

"In this manner, being disappointed in his expectation that his journey would be finished with 1853, he determined to return to Lima, and pass the rainy season there till April; however he changed this place, where, in the meantime, the yellow fever had broken out in a severe form, for Chili, where a cooler climate seemed to promise the restoration of his impaired health and strength. Advices from the Netherlands induced him to settle at Arequipa, where he was expecting to receive news of a score of Wardian cases which he bought at Lima, being forwarded to Islay. Having received this advice, he determined to go to a distance of 150 Spanish leagues into the interior, to make further investigations.

"A series of difficulties however presented themselves, which rendered the obtaining of Calisaya plants almost impossible. Peru and Bolivia were at war with each other. In the former year, the frontiers of the latter were wholly forbidden to the Peruvians. Mr. Hasskarl however believed that the restraint had been removed, with the exception of a small port on the "*desaguadero*" (outlet), lying at the south corner of the Lake Titicaca, which favourable change might have been brought about by the departure of the Peruvian armies, under the command of Echinique, to reduce Arequipa, where the insurgents had ranged themselves under the banners of Castilla.

"Bolivia was the country to which his attention was particularly directed, for there, according to the information, right or wrong, he had received, the Quinquina-trees were not so widely spread, but in certain places, called "*manchos*" appear in great numbers,

and grow much higher. If he might be fortunate enough to penetrate into the more deeply situated districts of Bolivia, the chance of collecting seeds and plants was not unfavourable, as the Calisaya of Bolivia, which is collected here, is the Quinine Bark *par excellence.*

"The frontiers of Bolivia were soon reached. Mr. Hasskarl was soon at La Paz, not far from the snow-mountain at Lutchie, a Bolivian frontier village, where he learned that the military order, forbidding the passage of the frontier, had not been revoked, as he had been erroneously informed.

He was thus obliged to determine to retire on the Peruvian territory, which he did, with the plan of going to Sandia in an easterly direction, keeping along the Bolivian frontier. With what pains and difficulties this expedition was attended can scarcely be conceived, unless we gave the detailed account furnished by himself, which our present space forbids. At the frontier places of Peru are often found Bolivians, who are generally Cascarilleros. For these the passage of the boundary was not forbidden, as it was for the Peruvians. They carry on their trade, have their families and abodes in Bolivia; they export all sorts of objects or produce, and were not only disposed to serve Mr. Hasskarl, but they afforded all wished-for help, so that he was (naturally for an equivalent) very quickly supplied with plants by some, with seeds by others. Awaiting these, he went from one frontier place to another, and at last reached the above-mentioned Sandia, which he determined to make his head-quarters, and to which the objects to be delivered were to be forwarded at an appointed time, that he might pack them. He determined also to visit the places deeper inland himself, and to study, as much as possible, the Quinquina Calisaya.

"Meanwhile, the agreement with the Bolivians for plants and seeds of Quinquina-trees, for which provisions and strong drinks were given to those people, to load their mules and to serve as barter, was fulfilled, and by this means he really succeeded. While Mr. Hasskarl was gone from Sandia eastwards, one of the Bolivians arrived with a very considerable number of plants. Having

received information of this, he returned speedily to Sandia to secure all, that the plants might not suffer from the air and heat. On arriving, he found about 400 Calisaya plants, although not all of the strength for which he had agreed. The person who brought them must have had a very difficult journey to arrive at Sandia with this precious cargo.

"We shall not here enumerate the difficulties and dangers with which Mr. Hasskarl and that precious burden had to contend before he had accomplished a distance of 150 leagues, to bring those objects in a safe state to a place of shipment. The necessary means were contrived and put in action to obtain the seeds promised, but in this he was not able to succeed. The person who had undertaken to secure them, and to follow him on his arrival at Sandia, to Arequipa and Islay, and for which sufficient travelling expenses were allowed, did not come; at the same time, the interest that was felt in keeping the plants alive did not admit of delay.

"In the packing of the plants several circumstances required attention; first, the plants were to be made sufficiently damp to be able to reach the coast without drying up, notwithstanding the strong drying winds, and the almost perpendicular rays of the sun. Particularly was it necessary to protect them against this last, against the great warmth during the day; while on the other, it was equally necessary to guard these precious objects against the other extreme, the cold of the evenings and nights, which on those mountains is sufficiently severe. Just in the months from June till August, the water on the high table-lands (particularly at night) is frozen to ice. If it had been the aim of the indefatigable traveller to transport the plants set in *earth*, the weight, and the consequently increased number of beasts of burden, would have caused more hindrances; the plants themselves, but particularly their roots, would certainly have been injured by the continual shaking of the animals. It was also necessary, in other points of view, to provide for the plants in such manner that they should not have to suffer; considering that large plants were difficult to preserve from the injurious external influences before mentioned. The sprigs were closely packed together, with the roots in damp moss;

each packet was wrapped in the bark of Pisang stalks, and fastened with sackcloth, and made into small bales, somewhat resembling wool-bales, as those in which goods are forwarded on the llamas from the interior to the coast. The Pisang stalks necessary for this packing had to be fetched from the lowlands, on the shoulders of Indians; the moss, which did not grow at Sandia, was obtained in the mountain districts; all which, on account of the awkwardness and laziness of the Indians, cost much pains, time, and money.

" But with the greatest difficulty was the necessary rope obtained. Four persons were sent into the lower woodlands to collect bark, and work it up so as to serve for rope. Strong cords were required to bind the packages on the beasts of burden; these were ordered at Cruzero, and in this Mr. Hasskarl met with cordial co-operation. The collecting of so many mules in this solitary and out-of-the-way place was no slight matter: they were weak animals that could not carry half the weight the mules of Arequipa were able to bear on their backs.

" After a legion of difficulties of divers kinds, too many and too various to sum up here, the expedition started from Sandia on the 8th of June.

" It seemed however as if the difficulties would never come to an end. The animals were driven forward as fast as possible, but it was necessary, for the sake of the plants, to shorten the way as as much as it could be. From early in the morning till late in the evening they travelled on, almost without interruption, to leave the hill-country, with its extreme changes of temperature, behind, and to get as far off the highway as possible, that the cavalcade might incur no risk from the numbers of troops, who took possession of all transports as contraband of war, and that the plants, which were threatened with many dangers from that cause, might arrive in safety.

" Arrived at Azangora, they learned that no beasts of burden were to be obtained, as they were all required by the insurgents belonging to the party of Castilla, to carry muskets brought from Bolivia to Cuzco; whereas other drivers had taken the district of

the mountains, to avoid being compelled to a like service for the corps of General Roman, who was on the way from Puno to Cuzco. It appears that the strife of the two Republics against each other, and the troubled condition of the contending parties, caused the indefatigable and courageous traveller many difficulties, and almost occasioned the failure of his mission.

"We will not now follow him in the enumeration of his disasters, but only say that, not counting five days when he was detained by meeting with the soldiers, he, by means of forced marches, accomplished the journey from Sandia to Arequipa in a week; thence, embarking on a ship ready for sea, he went by Islay to Callao, and thence direct to Java.

"It seemed as if the courageous traveller must encounter new difficulties at the end of his mission. Islay was again in possession of the party of Echinique. An attack for the conquest of Arequipa was preparing there. But the means of transport were wanting. Mr. Hasskarl required many beasts of burden to transport his packages. To obtain these there was no sort of prospect. It was feared, and, as it appeared later, not without reason, that the animals would be seized. The profits of the expedition were not an equivalent to the risk the drivers feared they should incur. The party of Castilla, which was uppermost in Arequipa, moreover, did not permit the departure to Islay, and the one danger brought on the other. At last, when damages for the possible loss of the beasts was promised in case of need, and some persons of influence in Arequipa placed themselves in the breach for Mr. Hasskarl, his desired departure was allowed. On the journey to Islay nothing important happened, but at that place however the beasts were immediately pressed into the military transport service. The Wardian cases were arrived at Islay, but the frigate did not appear till a fortnight afterwards; this induced him to depart for Callao on a vessel going thither in ballast. In three days he arrived there. On the passage Mr. Hasskarl, unpacked his Quinquina plants, which he was able to do without interruption. He had reason to congratulate himself on their state, though they had been for more than four weeks shut up from light and air, when cutting

through the stems a fresh colour appeared. He immediately planted them in convenient cases. On the 7th of August, late in the evening, he arrived at Callao, and on the 27th he was ready to set out for Java, having passed the interval at Lima.

"As soon as the cooler west coast of South America was left, the heat began to increase daily, so that during the greater part of the day the thermometer marked 80° to 86° Fahrenheit. This made Mr. Hasskarl very careful of his plants, which, from his observations have in their natural position a temperature not above 60°, and generally below 50° Fahrenheit, and sometimes even at freezing-point. The objects had much to suffer in this heat, which must have been injurious to them, since they had made, including the transport from Bolivia, a land journey of six weeks. Shades of tents, etc., might ward off the sun's rays, but the glass cases were daily obscured with steam inside. The cases were opened, to clear away the mildew that had collected in them; and it was found good to repeat the operation daily. The mildew was continually renewed, and had to be taken away. At the beginning of the voyage, and after leaving the Sandwich Islands, the cases were inspected, and those that required water were supplied with it, however very sparingly.

"The stronger plants only began in any degree to sprout; the others showed no signs of doing so, although the stems evidently retained life. Some of them during the voyage began to shoot out at the root, whereas of the weaker plants, the parts above the soil appeared to be dying off, although it was apparently to be expected that they would shoot later. It was thought advisable not to endanger the plants by an untimely inspection, or loosening of the soil.

"We were informed, under date of the 22nd of December, 1854, that Mr. Hasskarl had arrived at Batavia on the 13th of that month, with twenty cases containing Quinquina plants, and at the same time, that a longer delay at Callao was caused by the difficulty of obtaining provisions and fuel; further, that at about 150 leagues from the Philippine Islands, the ship had encountered a dreadful hurricane, and had suffered much damage. They arrived at Ma-

cassar on the 3rd of December. As a long voyage now was considered bad for the plants, Mr. Hasskarl took his collection on board a steamship stationed there, and arrived at Batavia on the 13th, as mentioned.

"Measures were immediately taken by the Governor-General to transport the plants to the higher-situated Tjippannas, in which, however a delay of two days was occasioned by the tempestuous weather.

"Mr. Hasskarl, on his arrival, was charged with the cultivation of the Quinquina at Java.

"We have mentioned some seeds sent by Mr. Hasskarl to the Netherlands. The consequences thereof are to be considered as resulting directly from the mission carried out by that gentleman, and what is to be said of them will find an appropriate place here.

"Seeds of various sorts of Quinquina have successfully been received at the Colonial office as follows:—

1. "*Cinchona Condaminea*, Lamb., var. *δ*, *lancifolia*, Wedd. (*C. lancifolia*, Mutis), collected in new Granada, and presented to His Majesty's Consul-General there, Mr. Lansberge, by the famous traveller Karstens. From these seeds a few plants have been raised in the Academical Garden at Leyden. From Mr. Hasskarl were received—

2. "*Cinchona amygdalifolia*, Wedd. Sent immediately to Java per Overland Mail.

3. "*Cinchona Calisaya*, Wedd., from the Valley of Sandia, in the province of Carabaya, in Peru. Of this sort a quantity was sent, immediately on its arrival, by post to Java; another quantity was sown in the Botanical Garden.

4. "*Cinchona Calisaya*, Wedd, var. *β. Josephinæ;* sown, but come up badly in the Garden at Leyden.

5. "*Cinchona ovata*, R. et. P. (*Cascarilla crispilla, rhiqua* or *chiqua*). We were informed that this, like No. 4, grows as a shrub in the neighbourhood of Hohubamba (Peru), 5-6000 Paris feet, on sunny slopes; whereas No. 5 grows at 6-7000 feet in high woods, and even on slopes in a mouldy soil, more or less mixed with

mica-slate, which circumstances were taken into consideration in laying the seed to germinate, and in the raising of the plant.

"The seeds received (with the exception of those sent directly to Java) were immediately distributed by the Minister for the Colonies to the Directors of the Botanical Gardens of the Universities and of Amsterdam, to be germinated, and further cultivated. It will be unnecessary to mention that these directors, deeply impressed with the importance of the matter, used every effort to make these objects answer the views of the Minister. In the beginning of 1854, and since, in 1855, his Excellency, even a short time after the sowing, received from the Botanical Gardens favourable reports concerning the germination.

"With reference to the seeds that the Minister sent by the Overland Mail to Java, to be sown, favourable advices have been received from the Governor-General (see lower); which last circumstance induced the Minister to request the return of the seeds from the Gardens in the Netherlands, and to send them likewise by Overland Mail to East India. It will be readily seen that the Minister, in trying and promoting the matter by all the means in his power, has had no other aim than that of assuring himself of the success of the intended transplanting. The Quinquina plants raised in the Gardens progressed in their development so much, that even in 1854 some were sent to Java. This really took place, and they were sent from Leyden, Utrecht, and Amsterdam.

1. "From Leyden plants of *Cinchona Calisaya.*
2. "From Utrecht, plants of the *Cinchona ovata.*
3. "From Amsterdam, plants of *Cinchona Calisaya* and *Cinchona pubescens.*

"Of No. 1 favourable reports have been received; of No. 2 such are still expected.

"Could there possibly be a doubt as to the correctness of the naming of the sorts of those received from Mr. Hasskarl under the name of '*Cinchona Calisaya*, Wedd'? I think not. The Government had sent a thoroughly competent person, and one who, by a long expe-

rience in the investigation of nature, had become a clever botanist, and whose writings testify to his strict exactness and scrupulous nicety in the smallest particulars; his love of truth is above all praise; his special knowledge of the subject must be a guarantee against all mistake. With such security for my conviction, I thought to be able, *à priori*, to foresee, that from the seeds which the Government has been pleased to entrust to the Botanical Gardens, if they germinated, no other plants than the Calisaya Quinine-tree would appear, under which name I received them.

"The result has not disappointed the expectation. The Quinquinas here developed are *Calisaya* plants. A strict inquiry has proved this to me as certainly as science only can.

"Under date of the 21st of October, 1854, the Governor-General informed the Colonial Minister that a great part of the Quinquina plants had attained such a growth that they could be planted out in a regular garden. Later advices concerning the planting out do not inform us of the preservation of the greatest number of the plants which came up from seeds at the Tjibodas, but this was not to be expected; this has nowhere, or never been the case with transplantation. Experience yet teaches us that plants produced from seeds do not always grow up and remain sound.

"The result of the culture of the Quinquina, under the direction and care of Mr. Teysmann, as well those obtained from seeds of Mr. Hasskarl, as those sent on former occasions from Leyden and Amsterdam, is as follows:—

"In the beginning of the month of November, 1854, Mr. Teysmann went to Tjipannas to prepare the ground for the transplanting of the Quinquina plants there.

"The ground which Mr. Teysmann judged proper for the purpose was then covered with heavy wood; this however being prepared, the transplanting began. It was about half a mile above the Garden of Tjibodas, perhaps 300 or 400 feet higher than this place, and consequently 4600 to 4700 feet above the level of the sea. The soil is very mouldy, with a porous, greasy, red subsoil, in which trees of colossal height, mostly 150 feet, with a diameter

of four to six feet, thrive luxuriantly, but which however are now cut down. The land lies to the north-west of the deep ravine of Tjibodas, on the slope of the Gedeh Mountains, and offers above, as well as below, good ground for extending the culture, provided that the woods be felled. The climate through the whole year, but particularly in the rainy season, is very damp, and the vegetation is at times wrapped in the clouds.

"To these are now to be added the *Calisaya* plants brought directly from Peru by Mr. Hasskarl, those sent by Willink of Amsterdam, those sent and yet to be sent from the Gardens of the University and of Amsterdam, and the plants which at different times have been sent from the Netherlands to East India, besides those which are yet to come up from seeds now there; by which it may be computed that the plantations already made are, or will be in a short time, much more numerous than the success of the culture required.

"How well soever we may be convinced that all the care we can desire is given to the plants by Mr. Teysmann, it is not likely that the cultivation can be taken to heart better than by him who, on innumerable occasions, has risked his life in the countries from which he brought the living trees to Java. The observations concerning their growth, and the natural state of the places where they are found, can be applied to the culture at Java. Numerous particulars, which the most curious observer, who has not visited the original places where they grow, would pass by, are here brought to bear by the experience of Mr. Hasskarl. The long residence of that natural philosopher at Java, his acquaintance with the topography of the Island, with the elevations, table-lands, mountains and their slopes, the constitution of the soil, and the comparison of all these with those in the countries where the Quinquina grows; this rich treasury of knowledge and experience, we are of opinion, enables us to look for success to attempts so well undertaken.

"With all that has already been said with regard to the measures taken by the Government, and the direct importation from South America by Mr. Hasskarl, we think it not improper to say a

little of what has been done by means of botanical gardens in the Netherlands, and by one private person, Mr. J. Willink, in the cause of this weighty matter, although those endeavours alone would not, in our opinion, have attained the object of the importation.

"From the Botanical Garden at Amsterdam the Professor Miquel sent several Quinquina plants to Java. The results of the sending out of a Quinquina-tree to Java in 1847, under the name of *Cinchona alba*, were very favourable. This tree, after having blossomed at Java, was called there *Cascarilla Muzonensis*, Wedd., or *Cinchona Muzonensis*, Gaud. Mr. Teysmann occupied himself with the management of this tree, which is a shrub, and quickly obtained from it more than a hundred plants.

"To promote the chemical investigation of this sort of Quinquina, a few branches were sent to Mr. Rost van Tonningen, then apothecary at the Government Laboratory at Batavia; an analysis of which, on account of the small quantity of bark, was not easy. There was no Quinine in it, but a resin which unmistakably had the smell of Quinquina resin, and deserved further inquiry as soon as a larger quantity of the bark should be obtained. He determined to make a second analysis, when the trees should be older, and he should have a larger quantity of the bark.*

"We remark here, that till now it is not known at what period the alkaloids develop themselves; and we may expect that a further analysis of the bark of this sort, furnished by the justly-celebrated Botanical Garden of Amsterdam to Dutch East India, will afford us a new subject of information. We may not omit to mention that, for our chemists in Dutch East India, a new field of inquiry is opening, which may be of great importance to the very difficult, and as yet imperfect, chemical history of Quinquina barks.

"From the Botanical Garden at Amsterdam, besides the exports made by order of the Minister, plants of *Cinchona Calisaya* were successively sent to East India,—as in April, 1851, six plants; December, 1851, three plants; July, 1852, four plants. Mr. Wil-

* The result of the inquiry of Mr. Rost van Tonningen was published in the Nat. Tydschrift (Batavia, 1852).

link, of Amsterdam, has also sent once or twice to Java, and thereby has shown his real interest in the good cause.

"In the Botanical Garden at Paris some plants of the *Cinchona Calisaya* had grown up from seeds, sent by Mr. Weddell from South America; part of these were sent to Algiers, the rest were kept at Paris. In 1851 I saw two plants in one of the greenhouses, which, I was assured, were the only ones left. These, as I guess, were from 2-2½ feet high, and were in a healthy state. It would have been indiscreet to have asked for one of those two plants; I learned however that there was one at Messrs. Thibaut and Ketelière's, which seemed to me the same. This plant was conceded to me, and was sent from Paris to Leyden on the 21st of July, 1851. It grew luxuriantly here, and in a few weeks attained a length of 75 inches; it was sent by the Minister's orders, in an apparatus expressly made for it, to Java, on the 1st of December, 1851.

"A letter from Batavia, 21st April, 1852, informed me that what I had sent had succeeded; for which, it appeared, that the minute care and the particular form of the apparatus were to be thanked. A few slips were immediately taken from this little tree; and the preservation of the plant was ensured, if unfortunately the chief stem should wither, for which, at first, there was some fear. The slips grew, and the tree also was preserved, to which its transplantation to Tjipannas certainly contributed.

"The last advices from East India, concerning this plant, sent from the Botanical Garden, stated that very favourable expectations were formed of it, and that it had already attained a height of 5½ feet. Will the cultivation at Java succeed? Will the soil, the air, the light, the degree of warmth, of dampness, and other atmospheric relations, lastly, will the particular situation, suit the culture? Will the plant there find, in a word, all that it finds in its native soil that is necessary for its development in its normal state, and there everything to form all that which makes it the most valuable of all medicinal substances that the earth anywhere affords?

"Of no new agricultural undertaking is the result to be considered as certain. The whole system of agriculture consists but in the exchange or transplantation of plants from one *place* to another. This holds good for the agriculture of all Europe, and we may say the same (as far as we are acquainted with them) for the other parts of the world; but this is particularly the case with the culture in tropical districts, and with European civilization in other parts of the world. The numberless host of crops of economical or technical nature belong, rarely, or never, by nature, to the lands in which we see them raised.* But those cultivated plants are just the most useful of the whole earth. We seek and find at last, without difficulty, all the circumstances that they require, if the plants are not wholly unfit for the change of air and soil, which quickly appears. Many plants for the commerce of Java, whose produce, that of some at least, brings large sums annually to the treasury, are not indigenous to that beautiful country, but have been brought to it from elsewhere,—Coffees from Arabia, indigo from Southern Africa, cinnamon from Ceylon, vanilla and nopal from Mexico, tobacco from America, rice from China and Japan, etc. Of some others the origin is no longer to be known. Other plants were originally there, but specimens of them have also been imported from other places, and they all succeed excellently. To expose all this in detail would be to communicate things already known.†

* Von Humboldt (and we cannot produce a greater authority) says in his Essay 'Sur la Géographie des Plantes,' p. 27: "L'homme, inquiet et laborieux, en parcourant les diverses parties du monde, a forcé un certain nombre de végétaux d'habiter tous les climats et toutes les hauteurs; mais cet empire exercé sur ces êtres organisés n'a point dénaturé leur nature primitive. La pomme-de-terre, cultivée à Chili à trois mille six cents mètres de hauteur, porte la même fleur que celle que l'on a introduite dans les plaines de la Sibérie. L'orge qui nourrissait les chevaux d'Achille était sans doute la même que nous semons aujourd'hui. Les formes caractéristiques des végétaux et des animaux, que présente la surface actuelle du globe, ne paraissent avoir subi aucun changement depuis les époques les plus reculées," etc.

† Humboldt says (p. 27), "C'est ainsi que l'homme change à son gré la surface du globe et rassemble autour de lui les plantes des climats les plus éloignés. Dans les colonies Européennes des deux Indes un petit terrain cultivé présente le café de l'Arabie, la canne à sucre de la Chine, l'indigo de l'Afrique et une foule d'autres végétaux qui appartient aux deux hémisphères." Others think indigo an

The Island of Java must be considered as having not high alone but also low temperature, and different climates, even if it be not known by experience. On one and the same island grow cocoa-palms and species of oak; from its plains to the different elevations are found all the varieties of vegetation which are met with from the equator to the temperate zones. The plains of Java furnish the tropical flora in all its varieties; and the heights, table-lands, and mountain-tops, the floras of Southern and Middle Europe. The plains of Europe present many floras agreeing with that of the Java mountain-tops, which are 9,000 feet higher.

"The progress of our knowledge of the geographical propagation of plants, and of that propagation in connection with the knowledge of the physical constitution of countries, offer a vast field for enterprise in the culture and transplantation of plants, which may sometimes be brought from distances of thousands of miles.

"The situation of many of the Quinquina districts being analogous to the geographical breadth of Java, must not be lost sight of. If this island does not present a like temperature in respect to the division of the quantity of sunlight, that mighty spur to vegetation, it will however give some analogy.

"There exists at Java a principal requisite, which is of the greatest importance, and which almost warrants success. It is this: a good result to the transplantation of the Quinquina-tree from its native soil to a foreign land, can only be expected if (except conditions of less weight) one principal condition be fulfilled, namely that the trees be not planted in any country beyond the tropics; as only in the tropics does a temperature sufficiently even and unvarying last during the whole year, and by which the free development of the Quinquina-tree is made dependent by nature, as it appears in the geographical extent of those trees in Bolivia, Peru, Ecuador, New Granada. For this reason, the countries without the tropics, as Algiers or the Himalaya Mountains, could

Indian plant, although from the different information and opinions we may deduce that the matter is uncertain. See Roxb. Fl. Ind. iii. 379; Wight and Arn. Prodr. p. 202; Royle, Ill. Himal. t. 195; Alph. de Candolle, Geogr. Bot. ii. 854.

never serve for the culture of the Quinquina-tree, because they lie without the tropics, and the difference in the temperature of winter and summer is too great to suppose that trees that have been used to an even temperature through the whole year, would thrive there. Similar elevations, with a climate constituted as nearly as possible alike, having the same variations by day and night, are to be found. On the mountains of Java, floras similar to those of the Quinquina-woods of Peru, may indicate the way, the place, the soil probably, where the Quinquina may be cultivated with good success.

"In the opinion of Dr. Junghuhn, the elevation for the culture of the Quinquina is to be found at 5000 and 6000 feet, or even higher, particularly as we can with confidence assert that, in America, experience has taught us that those sorts which are met with in the lower stations produce less Quinine, and are used by the Carcarilleros only to mix with the better barks.

"The experience at first acquired should plead for the correctness of the assertion of many Dutch naturalists, who have frequently raised their voices in this important cause, and for the merited confidence which was reposed in their opinions by the present Minister for the Colonies, M. Charles Pahud, under whose direction, doubtless to his own satisfaction, this matter was begun and has been so far successfully carried out; indeed the culture is already begun, as we think we have established in this communication; but particularly by advices from Java, by which we are informed that the culture of the Quinquina is so far advanced that they are of opinion that it is *impossible for it to fail.* These foreign plants have been so acclimated, multiplied, raised from seeds, planted out, and all with such good success, that the Quinquina plantation is reported as being in a very flourishing state.

"We are convinced that unless great and not to be foreseen calamities befall them, we shall in a few years see Quinquina plantations at Java yielding the best sorts of Peru and Bolivia. The number of trees which may be raised in a few years is incalculable; but if we take for the basis of our calculation, the fact that a small tree which arrived at Java three years ago, is now five feet and a half high, and has given off sixty striplings, then, in a few years, by a

proportionate continuation of the culture, the number of trees will be increased to millions.

"Thus we have succeeded in carrying out a matter in which the whole human race has an incalculable interest, and which was undertaken, not for the Netherlands alone, from thirst for gain or commercial speculations, but for the real benefit of mankind. We flatter ourselves that the Netherlands, on this account, may reckon on the approbation of the whole civilized world."

Supposed Aërolite in a tree.

We re-publish the following paper by Sir R. Murchison, from the proceedings of the Royal Society not only on account of the intrinsic interest attaching to the subject but as an example of careful induction and research applied to a singular natural phenomenon, and as an example of the caution with which conclusions should be drawn regarding the nature and origin of remarkable appearances in nature. Young and rash observers, particularly in India where access to books and well authenticated specimens is often difficult, are too apt to pronounce dogmatically on forms which meet them in the course of their inquiries. The care and circumspection exhibited by so eminent a philosopher as the President of the Geological Society in this investigation should serve as a warning against too hasty and confident a reliance on first impressions.

"In bringing this notice before the Royal Society, it is unnecessary to recite, however briefly, the history of the fall of aërolites or meteorites, as recorded for upwards of three thousand years, though I may be pardoned for reminding my Associates, that the phenomenon was repudiated by the most learned academies of Europe up to the close of the last century. The merit of having first endeavoured to demonstrate the true character of these extraneous bodies is mainly due to the German Chladni (1794), but his efforts were at first viewed with incredulity. According to Vauquelin and other men of eminence who have reasoned on the phenomena, it was in 1802 only that meteorites obtained a due degree of consideration

and something like a definite place in science through the studies of Howard, as shown in his memoir published in the Philosophical Transactions.

"Vauquelin, Klaproth, and other distinguished chemists, including Berzelius and Rammelsberg, have successively analysed these bodies, and the result of their labours, as ably brought together in the work of the last-mentioned author, is, that whilst they have a great general resemblance and are distinguishable on the whole by their composition from any bodies found in the crust of the earth, each of their component substances is individually found in our planet. They are also peculiarly marked by the small number of minerals which have collectively been detected in any one of them; nickel and cobalt, in certain relations to iron, being the chief characteristics of the metallic meteorites.

"Of the various theories propounded to account for the origin of these singular bodies, it would indeed ill become a geologist like myself to speak; and referring in the sequel to some of the various works in which the subject has been brought within formula, I will at once detail the facts connected with the discovery of this metalliferous body in the heart of a tree, as now placed before the Members of our Society, feeling assured that, whatever be their ultimate decision, my contemporaries will approve of the efforts that have been made to account for this singular and mysterious phenomenon.

"On the 2nd of June, a timber merchant, residing at North Brixton, named Clement Poole, brought the specimen now exhibited to the Museum of Practical Geology, when it occurred to Mr. Trenham Reeks, our Curator, that it might be a meteorite, and on inspecting its position in the mass of wood, and having heard all the evidence connected with it, I was disposed to form the same conclusion. On submitting a small portion of the metallic part to a qualitative test in the metallurgical laboratory of our establishment, the presence of nickel, cobalt and manganese was detected in the iron included in the mass, and as the surface was scorified, indented, uneven, and partially coated with a peculiar substance, the surmise as to the meteoric nature of the imbedded material seemed

to be rendered much more probable. Again, in looking at the wood which immediately surrounded that portion of the mass which remained, as it is now, firmly inserted in the tree, a blackened substance was observed to be interpolated between the supposed meteorite and the surrounding sound wood. On the outside of this substance (which had somewhat a charred aspect) we observed a true bark, which follows the sinuosities of the wood wherever the latter appears to have been influenced by the intrusion of the foreign mineral matter.

"Seeing thus enough to satisfy our conjecture, if sanctioned by other evidence, I desired Mr. Poole to bring all the fragments of the wood he had not destroyed which surrounded this body. On placing the ends of some of these (also now exhibited) on the parts from which they had been sawed off, they indicated that the space between the mineral substance and the surrounding sound wood widened upwards; the decayed wood passing into brown earthy matter with an opening or cavity into which rootlets extended. On interrogating Mr. Poole, who cut down the tree and superintended the breaking up of its timber, I learnt from him all requisite particulars respecting its dimensions, the position of the ferruginous mass, the quantity of wood above and below it, a description of the place where the stool of the tree was still to be seen, and of the parties who, living on the spot, were acquainted with every circumstance which could throw light on the case.

"At this period of the inquiry, the Museum in Jermyn Street was visited by Dr. Shepard, Professor in the University College, Amherst, United States, whose researches on meteorites are widely known, and who has furnished an able classification of them by which they are divided into the two great classes of stony and metallic. Having carefully examined the specimen, Dr. Shepard expressed his decided belief that it was a true meteorite, and the next day wrote to me the following account of it; at the same time referring me most obligingly to a series of interesting publications on the subject as printed in America and Europe* :—

* Dr. Shepard's numerous memoirs on meteorites are all to be found in the volumes of the American Journal of Science and Art, and in the same work the reader will find not only the general classification of these bodies by this author, who

"Concerning the highly interesting mineral mass, lately found enclosed in a trunk of a tree, and of which you have done me the honour to ask my opinion, I beg leave to observe, that I have no hesitation in pronouncing it to be a true meteoric stone.

"Aside from the difficulty of otherwise accounting for it, under the circumstances in which it is found, the mass presents those peculiar traits that are regarded as characteristic of meteorites. It has, for example, a fused, vitrified black coating, which is quite continuous over a considerable part of the mass, and contains several grains and imbedded nodular and vein-like portions of metallic iron, in which I understand nickel and cobalt have been detected.

"The general character of the body of the stone is indeed peculiar; and as a whole, unlike any one I have yet seen; it being principally made up of a dull greyish yellow, peridotic mineral, which I have nowhere met with among these productions, except in the Hommoney Creek meteoric iron mass, and which exists in it only in a very limited quantity. It is singular to remark also, that the stone under notice strikingly resembles in size, shape and surface, the iron above alluded to.

"The absence of the black, slaggy coating on one of the broad surfaces of the stone, may arise from its having been broken away, by the violence to which it must have been subjected in entering the tree; for it appears to have buried itself completely at its contact, an operation which would probably have been impossible, in the case of a stone, but for its wedge-shape configuration, and the coincidence of one of its edges with the vertical fibres of the wood.

possesses a collection from 103 localities, but also essays on the same subject by his countrymen Dr. Troost, Professor Silliman, jun., and Dr. Clark.

In our own country, Mr. Brayley published some years ago a comprehensive view of this subject in the Philosophical Magazine, and recently Mr. Greg has in the same publication put together all the previous and additional materials, with tables showing the geographical distribution of meteorites. Among the well-recorded examples of the fall of metalliferous meteorites, no one is more remarkable than that which happened in the year 1851, about sixteen leagues S. E. of Barcelona in Spain. In describing that phenomenon, Dr. Joaquim Balcells, Professor of Natural Sciences at Barcelona, has illustrated the subject with much erudition, whilst his theoretical views are ingenious in his endeavour to explain how meteorites are derived from the moon.

"In reply to a question I subsequently put to Dr. Shepard as to whether he knew of any examples of meteorites having struck trees in America, he replied as follows:—

"I think you will find in the volume I left with Mr. Reeks at the Museum, an account of the fall of Little Piney, Missouri, February 13th, 1839; in which it is stated that the stone struck a tree and was shattered to fragments, it being one of a brittle character. In the interior of the Cabarras country, N. Carolina, a stone (October 31, 1849) I know struck a tree, and I found it was difficult, indeed impossible, to separate completely the adhering woody fibres from the rough hard crust of the meteorite. The stone in this case is a peculiarly tough one, having a decidedly trappean character, rendering it as nearly infragile as cast iron."

"Aware that some time must elapse before the precise analysis, which I wished to be made in the laboratory of Dr. Percy, could be completed, and that the last meeting of the Royal Society was to be held this evening, I announced the notice I am now communicating. At the same time I resolved to visit the locality where the tree stood and to obtain on the spot all the details required. Having done so, accompanied by Mr. Robert Brown, Sir Philip Grey Egerton, Professor J. Nicol, and Mr. Trenham Reeks, the information ultimately obtained was as follows:—

"The man who helped to cut down the tree confirmed in every respect the evidence of Mr. Poole as to its position, height and dimensions, and pointed out to us the stump or stool we were in search of, which is to be seen at nearly 200 yards to the east of the St. George's Chapel, Lower Road, Battersea Fields, and at the eastern end of a nursery garden, between the railway and the road, occupied by Mr. Henry Shailer.

"The tree was a large willow, probably about sixty years of age, which stood immediately to the east of the old parsonage house recently pulled down. Its stem measured about 10 feet in circumference at 3 feet above the ground, and had a length of between 9 and 10 feet; from its summit three main branches extended, one of which, pointing to the S. W. or W. S. W. had been for many years blighted, and was rotten to near its junction with the

top of the main trunk; a portion of this blighted main branch is exhibited. The other two main branches, which rose to a height of 50 or 60 feet, were quite sound; a part of one of these offsets is also exhibited.

"The stool of the tree was visibly perfect and without a flaw, and at the wish of Mr. R. Brown, a section of it has been obtained since our visit, which is also here, and the rings of which seem to confirm the supposition as to the age of the tree.

"Mr. Poole having conveyed the tree to Brixton, cut the trunk into two nearly equal parts, intending to make cricket-bats out of each. In doing so, he perceived that the upper portion of the lower of the two segments was in a shaky or imperfect condition, and hence he resolved to saw off the upper part of it, intending thereby to obtain wood large enough for the "pods" of his cricket-bats, but not such entire bats as he was making out of the upper segment.

"In dividing the tree, the saw was stopped at about 8 inches from the surface on one side (or the breadth of a large saw) by a very hard, impenetrable substance, which was supposed to be a nail, and hence Mr. Poole resolved to break up the portion of the wood he had previously condemned as of inferior quality, and hewing it down from the sides he uncovered, to his astonishment, the great lump of metalliferous matter, as now seen. Attaching little value to it, much of the surrounding wood was thrown away or used up before the specimen was brought to Jermyn Street; but enough has been obtained to throw light on the probable or possible origin of the included mass.

"On interrogating Henry Shailer, a market gardener, who has long lived on the spot and managed the ground where the tree grew, when it was part of the garden of the former clergyman (Mr. Weddell), I learnt from him that he had known the spot for sixty years, that in his days of boyhood it was a fellmonger's yard, before it was attached to the garden. He had observed that the tree was blighted in one of its main branches for many years, and had always supposed that it was struck by lightning in one of two

storms, the first of which happened about 1838 or 1839, the other about nine years ago.

"So far the evidence obtained might be supposed to favour the theory that this ferruginous mass* had been discharged near to the blighted branch, and had penetrated downwards into the tree, to the position in which we now see it, charring and warping the wood immediately around it in its downward progress; whilst in the sixteen years which have elapsed, the wood renovating itself, produced the appearance which has so much interested the eminent botanists who have examined it, viz. Mr. R. Brown, Dr. Lindley, Professor Henfrey, Dr. J. Hooker, and Mr. Bennet.

"On the other hand, I must now point out some features of this extraordinary case which check the belief in the included mass being a meteorite.

"We found lying near the root of the tree two fragments, one of which is similar to the substance included in the tree, while the other is decidedly an iron slag. On bringing these fragments, weighing several pounds, to Jermyn Street, and on breaking one of them, it was found, like the supposed meteorite, to contain certain small portions of metallic iron, in which both nickel and cobalt were also present; and hence the scepticism which had prevailed from the beginning of the inquiry in the minds of some of my friends, was worked up into a definite shape.

"The occurrence of stones enclosed in wood is not a novel phenomenon. Mr. Robert Brown has called my attention to two cases as recorded in the following words:—

"De lapide in trunco betulæ reperto. G. F. Richter in Acta Phys. Med. Acad. Nat. Curios. volume 3, page 66†."

"Descriptio Saxi in Quercu inventi. Kellander, Acta Literaria et Scientiæ Sueciæ." 1739, pp. 502, 503.

* The ferruginous mass is, it is supposed, about thirty pounds in weight; but as one of its extremities is still imbedded in the wood, the precise weight cannot be stated.

† "Lapis prædurus subalbicans et manifeste siliceus pruni ferme aut juglandis minoris magnitudine. * * * * Nidus ad figuram lapidis non plane accommodatus, sed quadrangulus, et hinc illinc in mediocres rimas desinens, corticeque imprimis notabili, non multum ab exteriori cute diverso, maximam partem vestitus."

"Since the Battersea phenomenon was announced, Professor Henslow, to whom I had applied, wrote to me saying, that he possessed a remarkable example of a stone which was found imbedded in the heart of a tree, in sawing it up in Plymouth Dockyard; and he has obligingly sent up the specimen, which is now also exhibited. In this case, judging from the mineral character of the rock, and its being slightly magnetic, Professor Henslow supposed that it was perhaps a volcanic bomb. On referring it to Dr. Shepard, that gentleman entertains the opinion that it is also a meteorite, and states that it resembles certain meteoric stones with which he is acquainted; suspicions of which had also been entertained by Professor Henslow. From the examination of a minute fragment which I detached from this stone, it appears to be composed of a base of felspathic matter, with minute crystals of felspar and of magnetic iron pyrites. Externally it has a trachytic aspect, though, when fractured, it more resembles, in the opinion of Mr. Warington Smyth, a pale Cornish elvan or porphyry than any other British rock with which it can be compared. Whatever may have been the origin of this stone, which is of the size of a child's head, it is essentially different from the metalliferous mass from Battersea, to which attention has been specially invited, and its position in the heart of an oak is equally remarkable. Like the Battersea specimen, the segment of wood from Plymouth Dockyard is characterized by an interior bark which folds round the sinuosities of the included stone.

"In respect to the envelopment of manufactured materials in trees, my friend, Mr. H. Brooke, the distinguished mineralogist, tells me that he perfectly remembers the case of an iron chain which had been enclosed in the heart of a tree, the wood of which was sound around the whole of the included metallic body. This specimen was to be seen some years ago in the British Museum. Again, he informs me that at Stoke Newington he recollects to have seen a tree, the trunk of which had grown over and completely enclosed a scythe, except on the sides where its ends protruded*.

* Many other examples of extraneous bodies found enclosed in the heart of trees have been brought to my notice since this account was written. The most curious of these is perhaps that of an image of the Virgin, which having been placed in a niche had become imbedded by the growth of the tree around it.

"Whatever may have been the origin of the metalliferous mass from Battersea, its discovery has at all events served to develop certain peculiarities in the growth of plants which appear to be of high interest to the eminent botanists who have examined the parts of this tree which surrounded the supposed meteorite. Unwilling to endeavour to anticipate the final decision as to the origin of the body in question, I may be permitted to feel a satisfaction that its discoverer brought it to the Establishment of which I am the Director, and which numbers among its officers a Fellow of this Society, who is so well calculated, by his analytical researches, to settle the question on a permanent basis. Should the metallurgical analysis now under the conduct of Dr. Percy lead to the inevitable conclusion that the composition of this body is different from that of well-authenticated meteorites, and is similar to that of undoubted iron slags, we shall then have obtained proofs of the great circumspection required before we assign a meteoric orign to some of these crystalline iron masses, which though not seen to fall, have, from their containing nickel, cobalt and other elements, been supposed to be formed by causes extraneous to our planet.

"Postscript, 30th June 1855.—The following are the analyses above referred to which have been given to me by Dr. Percy since the preceding notice was read :—

"*The slag-like* matter (1) attached to the metal in the tree, as well as the similar matter (2) with adherent metal which was found by Mr. Reeks in the vicinity of the tree, has been analysed. The results are as follow :—

	No. 1.	No. 2.
Silica	58·70	63·52
Protoxide of iron	35·46	32·30
Lime	0·30	0·59
Magnesia	0·74	0·21
Protoxide of manganese	trace	trace
Alumina	3·40	2·85
Phosphoric acid	0·43	0·57
Sulphur as sulphide	trace	trace
	99·03	100 04

"No. 1. was analysed by Mr. Spiller, and No. 2. by Mr. A. Dick, chemists who have been incessantly engaged at the Museum during the last two years and a half in the analyses of the iron ores of this country, and whose great experience renders their results worthy of entire confidence. Cobalt and nickel were not sought for in either case, but the metallic iron enveloped in both specimens contained a minute quantity of cobalt and nickel. Another piece of slag-like matter, which was found on the ground near the tree, and which from its external characters I have no hesitation in pronouncing to be a slag, was examined for cobalt and nickel and gave unequivocal evidence of the former in minute quantity, though not satisfactorily of the latter.

"The metal previously mentioned is malleable iron. That which was detached from the slag-like matter, found outside the tree, was filed and polished, and then treated with dilute sulphuric acid. After this treatment, the surface presented small, confused, irregularly-defined crystalline plates, and was identical in appearance with the surface of a piece of malleable iron similarly treated after fusion in a crucible."

COLONEL H. C. RAWLINSON,

On the Results of the Excavations in Assyria and Babylonia.

These excavations, independently of the treasures of art disclosed by them, have opened up to us a period of about 2000 years in the world's history, which, as far as the East is concerned, was before almost entirely unknown. The cuneiform inscriptions of Babylonia and Assyria furnish a series of historical documents from the 22nd century B.C. to the age of Antiochus the Great. The speaker divided these documents into three distinct periods of history, the Chaldæan, the Assyrian, and the Babylonian, and he then proceeded briefly to describe each period in succession. During the Chaldæan period the seat of empire was to the south, towards the confluence of the Tigris and Euphrates, and the sites of the ancient capitals were marked by the ruins of Mugheir, of Warka, of Senkereh, and of Niffer. At Mughier, called in the in-

scriptions *Hur*, and representing the biblical *Ur* of the Chaldees, inscriptions have been found of a king, "*Kudur*, the conqueror of Syria," who was probably the Chedorlaomer of the Bible. At any rate, a king named *Ismi-Dagan*, who lived some generations later, is proved, by a series of chronological dates found in the Assyrian tablets, to belong to the 19th century B.C., so that the era of the earlier king agrees pretty well with the ordinary computation of the age of Abraham. The names of about twenty-five kings have been recovered of the ancient period, and there are good grounds for believing that the Assyrians did not succeed in establishing an independent empire at Nineveh till the early part of the fifteenth century B.C.

From B.C. 1273 to 625, the Assyrians seem to have been the lords paramount of Western Asia, and their history is preserved in an almost continuous series of documents, from the institution of the empire to the taking of Nineveh by the Medes and Babylonians. During the later part of this period, or from about 800 B.C., Jewish history runs in a parallel line with that of Assyria; and wherever a comparison can be instituted between the sacred records and the contemporary annals of Nineveh, the most complete agreement is discovered between them; and that not only in regard to the names of the kings, but also in respect to their order of succession, their relationship to each other, the wars in which they were engaged, and even the leading features of those wars. Col. Rawlinson noticed many such examples of coincidence, and drew attention to the great value of the verification which was thus obtained of Scripture history.

The third, or Babylonian period, was then shortly discussed; the reigns of Nebuchadnezzar and Nabonidus being especially selected for illustration. A description was given of the excavation of the great ruin near Babylon called Birs Nimrud, and a translation was read of the edict of Nebuchadnezzar inscribed upon the clay cylinders, which were found imbedded in the walls of the temple. A number of original relics, discovered among the ruins of Chaldæa, Assyria, and Babylonia, and illustrative of these three periods of history, were also exhibited to the meeting, previously to their being deposited in the British Museum.

LIST OF KINGS.

I. CHALDÆAN PERIOD.

Name of King.	*Approximate Date.*
Urukh - - - - -	B.C. 2234
Ilgi - - - - - - -	
- - - - - - - -	
Sinti-Shil-Khak - -	
Kudur-Mapula - - -	1950
- - - - - - - -	
Ismi-Dagan - - - -	1860
Ibil-Anu-Duma - -	
Gurguna - - - - -	
- - - - - - - -	
Naram-Sin - - - -	
Durri-Galazu - - -	1700
Purna-Puriyas - - -	
- - - - - - - -	
Khammurabi - - -	
Samshu-Iluna - - -	1600
- - - - - - - -	
Sin-Shada - - - -	
Rim-Sin - - - : -	1500
Zur-Sin - - - - -	
- - - - - - -	
Merodach-Gina - - -	
- - - - - - - -	
- - - - - - - -	1400
- - - - - - - -	
- - - - - - - -	1300
- - - - - - - -	

II.—ASSYRIAN PERIOD.

Belukh - - - - -	1273
Pudil - - - - -	1255
Phulukh I. - - - -	1240
Shalama-Bar I. - - -	1220
Sanda-Pal-Imat - - -	1200

Name of King.	*Approximate Date.*
Asshur-Dapal-II. - -	B.C. 1185
Mutaggil-Nebo - - -	1165
Asshur-Rish-Ipan - -	1140
Tiglath-Pileser I. - -	1120
Asshur-Bani-Pal. I. - -	1100
- - - - - - - -	
Asshur-Adan-Akhi - -	950
Asshur-Danin-I. - - -	925
Phulukh II. - - -	900
Tigulti-Sanda - - -	880
Sardanapalus - - -	850
Shalama-Bar II. - -	815
(Asshur-Danin-Pal)	
Shamas-Phul - - -	780
Phulukh III. { or Pul and Samuramit { Semiramis }	760
Tiglath-Pileser II. - -	747
Shalmaneser (?) - - -	730
Sargon - - - - -	721
Sennacherib - - - -	702
Esar-haddon - - -	680
Aashur-Bani-Pal II. -	660
Asshur-Emit-Ilut - - { to	640 to 625

III.—BABYLONIAN PERIOD.

Nabopolassar - - -	625
Nabokodrossor (or Nebuchadnezzar) -	605
Evil-Merodach - - -	562
Nergal-Shar-Ezer - -	560
Nabonidus, and Bel-Shar-Ezer (Belshazzar)	554 to 538
Taking of Babylon, by Cyrus.	

N.B.—It must be understood that the reading of many of these names is still far from certain. [H. R.]

Journal of Royal Institution, Vol. II., p. 143.

Flora Indica.

We regret to learn that this valuable work is likely to be arrested in its progress, owing to the want of encouragement on the part of the East India Company. Drs. Thomson and Hooker undertook the work at their own risk. The first Volume gives an earnest of what might have been expected at their hands. The authors are already well known to the scientific world by their botanical works, and every one acquainted with science is aware of their high standing and of their thorough competency for the task they have undertaken. The work is a national one, and promises to be one of the most important which has appeared in the botanical world. It will be the result, in a great measure, of personal observations, aided by the unrivalled resources of the Hookerian Herbarium. That such a boon to science should be stopped for want of funds, and that the authors should suffer pecuniary loss, is by no means creditable to our country. When the Admiralty have most nobly published the results of arctic and antarctic expeditions, it is surely not too much to expect that the East India Company, which is so much indebted to the labours of scientific men, should lend a helping hand in making known the vegetable productions of that vast territory over which they rule.

We think that all interested in science should unite in memorializing the Company on this subject, and we cannot for a moment doubt that the unanimous voice of scientific societies and scientific men will ultimately prevail.—*Edinburgh New Philosophical Journal, Vol. V., p.* 204.

SCIENTIFIC INTELLIGENCE.

Mines of Antimony.

On the table at the Home Office may be found some interesting correspondence relating to Mines of Antimony.

So far back as 1854, Major Hay brought to the notice of the Chief Commissioner of the Punjaub, that he had discovered on the great Shigree Mountain a vast deposit of metals in granite, one of

the principal being a Sulphuret of Antimony. In June 1855, M. Marcadieu, the Analytical Chemist, visited the locality, and while he acknowledged the richness of the mine, urged that placed as it is at an elevation of 13,507 feet, and covered for a great portion of the year with snow, no great commercial benefit could be anticipated from it. Major Hay, however was by no means discouraged, and determined to prosecute his researches, the results of which he communicated to the Deputy Commissioner of Kangra.

Six distinct beds of metal are now visible on the surface, three of which have been worked. Major Hay believes that the supply is inexhaustible, and the specimen sent to Dr. Macnamara for analysis, was found to contain so much as sixty per cent. of pure metal. It appears that owing to the dreariness of the locality, and other unfavourable causes, it would not be advisable to work the mines for more than three months in the year, and even during that limited period, the labourers would have to work under considerable disadvantages. Major Hay calculated that including every expense, the Antimony could be landed at Nuggur for two rupees per *pucka* maund; but he seems to have made no allowance for the impurities with which the metal must always be impregnated, and it is said that the three hundred and twenty *kucha* maunds lodged at Nuggur, probably do not contain more than one hundred and sixty maunds or sixty *pucka* maunds of pure metal. The Officiating Commissioner and Superintendent of the Trans-Sutlej States, is disposed to estimate the precise cost of the Antimony at Nuggur, after purification, at double or triple the price fixed by Major Hay.

With the view of testing the commercial value of the Antimony sent down, a meeting of the merchants of Julundhur trading in this article was called, and they assured Major Lake the Officiating Commissioner that in its then impure state, Major Hay's Antimony would scarcely find a market; that the sulphur with which it was impregnated would seriously affect its value, and that even under the most favorable circumstances, it would scarcely fetch more than four or five rupees a *pucka* maund. The Officiating

Commissioner was also informed that they could procure from a mine near Jugadree at four rupees a *pucka* maund, landed at Julundhur, an Antimony of somewhat inferior quality to that discovered on the Shigree Mountain, and also showed him a specimen procured from Reeanee near Jummoo, for which they paid as high as nineteen rupees a pucka maund. With this Antimony, it is said, Major Hay's specimens cannot be compared in quality, and if the relative distance of the two places be considered, the accessibility of Reeanee and the isolated position of the Shigree Mountain, the Antimony brought down from the latter place will not be able to compete with the Jummoo product in the distant markets of the Punjab. The Officiating Commissioner however, thinks it important to ascertain whether the Mines of Reeanee are sufficient for the wants of the Punjab, and if so, how it is that the Antimony of Europe and Candahar finds a sale. He states that he has been credibly informed that Antimony is now in less demand than it was in Europe, where it was formerly employed in all printing types, but by a recent invention leaden types capped with steel are used instead. He does not therefore anticipate any great commercial benefit from Major Hay's discovery, but considers that the latter is entitled to credit for prosecuting his researches with so much enterprise, and recommends that he be reimbursed all expenses to which he has been put in this attempt to develop the resources of the Koolloo Province.

Major Hay in a letter addressed to the Deputy Commissioner of Kangra, mentions that, towards the beginning of the last war it was stated, Antimony had been manufactured into cannon-balls, and had been found to answer better than any other metal; and that as the different scientific journals published the result, he apprehends "it was not a mere puff of the holders of Antimony to sell the metal;" and suggests that there is nothing to prevent the mine being worked on so extensive a scale as to furnish all magazines in Upper India with shot made from Antimony.

A refusal of the sanction of His Lordship in Council however has recently been conveyed to the Chief Commissioner of the Punjaub to the working of the Antimony mines discovered by Major

Hay, on the ground that no material advantage would be derived from the undertaking. He is, nevertheless, pleased to acknowledge the exertions of Major Hay, and to authorize that Officer to submit a contingent bill for his *bonâ fide* expenses."—*Madras Spectator, March* 19, 1857.

Observations on the Graphite or Plumbago of Kumaon and of Travancore, by J. FORBES ROYLE, M. D.

Specimens of Graphite and Plumbago have on various occasions been sent from different parts of India and a desire expressed to have their value ascertained in this country,

Thus at the Exhibition of 1851, there were specimens from Almorah, Vizagapatam and Travancore.

The specimens from Travancore are in nodules extremely soft but brilliant, very like the Ceylon Graphite, of which some quantity has for some time been imported and sold for about £8 to £10 a ton. Some of the purer specimens of Travancore would rank with them, but all impurity greatly deteriorates its value. The Vizagapatam in its present state seems to be worthless.

Graphite has on several occasions been sent from Almorah as in 1849 and 1850, again in 1851 and lastly on the present occasion. It was first discovered by Captain Herbert near Almorah, who describes cutting it into slices of which he made pencils, showing that it had some of the qualities required in that substance. The specimens sent in 1849 and 1850 were examined and reported on by the late Mr. Phillips and also by the late Mr. Brockeden. The latter of whom was well acquainted with the practical uses and commercial value of Graphite, but he pronounced the specimens for any purpose that he was acquainted with as useless, and therefore worthless. The same opinion was again given to me by Mr. Brockeden before his death.

If the enormous value (from 30*s.* to 50*s.* a pound) of good Graphite, is considered, the declared worthlessness of these Indian specimens seems to be unaccountable. It is desirable to ascertain

what constitutes the value of good Graphite and what causes the deterioration of that from India. For this purpose it is necessary to notice the different uses to which this substance is applied. These are 1st for making pencils, 2nd to diminish the friction of machinery, 3rd to make fire proof crucibles, 4th to *black-lead* grates as it is called. For all these purposes except the last, it is evident that purity is essential.

The best pencils were formerly made of the Borrowdale Graphite, obtained from a mine which is now exhausted. This kind was pure and compact, and sold readily at about 40*s*. a pound. It was sawn into thin slices, these were inserted into the groove of one-half of Cedar Pencils and the superfluous part filed off, then the other half was glued on to the filled up half of the pencil. It is evident that for such a purpose only the purest specimens were of any value, for the presence of a bit of quartz or of an ore of iron or of any other metal would injure the tools and fracture the thin slices or slender prisms of Graphite, and if they did not produce any of these effects, they would be very inconvenient at the point of a pencil for whatever purpose employed. Indeed if it had not been for the discovery, that finely-powdered Graphite can by an extreme degree of pressure be rendered nearly as compact as the best natural Graphite, we should have been without any more good drawing pencils. But the Graphite for grinding though in small pieces, must be pure, or otherwise the grinding mills become injured, besides pencils made with it being unfit for use.

So also finely powdered Graphite is required for mixing with fatty substances in order to diminish the friction of machinery. It is equally evident, that this must be of the purest kind, or otherwise the machinery in which it was prepared, or that to which it was applied would be equally injured. Thus also if Graphite as an infusible substance, is required for mixing with the more infusible kinds of clay for making the best crucibles, the Graphite must be without impurities, as these would diminish the melting point and render the crucibles useless.

The Graphite or Plumbago, black-lead as it is commonly called and used for polishing grates, is an impure substance, but if

it has sufficient lustre it may be applied to such a purpose, but then it is always a low priced article.

Notwithstanding the unfavorable opinion entertained by Mr. Brockeden of the Graphite from Kumaon, I again submitted to him the specimens sent to the Exhibition of 1851, as well as those which had been forwarded from Travancore. He considered both as valueless, so Messrs. Reeves whose opinion I likewise asked accounted them "quite useless for the manufacture of black-lead pencils." Messrs. Woiff of Church Street Spitalfields who also make pencils, by first grinding and then condensing Graphite, took a more favorable view of the specimens, inasmuch as they could not conceive why pure specimens should not be found in the localities where both kinds had been collected. But they also observed, that they could not use the specimens in the state in which they had been sent, without damaging their machinery, and it would take time and labour, costing of course a good deal of money in this country, to separate the purer specimens from those which were intermixed with quartz or ores of iron.

Among the Travancore specimens however Messrs. Wolff observe many which are sufficiently pure for use, and if these were picked out in India and sent separated from the pieces covered and intermixed with quartz or iron ore, there is no doubt that it would sell in the markets for at least £8 or £10 a ton according to its purity and perhaps higher. As Trevandrum near to which the Plumbago is found is in the vicinity of the Sea and near a port like Cochin, there would be very little expense in land carriage and therefore freight would be the chief charge, but this might not be high as Plumbago is sometimes sent as ballast.

With regard to the Graphite from near Kumaon, Messrs. Wolff state, like Mr. Brockeden, that they cannot use it in the state in which it is sent in consequence of the quartzy sand and iron ore with which it seems to be intermixed. But from the internal purity of some of the Graphite in nodules, as well as from the appearance of the larger specimens they conceive that pure specimens of compact Graphite should be found in the same locality. But of this, those examining the localities themselves must

be better judges than those looking at bad specimens. It is certain that no specimens have yet been sent sufficiently pure to be sawn in slices or for grinding in the mills. The specimens last sent are valued at not more than £5 a ton.

Mr. Ruel celebrated for making crucibles (v. Jury Reports) considered that the specimens from Travancore were not worth more than 8*s*. a cwt. for his purpose though the price is sometimes as high, as 14*s*.

A good practical test I am told is that of chewing a small piece, when if not gritty, it will probably be found to be sufficiently pure for grinding up.

It is possible however that the enquiries now being made by Chemists may devise methods by which the impure specimens may be made available for purposes not yet generally known, I have been asked by one of our intelligent Chemists to ascertain the quantity in which the Travancore Graphite can be obtained and the cost per ton, at which it can be delivered on board-ship. It seems desirable therefore to forward a copy of this communication to Travancore as well as to Kumaon.

Extract from a letter from the Resident of Travancore and Cochin, dated 9th February 1857.

"Two varieties of Graphite are found in Travancore, one in their laminæ, another granular, and I sent specimens of both to the Exhibition of 1851.

"The granular or fibrous variety, I have only yet discovered in two localities and both of them in laterite, a few feet only below the surface. One locality is about 5 or 6 miles N. E. of Trevandrum and the other about 12 or 14 miles N. E., I brought in from this latter locality on my visit to it about 3 cwt.

"Some small deposits are also found immediately on the W. of the town of Trevandrum, but I have not yet heard of any other deposits of this granular variety, though I think it probable they exist.

"Graphite in thin scates or laminæ is common nearly throughout the laterite tracts of Travancore and Cochin, but more or less

abundant in particular places. It is found in some places in laminæ of considerable size, particularly in a laterite hill about 25 miles N. E. of Trevandrum at a place called Caviattencoodul, near the foot of the Ghât mountains.

"It is also found in laminæ of good size in the disintegrated gneiss of the Ghâts on the Tinnevelly side, also common in the Kunker or Travertine Deposits near Culdacoorchee and Ambasamoodrom.

"The Vizagapatam Graphite is perhaps also found in laterite, of which there is a large deposit at Bimlipatam.

"The objections made to the specimens of Graphite sent by me to the London Exhibition of 1851, were because of the impurities attached to it, but one motive in the selection of the specimens forwarded was to exhibit the matrix or laterite rock in which they were found."

Dr. Walker's report on boring for Coal at Kotah, a village 10 *or* 12 *miles from the junction of the Wurdah River with the Godavery, in the months of April and May,* 1848.

[The following paper was received from Hyderabad and communicated by the Chief Secretary to Government to the Literary Society for the information of Mr. Wall, the Coal and Mineral Viewer of this Presidency.]

In a paper published in the Journal of the Asiatic Society of Bengal for the month of June 1841, and to which reference is now made, I showed the probability of a coal bed existing on the left bank of the Pranheetah or Wurdah river, close to a small village called Kotah or Kotahpilly, about ten or twelve miles from the junction of this river with the Godavery, and sixteen miles N. W. of the large village of Mahdeopore.

Encouraged by the indications detailed in that paper, a boring operation was undertaken to ascertain the extent and position of the coal stratum, if such existed, the superintendence of which was entrusted to me.

The rods, drills and augers of the boring machine were made up at the Ordnance stores, Bolarum, and from the extreme dif-

ficulty in giving to steel at an up-country station the requisite hardness and temper it was feared by Captain FitzGerald, the Officer in charge of the Ordnance Department, that much obstruction to the work would be experienced in boring through the harder strata; that these apprehensions were well grounded, the result showed.

The boring machine reached its destination towards the end of March, but owing to the heavy rods, one and a half inch square, not arriving till the 4th of April the work was not begun in earnest till then, as the lighter rods of an inch square were found to be nearly useless and it was only by affixing heavy weights to the stronger rods that any progress was made. No difficulty was experienced in procuring coolies to work the machine for the moderate hire of a seer of rice and three small pice a day, they were divided into two working parties of eight or nine men each.

At Kotah, the river is about half a mile in breadth from bank to bank, and during the hot weather it is a large stream containing at least double the quantity of water of the Godavery and by a rough estimate is a couple of hundred yards in width. The alluvion on its left bank is of various depth, from 60 to 100 feet, and is composed of tough cotton soil with Chalcedony Jasper and other quartzose pebbles; towards the margin of the river the alluvion is much thinner.

In consequence of the tendency of this soil to fall in and by clogging the machine and filling up the bore seriously to impede the work, it was resolved to bore where it was as shallow as could be found, and this occurred in the immediate vicinity of the river ten yards from its brink.

The alluvion of 20 feet was pierced on the first day but so hard was the subjacent rock, composed of argillaceous limestone, and so frequently did the drill require repairs that it took nine days to get through a foot, from the 5th to the 12th of April; a specimen of what was taken up during that time accompanies this report and is marked No. I. On the 13th the rock became softer, and of a yellowish color and a foot and a half were pierced in three days, then followed a foot of blue clay when again the hard rock intervened,

and but four inches were got through in three days. From this date (the 20th) to the 29th the average boring was about 8 inches a day, the rock being softer although composed of much the same matter as the harder rock, clayey limestone or shale. On the 30th at 29 feet 4 inches from the surface, and 9 feet 4 inches from the overlying rock a bed of shale and slate coal of the thickness of 2½ feet was reached, a specimen of this as taken up by the auger of the machine is marked No. II. Hard rock again occurred and a fortnight was exhausted in penetrating a foot and a half deeper, when another bed of coal and shale like the last but of nine inches only in thickness was reached, earth too had fallen into the bore, and some time was occupied in clearing it out. From this time until the 29th of May when the rising of the river and the constant breaking of the drill and auger warned us to stop the work, not more than half a foot of hard rock which again occurred was bored through.

Thus the whole depth of the bore only amounted to thirty-four feet seven inches, an inconsiderable distance when compared to the extent commonly gone through in search of coal in Europe. Surface coal too is usually of an inferior quality, such as the specimens now sent. But that a true coal field exists at Kotah I think may be inferred from the following reasons.

1st. The strata accompanying the slate coal are those which are found along with deposits of this mineral in other parts of the world, argillaceous limestone and shale, as the specimens sent will abundantly show.

2nd. The fossil plants, of which in the specimens sent the scales of a lepidodendrous plant are most conspicuous, are identical with the fossil plants of the true coal measure, this may be learnt by inspecting them.

Should coal be ever required in this part of India for the purposes of steam, or for smelting the iron ore so profusely scattered through the neighbouring sandstone, it would appear that sufficient data have been now afforded to warrant the sinking of a shaft at kotah whereby a more effectual search can be made than by a boring machine. No difficulty would be met with in procuring

well-diggers for this purpose on the spot, accustomed to wield their own tools and at a low rate of wages.

The importance of finding good serviceable coal on the banks of the Pranheetah, and so close to the main stream of the Godavery is scarcely to be overrated. By means of river steamers of light burden a new avenue of commerce would be opened, and access at a cheap rate would be attained to the most fertile tracts in the Deccan. The navigability of these rivers was shown by Captain Fenwick, late of the Nizam's Service, when in the employ of Messrs. Palmer and Co. of Hyderabad more than a quarter of a century ago, for not only was timber floated down to the mouth of the river, but the cotton of Berar was brought down from Woon, a village on the bank of the Pranheetah seventy-five miles S. E. of Nagpore, to Coringa. In my report on the Chennore Sircar, I shall give in detail various other articles produced in those parts that might be turned to commercial account and profit, if a cheap and free access by means of water carriage to the coast were afforded them.

As the Godavery has never been surveyed with a view to its purposes as a navigable river, I shall give from the information of Captain Fenwick, an account of the obstructions that are met with in its channel. A map, which was furnished to the Supreme Government in June 1841, by the Resident at Hyderabad, Major General Fraser, will indicate the localities where these impediments occur.

From Coringa to Budrachellum, the navigation is perfectly free, except that there is a whirlpool at Papeecondah, not far above Palaverum at the opening of the narrow and tortuous straits of the same name which wind through a range of high hills for more than 12 or 15 miles commencing from the Nizam's Boundary. The river here is generally not more than 300 yards wide. In some places I think even less. The mountains rise almost perpendicularly from the water's edge, and the depth is many fathoms. From Budrachellum to Ellapoka the river is impeded by rocks when it is low, but when half full or more, there is no difficulty in the navigation. The same description applies to the rocks marked at Central Donurgoorum and Albaka ; from the last point the river

although quite free is somewhat shallow, early after the rains. The next obstacle is the two whirlpools at Mooknoor which when the river is full, present a considerable obstacle, but not so when it is moderately full at which time the boatmen, who are very expert, manage to steer between them without danger. The passage between Nulumpully and Mooknoor, is only tedious after the rains as during the freshes the rocks may be sailed over. The last obstacle in the Godavery is just at the junction of the Indarootee. The channel through the rocks, which are there high is very narrow, and pointed ones in it render the passage somewhat dangerous, " some of these" adds Captain Fenwick " I had removed the nature of the rock being soft slate."

Specimens of Minerals belonging to the Coal Measure to accompany the report.

No. I. and No. II. are referred to and explained in the report.

No. III. Shale and Bituminous shale from Kotah.

No. IV. Prismatic Limestone from the same place.

No. V. Slate Coal.

No. VI. Specimens of Coal with fossil impressions chiefly of lepidodendrous plants to show that the measure is a true Coal.

No. VII. Specimen of Coal found in the river bed (detached).

No. VIII. Specimen of Iron ore (brown clay) found in the vicinity of Kotah.

Report on specimens of Coal, Prismatic Lime Stone and Iron Ore, forwarded with Dr. Walker's Report, by James Dodd, Esq., Assay Master, in charge of Chemical Examiners' Department, Calcutta.

Coal.		Bituminous slate.
Volatile matter....	29 per cent.	No. 1-41·25-2-26·667.
Ash.....	29 do.	„ 46·25 „ 66·250.
Carbon.....	42 do.	„ 12·50 „ 6·083.

Prismatic Lime Stone.

Carbonate Lime.... 27-3 per cent.

Iron Ore

Metallic Iron..... 22-4 do.

Report on specimens of Bituminous Shale transmitted along with Dr. Walker's Report, by Dr. Falconer, A. M. *and* M. D., *Supt. Hon'ble Co.'s Botanical Gardens, Calcutta.*

I have carefully examined the specimens in question six in number, and although they exhibit abundance of black flakes as commonly occurs in bituminous shale, which are probably of vegetable origin, I cannnot detect the presence of any determinable impressions of vegetable fossils. The black flakes, under a careful examination with the microscope, exhibit no marks of structure and appear to be bituminous.

The appearances which seem to have been taken for vegetable fossils and which I presume are those alluded to by Dr. Walker in his Report as "Scales of Lepidodendrous Plants," I have made out to be enamel dersinal plates of an extinct placoid fish co-ordinate with Lepidotus and Dapedius. If Dr. Walker forwarded any well marked vegetable fossils they have not been submitted to me, there are one or two obscure and indistinct impressions probably of organic origin but they are not determinable.

In the list appended to his Report, Dr. Walker mentions No. VI. specimens of coal with fossil impressions chiefly of Lepidodendrous plants to show that the measure is a true "coal," I have observed nothing among those sent, to which this description could accurately apply, nor have seen any samples of coal among them. Should there happen to be any, I should be glad to examine it, on the chance, that some portion of it may exhibit determinable structure. In reference to this point I may mention that I have detected structure on the Burdwan coal, sufficient to determine the plans from which the coal was produced, and which go a long way to prove that the Burdwan coal fields belong to an age and series, perfectly distinct from and more modern than the great English coal measures.

There is no evidence afforded by such of Dr. Walker's specimens as I have seen that the Chennore coal belongs to the same formation, as the English Carboniferous series.

[With reference to the latter part of Dr. Falconer's Report the only specimens approaching coal that accompanied Dr. Walker's letter were forwarded to Dr. Falconer, and he reported upon them as follows.]

I have detected structure in the Chennore coal under the microscope, consisting of glandular dotted vascular tissue referable probably to the natural family of Coniferæ.

Plants of this order are met with in the *Lias* and *Oolite*, as well as in the coal measures, and the Chennore specimens furnish no decisive information as to the formation in which they occur.

[Extract from Dr. Walker's statistical Report on the Northern and Eastern Districts of the Soubah of Hyderabad.]

I have already sent a communication on the coal found in the bed of the Pranheetah, close to its junction with the Godavery, and to this I refer. The subject of rendering the Godavery navigable has lately been discussed, and some interest has been excited in what would appear to be a measure very feasible and very advantageous. Should this scheme ever be carried out, the mineral, conveniently situated as it is, might be turned to profit.

The surface of the coal measure has as yet so to speak been merely scraped, but from the impressions of fossils found on the coal, chiefly Lepidodendrous plants, there can be no doubt of a true coal mine being there in existence.

[Major Jacob, H. C. Astronomer, Madras, placed at the disposal of the Society some Barometer and Thermometer Curves, and supplied a brief notice in explanation of them. The Curves have been accurately lithographed by Dumphy, and will be found at the end of this number, but on a smaller scale than those sent by Major Jacob, to suit the size of the Journal.]

Plates (1) to (8) at the end of this number give the indications of the Barometer and Thermometer for the years 1852—55 as noted at the H. C. Observatory, arranged in curves so as to exhibit the periodical changes. In the case of the Barometer the curves for every month show very conspicuously the course of the daily tides, there being two well marked maxima and minima: the principal maximum occurring at 21*h*. 16*m*. (or $\frac{1}{4}$ past 9 A. M.), while the lowest minimum is seen at about 4 P. M.: with a second rise and fall during the

night; the highest nightly rise being at 10 P. M. and the lowest descent at 15*h*. or 3 A. M.: the daily range being on an average 0·120, and that during the night about half as much. The variations in the times or range between the different months is very trifling, but the mean value for each month shows considerable alterations; the mercury standing highest on the average in January, falling gradually until June, and rising again from July to December, the rise being usually, but not always, most rapid from October to November. The same general course is also visible, though subject to great fluctuation, in the curve of daily means at the foot of each Barometer Plate, where are shown the successive changes in the mean height of the mercury from day to day. In most of the years there will be seen one or more considerable depressions about the beginning of November, indicating the effect of the storms which so frequently occur about that time.

The Thermometer curves have rather a peculiar form; that portion which belongs to the day, viz. from 18*h*. to 6*h*., having nearly a parabolic shape, while the night portion scarcely differs from a straight line, showing a nearly uniform descent from sunset to sunrise, the change from the night to the day being much more abrupt than the converse. The coldest time of the 24 hours appears to precede that of sunrise by a few minutes; the hottest time is about 1*h*. 10*m*. P. M., but varies in the different months from 0*h*. 30*m*. to 2*h*. June is on the whole the hottest month but is nearly equalled and in one year surpassed by May. The coldest month is January, but December and February differ but little from it. The range of temperature is seen to be much greater in the hot than in the cold season, the least occurring in November. The mean daily range amounts to 12°.

New species of Silk Worm.

"THE AGRI-HORTICULTURAL SOCIETY OF INDIA has reported most favourably on a new variety of silk, brought into notice by Capt. HUTTON, of the invalids, a resident of Landour. The worm which produces it (*Bombyx Huttoni*) spins in all weathers, whereas the common silk-worm is apt to be thrown off work by a passing

cloud. It is thought that the new worm may prove commercially important, and Government is solicited to institute experiments regarding its productive powers. In connection with silk it was announced at the late meeting of the Society, that the new plan of manufacturing silk directly from the bark of the mulberry tree is rapidly gaining ground. Signor LOTTERI, the inventor, announces that four companies have been started in Europe for carrying out the system, one of which has already paid him down 25,000*l.* for the privilege."—*Allen's Indian Mail, 30th Jan.* 1857.

NOTICES OF BOOKS.

Oriental Literature.

The Poems of the Hudsailis, edited in the Arabic from an original MS. in the University of Leyden and translated with annotations by J. G. L. KOSEGARTEN; vol. I. containing the Arabic text, London, 1854, 4to.

This work is now in course of publication by the Council of the Oriental Translation Fund. The first volume contains only the Arabic text. M. KOSEGARTEN purposes to give a complete translation in the second and the remainder of the text in the third.

This collection of poetical compositions or Dewans contains the National poems of a tribe of Bedouins—the *Hudsailis* or *Hodeilites* and belongs to the same class of compositions before the Æra of Mohammad as the *Moallakat*, the *Hamasa* of BOHTORI and the *Kitab-al-Aghani* of which latter work Mr. KOSEGARTEN has also commenced the publication. The MS. which is a unique copy, in the Library at Leyden, is incomplete, the 2nd volume only being in existence but it contains the commentary of ASSUKARI, the compiler of the work.

In connection with the literature of this epoch are the *Ansab* or geneological tables of the Arab races published by M. WASTENFELD at Gottingen from the writings of MOHAMMAD BIN AL HASAN IBN DOREID, a poet and philologist of the 3rd century of the Hijri.

Geneologische Tabellen der Arabeschen Stæmme und Familien von Dr. FERD. WASTENFELD—Gottingen 1852, Fol.

Register zu den genealogischen Tabellen with historical and geographical notices, 1853.

Handbuch Geneologisch etymologisches von ABUBEKR MOHAMMAD BIN AL HASAN IBN DOREID *herausgegeben von* FERD. WASTENFELD—Gottingen 1854, 8vo.

The indefatigable M. VON HAMMER continues the publication of his great work on Arabic Literature *(Literatur geschichte der Araber)* of which the 5th vol. containing 1,115 pages appeared in 1854 and the 6th extending to 1,169 pages in 1855.

The Library of the Society possesses a copy of this admirable work presented by the munificence of M. VON HAMMER himself. Each vol. commences with a general view of the literature of the epoch of which it treats, followed by biographical sketches of the writers arranged either according to the class of society to which they belonged or according to the subject of their works; followed by translations of some of the most remarkable poems.

The six volumes already published contain notices of more than 700 authors and afford a striking example of the patient and laborious habits of study and research so remarkably characteristic of the savans of Germany.

The 2nd and 3rd volumes of the Travels of Ibn Batuta—the text and translations by MM. C. DEFREMERY and Dr. B. R. SANGUINETTI, have been published at the Imprimerie Imperiale, Paris, 1854 and 1855.

M. RENAN is occupied with a valuable philological work on the Semitic languages, the first volume of which appeared in 1855 and received the prize of the Institute.

It is entitled *Histoire Generale et Systeme comparè des langues Semitiques*, par ERNEST RENAN, Paris, 1855, 8vo.

The fourth volume of the translation of the *Shahnameh of* FIRDAUSI, by M. JULES MOHL, Secretary of the Asiatic Society of Paris, appeared in 1855.

The third volume of the *Rig Veda Sanhita* with the commentary of SAYANA CHARYA, by M. MAX MULLER, has been published and copies are on their way to India.

Another translation of the *Hitopadesa* has appeared at Paris by M. LANCEREAU. It is very neatly got up in 12mo. and is enriched with interesting notes tracing the origin and history of the several fables and tales.

The first complete translation of the Persian version of the same work, the *Anvari Soheili* of HOSEYN VAZ AL CASHAFI, by Professor EASTWICK, was published by Austin of Hertford in 1854.

From the same Press has likewise issued a new edition of the text of the *Bhagavat Gita* with a translation by J. COCKBURN THOMPSON, 1855.

The VII. No. of the Journal of the Asiatic Society of Bengal for 1856, which has lately been received, is occupied by an index of the matter contained in the previous volumes from I. to XXIII. and of volumes XIX. and XX. of the Asiatic Researches. It is followed by a supplement repairing omissions in the first and by three special indices—1. of the Numismatic matter contained in the Journal; 2. of translations of ancient inscriptions, reprinted from the Journal of the Royal Asiatic Society, vol. VI. and continued to the end of 1854; and 3, a geological and mineralogical index to the Gleanings of Science, Asiatic Researches and the Journal of the Society.

A Comparative Grammar of the Dravidian, or South Indian Family of Languages, by the Rev. R. CALDWELL, London, 8vo. has just been received.

Mr. Caldwell has labored for the last seventeen years as a Missionary in the South of India. During a recent visit to England he completed a Comparative Grammar of the Languages of Southern India, the family of which he divides into nine principal branches, viz. Tamil, Teloogoo, Canarese, Malayâlum, Tolu, Toda, Kota, Gond, and Khond. He has discussed in detail the connexion these dialects have with each other, as well as that of the whole family with the families of other languages. He is opposed to Mr. Hodgson's theory

in regard to the identity of the languages of Southern India with the dialects of the Himalaya and Bootan, being more inclined to support the views of Mr. Max Muller on the affiliation existing between the Dravidian, and what is now styled the Scythian group of languages.

We hope to give a review of this in our next Number.

A Dictionary, Sanscrit and English, extended and improved from the second edition of the Dictionary of Professor H. H. Wilson, together with a supplement, grammatical appendices and an index serving as an English-Sanscrit Dictionary, by Theodor Goldstücker, Berlin, 1856, large 4to.; part 1, (80 pages.)

This is the commencement of the publication of the long expected 3rd edition of Professor Wilson's dictionary.

The preparation of this new edition has been undertaken by Mr. Goldstücker alone. It contains considerable additions more particularly of those vèdu terms which Professor Wilson systematically excluded.

Mr. Goldstücker promises to insert in a supplement those words whose meaning he has not been able satisfactorily to explain as well as all new words he may meet with in the course of publication. The work will appear in parts, each part to contain 80 pages —price 87 fr. 50 centimes.

We are glad to have to announce the publication of a work in connection with our own Presidency, viz. a new edition of DR. BAIKIE's *Book on the Neilgherries*. It is thus noticed by the *Hurkaru*.

" Mr. W. H. Smoult has got up with great trouble and expense an edition of an account by R. Baikie, Esq., M. D., of *the Neilgherries, their topography, climate, soil and productions, and of the effects of the climate on the European constitution*. The subject matter of the work is of great interest to very many persons in this community, but the point which we are most disposed to dwell upon is the admirable style in which Mr. Smoult has contrived to get the work illustrated by an artist of the name of Fraser, a stranger we believe amongst us and who is about to try his fortune in another land, unless perhaps the local Government has the good sense to secure

so able a hand to its own service. The large panoramic view of Ootacamund is a picture that well deserves a handsome frame and is worth the price of the book itself. Then there is a capital frontispiece with a view of Sispara on the Neilgherries drawn from nature by Captain Francis and transferred to stone by Mr. Fraser, and there are four other separate sketches which with the large panoramic view of Ootacamund are enclosed in a tin case. The illustrations are all tinted lithographs and all exhibit an artist's taste and skill. Indeed such artistical productions in the way of book embellishments have never been published before in this country. In a land like this where health and even life itself are so precarious, every information regarding the climate of particular localities ought to be received with eagerness not only by the community but by a "paternal government." The Government of Madras, we hear, has subscribed largely to the work before us, by way of encouraging all attempts on the part of individuals to make the community acquainted with the character of the country and its resources. Such a sanatarium as the Neilgherries furnish us is a blessing that cannot be too highly appreciated. Many a valuable servant may be saved to the State, by having so near us a climate so admirably adapted to the restoration of individuals. Dr. A. Grant, who was the personal surgeon of the Marquis of Dalhousie and accompanied his Lordship to the Neilgherries in 1855 remarks that "it is surprising the advantages of the Blue Mountains should have been so long overlooked, in a country where European health is so precarious and the necessity of a change to a cool climate is so frequently and urgently called for. In Bengal they have scarcely attracted any attention, otherwise, how many invalids might have been saved a trip to Australia, or the Cape or even to England." Dr. Grant recommends that in Bronchitis, or incipient consumption, or when the liver is affected the patient should first go to Coonoor, "a pleasant, retired, and pretty summer residence," well sheltered and easily accessible, and when he has gained strength he should go, he says, to Ootacamund, the air of which is more bracing. In a very few days an invalid could pass comfortably from Calcutta to Ootacamund. The climate of the Neilgherries is delightful and the scenery is singularly varied and picturesque, as may be seen from the

accurate and truly artistical sketches which accompany the work before us.

"We learn from Mr. Smoult's excellent explanatory introduction that the late Bishop James, in a letter to the Right Hon'ble S. R. Lushington expressed himself perfectly charmed with the hills of Ootacamund. "I have been racking my memory," he wrote, "for some place to compare them with; the closest resemblance I can find is "Malvern" at the fairest season: but the extent and bold variety give these a decided superiority. I have a fuller sense of the enjoyment to be derived from air and exercise than I remember to have ever experienced at any time or at any place."

"Mr. Smoult's own share of the work is carefully and ably executed. He has brought out a very valuable publication. It does him great credit in every way. If Mr. Smoult should be a pecuniary loser by this costly publication he will at all events have the pleasant consciousness of having done a real service to his countrymen in India by calling their attention to the lovely and health-inspiring locality of the Blue Mountains. This book may save many a valuable life by its suggestions and the interesting information which it will circulate through a community in which individuals are so often reduced to the alternative of an immediate change of climate or a preparation for their final home."

Natural History.

DECANDOLLE'S PRODROMUS. Vol. XIV. Part. I. has lately reached us. It contains the large order *Polygonaceæ*, by C. F. MEISNER, excepting the Sub-order *Eriogoneæ*, which are from the pen of the laborious Mr. G. BENTHAM: *Myristicaceæ*, by the Author. *Proteaceæ*, by MEISNER, and *Penæaceæ*, by ALPH: DECANDOLLE. The Volume is a worthy addition to its invaluable predecessors.

Plantæ Indiæ Batavæ Orientales.

A work under this title is now in course of publication by the

Dutch Government under the especial patronage of the King of Holland. It is edited by Professor DE VRIESE. The first part which has only as yet appeared contains a full account of the plants found in the principal islands of the Eastern Archipelago—Java, Celebes, Amboina, Ternate, &c. from the MS.S. of the late Professor C. A. C. REINWARDT, between the years 1815 & 1822 edited by Dr. W. H. DE VRIESE, Professor of Botany in the University of Leyden. The technical descriptions are given in Latin and are illustrated by characteristic lithographed figures.

The work will be published in 4to. with 40 plates; three numbers have appeared in 1856, four more are to be given in the current year and the rest in 1858.

DR. REINWARDT died in 1854 without having given to the world any consecutive work on the rich and important collections he had made in the Dutch Colonies. His papers and drawings were presented to the Government and the task of editing them was entrusted to Professor Vriese.

"I purpose" says the Professor, "first to publish in this work, "the plants that DR. REINWARDT discovered during his travels in "the Indies and to elucidate such portions of their history as have "not already been investigated by the researches of other botanists. "When it is remembered that Messrs. BENNETT and R. BROWN "have only lately published the plants which DR. HORSFIELD "discovered in the island of Java at the commencement of the cen- "tury, it need not be matter of surprise that the discoveries of "REINWARDT in the other islands subsequent to 1815 should still "be worthy of publication. We doubt not that the labor we now "propose to ourselves of making known the botanical researches "of DR. REINWARDT will bring to light a great number of new "plants and contribute to give a better idea of the geographical dis- "tribution of plants in the Indian Archipelago, of which so little is "yet known."

One of the plates which have already appeared represents a plant which would form a most desirable addition to our gardens. The *Dichrefrichum Ternateum* found in the forests near the summit of the

Volcano of Ternate. It is a prostrate plant creeping on the ground but is conspicuous for its large, downy, cordate leaves and its bunches of scarlet tubular flowers from one to two inches long.

It appears to be allied to *Streptocarpus* with the habit of *Œschynanthus*.

At the meeting of the Botanical Society of Edinburgh, on the 12th June last, a paper was read by Lt.-Col. MADDEN on "*the elucidation of plants mentioned in* Dr. FRANCIS HAMILTON'S *account of the Kingdom of Nepal.*

At the following meeting on the 10th July 1856, Professor Balfour on taking the chair announced that since the last meeting Col. Madden had died suddenly from rupture of the aorta.

"We all, I am sure (he said), deeply deplore the loss of one who took a warm interest in our proceedings, and with whom we have had much pleasant intercourse. For my own part I cannot easily give expression to the sad feelings with which I contemplate the bereavement. He had been a constant visitor at the garden during the summer while engaged in preparing his elaborate paper on the Indian Plants in Dr. Buchanan Hamilton's herbarium; and I had looked forward to the pleasure of spending many a happy day with him in the prosecution of Botanical science. His amiable deportment and gentlemanly manner endeared him to all of us, and we all rejoiced to see one who had spent a large portion of his life in the active service of the East India Company, now devoting his time and leisure to the prosecution of science. During his residence in India he was a careful observer, and made many interesting remarks on the flora of the country. He sent home the seeds of many valuable plants which have flowered in Glasnevin and in other gardens. When he came to settle in Edinburgh he joined the Royal and Botanical Societies, in both of which he became a very active member. He was elected a councillor of the Royal Society, and took a marked interest in its proceedings, he particularly took charge of the Scientific additions, which it was agreed to make to its library. To the transactions of the Botanical society he contributed an excellent paper on the occurrence of

Palms and Bamboos high on the Himalaya, and it is to be hoped that the paper which was read from him at our last meeting will be in such a state as to allow of its publication. Most sincerely, I am sure, do the Society condole with his afflicted widow. Such events call on us to be ready, seeing we know not what a day may bring forth."

At the same meeting a paper was read entitled, *A brief account of the general Botanical features of a Hill District in Western India*, with the results of a series of observations in connection with vegetable climatology. By JOHN KENNETT WILSON, Bombay.

PROCEEDINGS.

The Managing Committee of the MADRAS LITERARY SOCIETY *and Auxiliary of the Royal Asiatic Society, Thursday Evening, January* 8, 1857.

The chair was taken at ½ past 6 by W. U. ARBUTHNOT, ESQ.

The Secretary laid the usual statements before the Meeting and the following papers were selected for the evening.

Read an interesting account from Major Jacob, the Honorable Company's Astronomer, explaining the different indications of the Barometrical and Thermometrical Curves, for the years 1852-53, 54 and 55; the Plates having been previously forwarded by him to the Society.

In regard to the Barometer the Curves for every month show very conspicuously the course of the daily tides, there being two well marked Maxima and Minima the principal Maximum occurring at ½ past 9 A. M., and the lowest Minimum at 4 P. M. The Mercury stands highest on the average in January, falling gradually till June, and rising again towards December. The Rise is usually most rapid from October to November, about which time considerable depressions are also observable indicating the effect of storms which not unfrequently sweep over this coast at that time of the year.

The Thermometer Curves, show the coldest time of the 24 hours to be a few minutes before sunrise, and the hottest time to be 1h. 10m. P. M. but varying in different months from 0h. 30m. to 2h. June on the whole is the hottest month and January the coldest. The range of Temperature is greater in the hot than in the cold season, the least occurring in November. The mean daily range amounts to 12°.

Resolved that the thanks of the Meeting be voted to Major Jacob, and that his paper be set aside for publication.

Read letter from Secretary to Government, dated 23rd Dec. 1856 forwarding Dr. Walker's Report on Coal boring at Kotah, a village about 10 or 12 miles from the junction of the Wurdah river with the Godavery.

In 1841 Dr. Walker submitted to the Asiatic Society of Bengal an account of some minerals found in the bed of the Godavery, of the nature of Slate Coal, with a few remarks on the Geological features of the place at which they were discovered. The account will be found published at page 341, vol. 10 of the Journal of the Asiatic Society of Bengal.

In consequence of the indications set forth in that paper a boring operation was determined on, and entrusted to Dr. Walker's superintendence.

The Rods, Drills, and Augers of the Boring-Machine were made up at Bolarum—about 30 feet was pierced on the first day; afterwards, falling in with Argillaceous Limestone it took 9 days to get through a foot. At the depth of 29 feet a bed of Shale and Slate Coal was met with. The whole depth pierced was only 34 feet 7 inches.

Dr. Walker infers that a Coal field may be found at Kotah for the following reasons.

1st. The strata accompanying the slate Coal are those which are found along with deposits of this mineral in other parts of the world.

2d. The fossil plants apparent are identical with the fossil plants of the true Coal measure.

The report concludes with an account of the obstructions to navigation in the Channel of the Godavery.

Read also letters from Mr. Dodd in charge of Chemical Examiner's Department, and from Dr. Falconer, Superintendent of the Botanical Garden, Calcutta, upon the mineral specimens forwarded by Dr. Walker.

The thanks of the Meeting were presented to the Contributors of the above Papers. Some time has elapsed since Dr. Walker's experiment, but Madras having now its Railway and Mineral Viewer, and the Committee being aware of the great importance of a Country like India being able to supply itself with Coal and Iron in the same way as England is favored with the former, thought it advisable to put on record in the Journal an experiment like Dr. Walker's, and it was resolved accordingly to request the Committee of Papers to arrange for the publication of his Report.

The Managing Committee of the MADRAS LITERARY SOCIETY *and Auxiliary of the Royal Asiatic Society, Thursday Evening, Feb.* 12, 1857.

The Hon'ble W. ELLIOT, in the CHAIR.

The Secretary read a letter, from Dr. Jameson, Superintendent of the Botanical Garden at Saharunpoor, to Mr. Elliot, giving an account of the Tea plantations in the Himalayas.

The encouragement given to the cultivation of Tea in the last 2 years bids fair to render Tea a staple article of produce in the N. W. Provinces. Last year the quantity turned out was 40,000 lbs. this year that amount will be doubled. It is now in great demand at Almorah and Deyrah, the best kinds realizing from 3 Rs. to 4 Rs. 8 As. per pound, and this not for small quantities, the amount disposed of having been 20,000 lbs.

A great proportion of the second class Teas was purchased by natives for the purpose of bartering with the Bhotiahs in the interior of the Himalayas and Thibet in exchange for Borax and other

products of the mountain region. Up to this time the Mountain races have been in the habit of consuming the brick Teas of China.

It is certainly a remarkable fact that an integral part of the Chinese Empire is receiving its supplies of Tea from India, and Dr. Jameson is sanguine that if aided by good roads the trade with the Bhotiahs will soon become an important one, and that the Indian Teas will be sold at rates so cheap as to drive the Chinese article out of the market in these regions.

Extracts of a letter from Professor Oldham to Mr. Brooke Cunliffe, were also read acknowledging the receipt of certain fossil remains from the cretaceous beds at Utatur and Verdachellam for the Museum of Economic Geology. Putting aside the Cephelopoda, Mr. Oldham observes, the specimens from the two localities indicate only a little difference in the depth of water where the deposits were formed; but the presence of these chambered shells points to a series of beds somewhat higher in Geological sequence. The great prevalence of *ammonites* of the section of *Ligati* as compared with the Verdachellam group is of this nature.

Mr. Oldham also sent copies of the prospectus of the new organization of the Geological Museum, one of which Mr. Cunliffe presented to the Society.

It is proposed to print this on the fly leaf of the Journal, and it is hoped that the Members of the Society will exert themselves to procure contributions to the collection. It is only by grouping together the geological facts derived from a comparison of fossil remains from all parts of India that a correct idea can be formed of the geological structure and conditions of this vast country. And the eminent qualifications of the officers attached to the geological survey afford the best guarantee that full justice will be done to such contributions.

Mr. Oldham adds that he had recently obtained a small collection of fossils from the limestone to the west of Mhow and Indore near the Nerbudda Valley which appear to be nearly of the same geological age as those from Utatur, with considerable variety however, as was to be expected from the difference of latitude.

It was also stated to the Meeting that fossil remains of a large vertebrate animal probably a gigantic saurian have recently been discovered at Utatur. Mr. Adolphe Schlagentweit, found a large bone, apparently the condyle of a femur, and a portion of what is stated to be a large tooth sent to Dr. Hunter by Captain Ryves will be shown at the forthcoming Exhibition.

The Annual General Meeting of the Society was fixed for the 26th Instant.

MADRAS LITERARY SOCIETY *and Auxiliary of the Royal Asiatic Society, Thursday Evening, February* 26, 1857.

SIR C. RAWLINSON, KT., PRESIDENT, in the CHAIR.

This was the Annual General Meeting of the Members of the Society.

The President, on opening the Meeting brought to notice an error that had crept into the Society's monthly Reports, of publishing the Proceedings of the Managing Committee of the Madras Literary Society as the Proceedings of the Madras Literary Society, none of the Members of which, save the Managing Committee, appear to have had an opportunity of attending, and it was resolved accordingly that endeavours should be made to give all Members the opportunity of attending any Literary or Scientific Meeting which the Managing Committee might be able to arrange.

The Secretary read to the Meeting the usual Report and Statement exhibiting the state of the Society's Funds up to the end of the past year.

To

The Members of the Madras Literary Society and Auxiliary of the Royal Asiatic Society.

GENTLEMEN,

The Managing Committee of the Society have the honor to lay before you the accompanying Statement of the accounts of the Society for the past year, exhibiting a balance in favor of the Society on the 31st December last, of Rupees 750-14-0.

The balance at the end of 1855, was Rupees 469-13-4.

The Committee hope this will be deemed satisfactory.

It may not be out of place here to add that the Statement rendered at our last Meeting on the 12th instant, exhibits a still more favorable view of the Society's Funds, showing a credit balance of Rupees 1,052-8-8.

The Committee have further to announce that, with the view of upholding the Literary and Scientific character of the Society, the publication of their Journal has been resumed, and from the present number of Subscribers they have every reason to hope that the issue of this Periodical will tend to the advantage of the Institution, and prove attractive to the Community.—255 copies out of 350 have already been disposed of.

In conclusion the Committee desire to state that the number of Subscribers to the Library at the end of the past year stood as follows:

First Class.....38
Second Class.....34
Third Class.....16

For the Managing Committee.

(Signed) J. W. BREEKS, *Secretary.*

Resolved, on the motion of Mr. R. Burgass, seconded by Mr. H. Fortey, that the Report be received and printed in the Journal.

Resolved, on the motion of Mr. R. Burgass, seconded by Major W. J. Wilson, that the Managing Committee use their best endeavours to obtain books on more advantageous terms, now that the late changes in the Book Trade hold out such a prospect to Purchasers.

Resolved, on the motion of the Chairman, seconded by Mr. R. Burgass, that the accounts be passed as satisfactory, and that the thanks of the Meeting be presented to the Managing Committee of the past year for their exertions in behalf of the Society, and that they be re-elected into a Managing Committee for the present year.

Resolved, on the motion of Mr. W. U. Arbuthnot, seconded by the Honorable Walter Elliot, that Mr. R. Burgass be invited

to become a Member of the Managing Committee, to complete the number as laid down in Rule VI. of the Society's Regulations.

The following Gentlemen were elected as the Managing Committee for the current year.

MANAGING COMMITTEE.

Major W. J. Wilson,	Mr. W. U. Arbuthnot,
Mr. T. Pycroft,	Major E. Lawford,
Colonel F. A. Reid, C. B.	Mr. H. F. C. Cleghorn, M. D.
Lieut. Col. T. T. Pears, C. B.	Mr. A. J. Arbuthnot,
Lieut. Col. F. C. Cotton,	Mr. R. Burgass,
Mr. G. H. Ellis,	Mr. J. W. Breeks, *Secretary.*

The thanks of the Meeting were voted to the Chairman, and the Meeting closed.

The Managing Committee of the MADRAS LITERARY SOCIETY *and Auxiliary of the Royal Asiatic Society, Thursday Evening, March* 12, 1857.

On the motion of Mr. W. Arbuthnot, seconded by Colonel Cotton, the Hon'ble W. Elliot, was elected Chairman of the Committee for the current year.

The Secretary laid before the Meeting the usual Monthly Statement of the Society's Funds, and brought to the notice of the Committee the urgent necessity which existed for a complete Catalogue of the Society's Books by embodying the Supplemental Catalogues for 1852-53 and 55 with the old Catalogue, and classifying each work under its appropriate head.

Resolved that the state of the Society's Funds is satisfactory, and that a new Catalogue of the Society's books be printed as soon as possible, containing every work received into the Library up to January 1857.

Extracts of a letter from Mr. Thwaites, Superintendent of the Royal Botanic Garden of Paradenia in Ceylon to Dr. Cleghorn were read, in which he expressed his readiness to permit the descrip-

tions of the new Genera of Plants of Ceylon, published by him in the Kew Miscellany, to re-appear in the Society's Journal.

The intimate connection of the Flora of India with that of Ceylon invests the details of such discoveries with peculiar interest for the Botanists of this part of the country and the Committee at once resolved to avail themselves with thanks of Mr. Thwaites' liberal permission. The Sub Committee of Papers were accordingly directed to make a selection of some of these New Genera for publication in future Numbers of the Journal.

Dried specimens of several of these, especially of such as are likely to prove useful in the Arts, have been forwarded by Mr. Thwaites to the present Exhibition.

Some of the early Proof Plates of Dr. McPherson's Antiquities of Kertch were laid on the table and attracted much admiration. They represented Vases, Statuettes, Bas Reliefs in Terra Cotta, Glass and Ivory, of Greek and Etruscan Types, Fibulœ and Gold ornaments, bearing a remarkable resemblance to thos e found in the Tumuli and Mounds in Britain and which Dr. McPherson supposes may have belonged to the Varangian Guards of the Byzantine Emperors, &c.

The Plates are executed in the best style of Chromolithography by a young and rising Artist named Kell, and though unfinished give promise of great beauty and elegance when completed.

The Committee acknowledge with thanks the receipt of the following papers.

1. Observations on the Graphite or Plumbago of Kumaon and Travancore by J. Forbes Royle, M. D. with an Extract from a letter from the Resident of Travancore and Cochin dated 9th February 1857, *from the Chief Secretary.*

This Mineral was formerly found in its most pure state in Borrowdale in Cumberland, which indeed was the only Mine which produced Lead of that fine quality requisite for the manufacture of Drawing Pencils.

The Cumberland Mines have been wrought since Elizabeth's time; pure Cumberland lead costing as much as from 30 to 40

shillings a pound. The lead is not found in veins but in detached pieces, so that the supply is occasionally irregular and the search for it laborious and often fruitless.

Inferior descriptions of lead come from Spain and Ceylon, and are used in the manufacture of crucibles and of the inferior sort of Pencils and in polishing Cast Iron.

At present Mr. Royle says, finely powdered Graphite can, by an extreme degree of pressure, be rendered nearly as compact as the best natural Graphite, or we should be without any more good drawing Pencils.

The great Manufacturers of Pencils in England reported the Kumaon and Travancore specimens as quite useless for the manufacture of black lead pencils, observing that they could not use the specimens in the state in which they had been sent without damaging their machinery, at the same time they could not conceive why purer specimens should not be found in the same locality.

In regard to the objections made to the specimens forwarded, General Cullen, the Resident of Travancore, remarks that one motive of their selection was to exhibit the matrix or Laterite rock in which they were found.

2. Reports V, VI, VII, and IX of the proceedings of the Officers engaged in the Magnetic Survey of India, *from the Chief Secretary.*

3. Memoirs of the Geological Survey of India, Vol. I. Part 1. *from T. Oldham, A. M., F. R. S., F. G. S. &c. Superintendent of Geological Survey of India.*

This is the first of a series of Memoirs published by order of the Right Honorable the Governor General of India in Council. The subject of the present Notice contains a highly interesting account of the Talcheer Coal Fields, situated in the Tributary Mahal of Cuttack, there is also a short notice of the Iron Ore procurable in the same locality.

Appended to this Memoir will be found accounts of the auriferous deposits of Assam and the vicinity of Shuè-gween in the Pro-

vince of Martaban. The gold discovered in both localities is of considerable purity, the latter Mr. Oldham considers fully equal in value to the average quality of Australian gold.

With the Book Mr. Oldham forwarded a letter to the Secretary and a notice setting forth the object of the Geological Museum now in progress in Calcutta of which he expressed a hope that the Society would obligingly promote the welfare, and sanction an interchange of publications.

Resolved that the notice be printed in the forthcoming number of the Journal, and that a letter be addressed to Mr. Oldham intimating the pleasure it will give the Society to effect an interchange of publications as desired by him.

The Meeting separated a little before 8 o'clock.

...ras Magnetic Observatory.

Remarks.	Barometer reduced to 32° Faht.	Thermometers. Means. Dry	Wet	Max.	Min.	Wind.	Rain.	Remarks.	Date.
	February 1857.								
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do	·949	72·8	68·4	83·0	66·4	S E	....	do	4
Cloudy	·955	72·9	68·3	83 3	67·3	?	....	Cloudy	5
Clear	·984	75·1	69 4	83·7	69·4	E N E	....	Hazy	6
Hazy				84·1	69 7	?	....		7
	·945	74·8	70·0	83·9	69·8	E	....	Clear	8
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	....	do	9

...n Meteorological Observations kept at the Madras Magnetic Observatory.

HOURLY MEANS.

Dry Thermometer......	Jan. 1857.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Feb. do.	80·7	78·8	76·9	75·7	74·6
Wet Thermometer......	Dec. 1856.	71·1	70·9	70·9	70·9	70·7
	Jan. 1857.	70·4	69·9	69·5	69·3	69·2
	Feb. do.	72·3	72·0	71·7	71·2	70·6

MADRAS, 9th March, 1857.

* The Number

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29·966	29·967	29·958	29·945	·928	·911	·901	·904	29·919	29·939	29·965	29·987	29·999	29·990	29·969	29·940	·908	·883	·871	29·934
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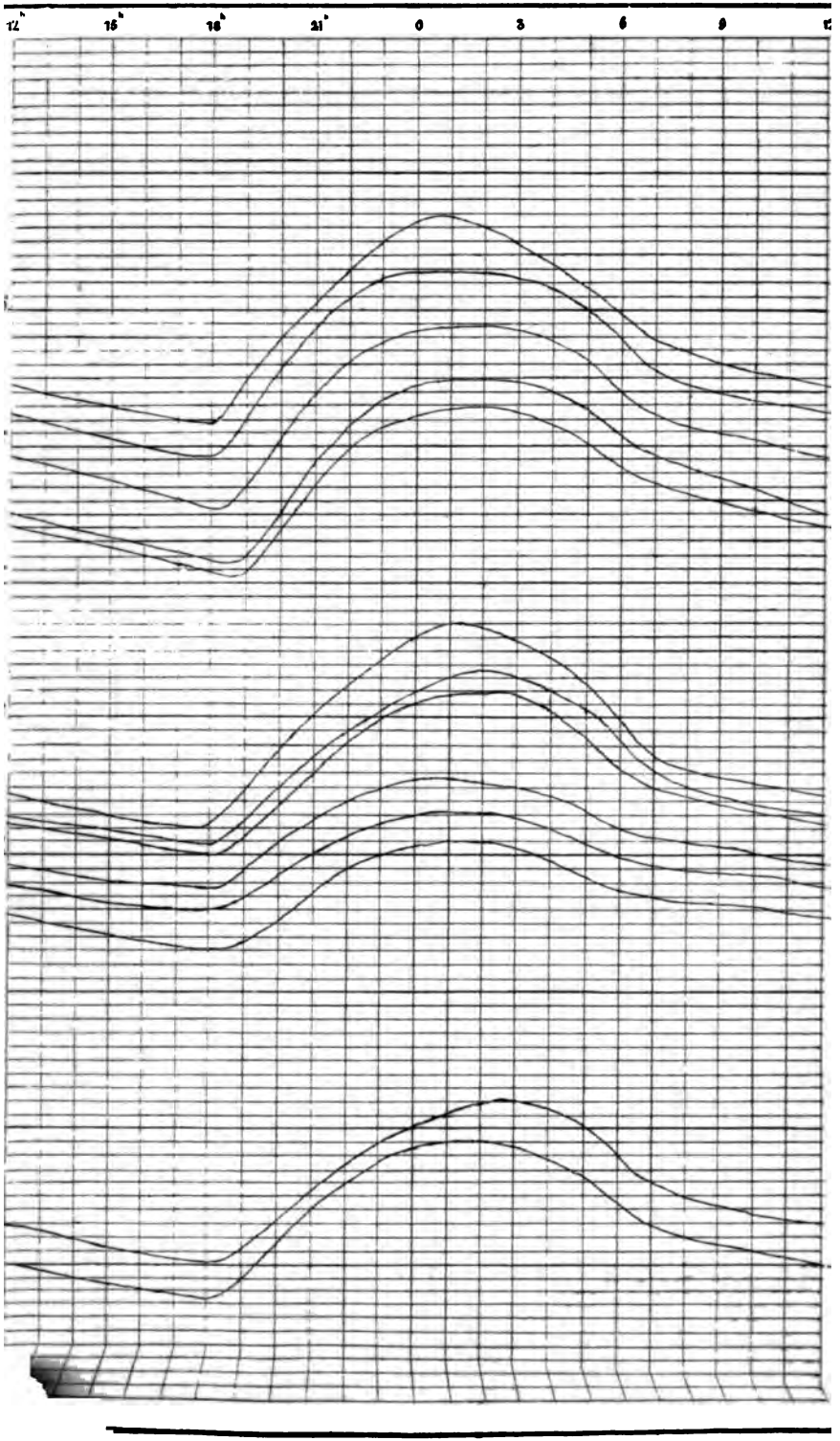
s in these Columns are not observed but interpolated for the sake of obtaining the daily means.

W. S. JACOB,
Hon'ble Company's Astronomer.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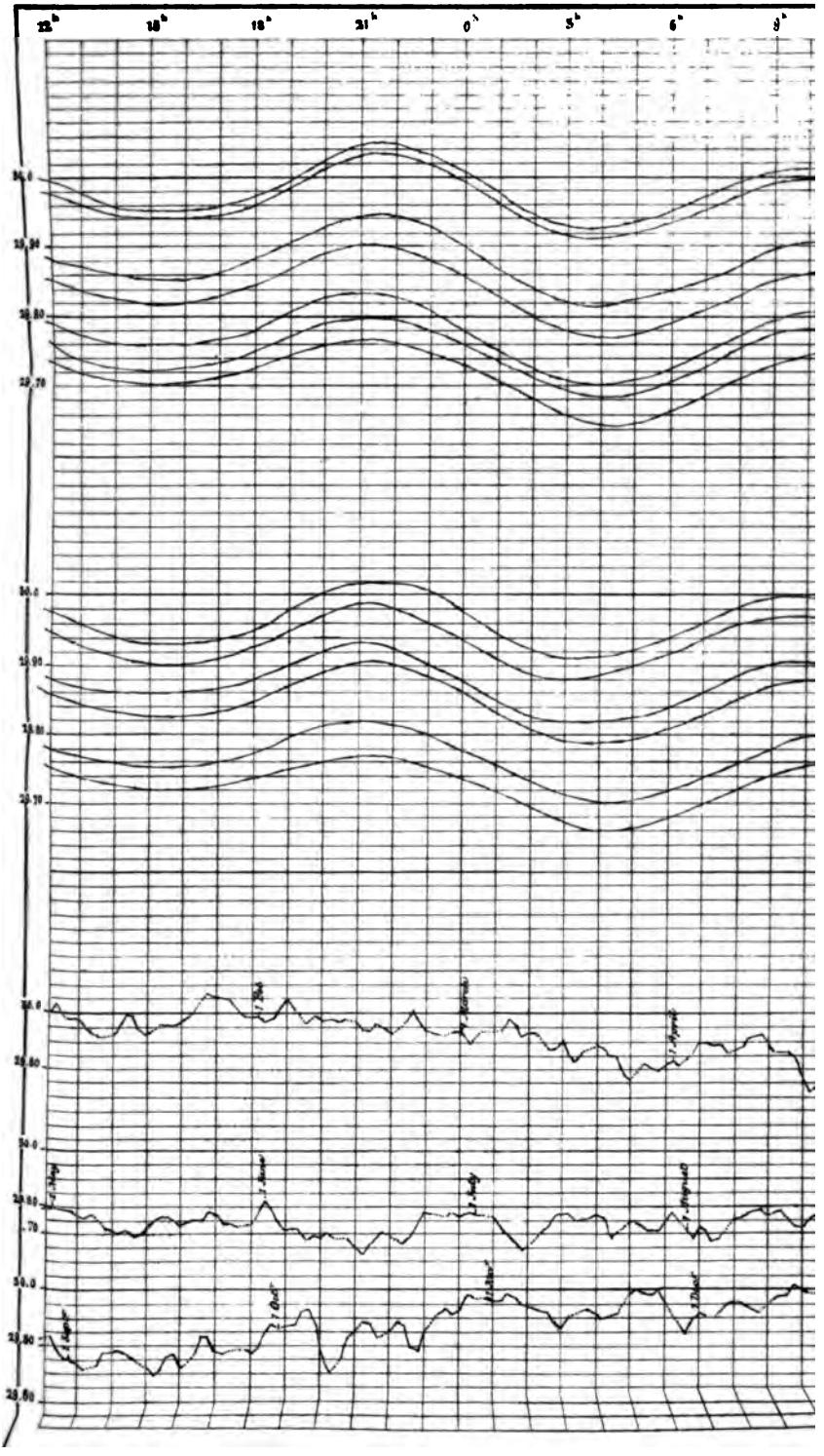
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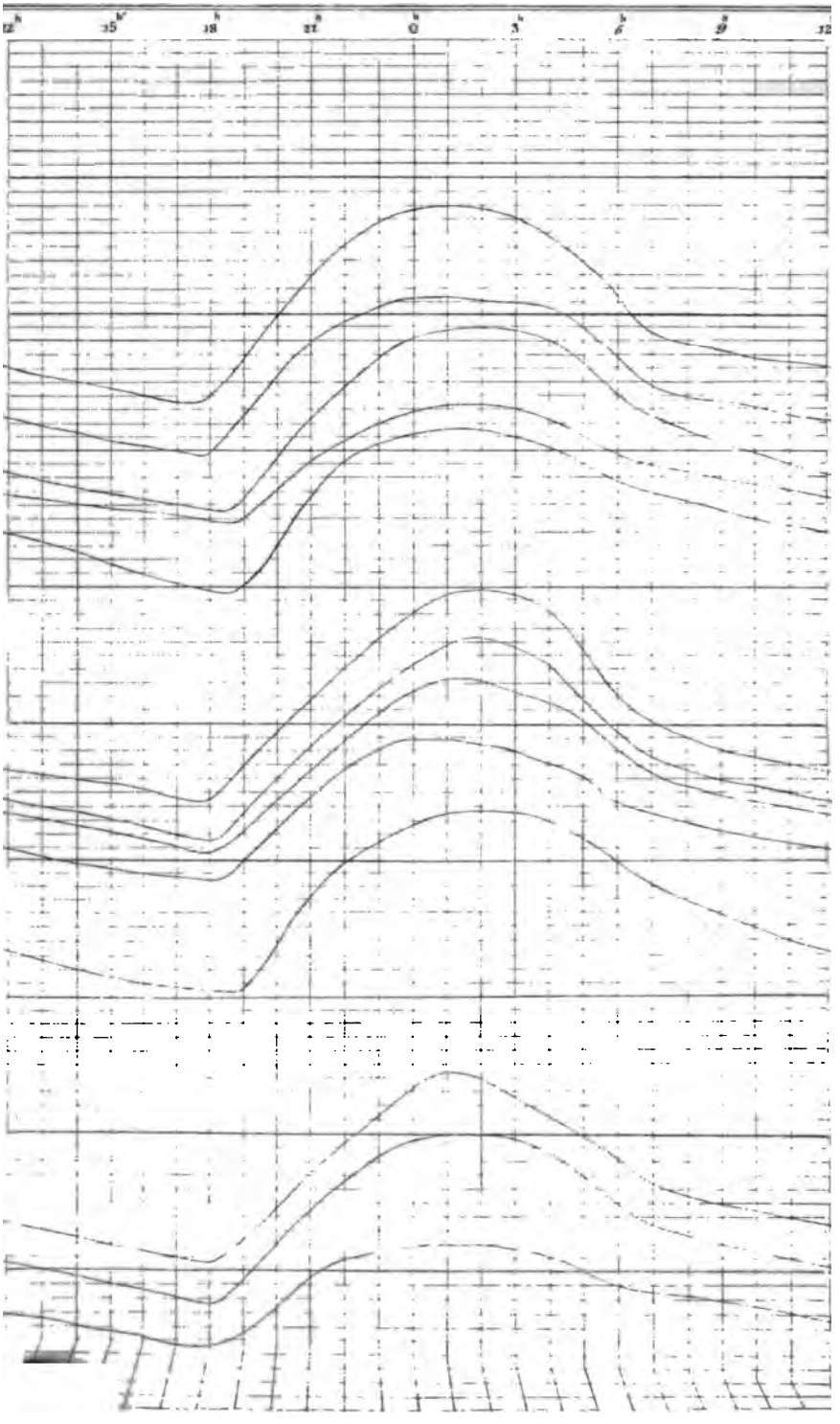
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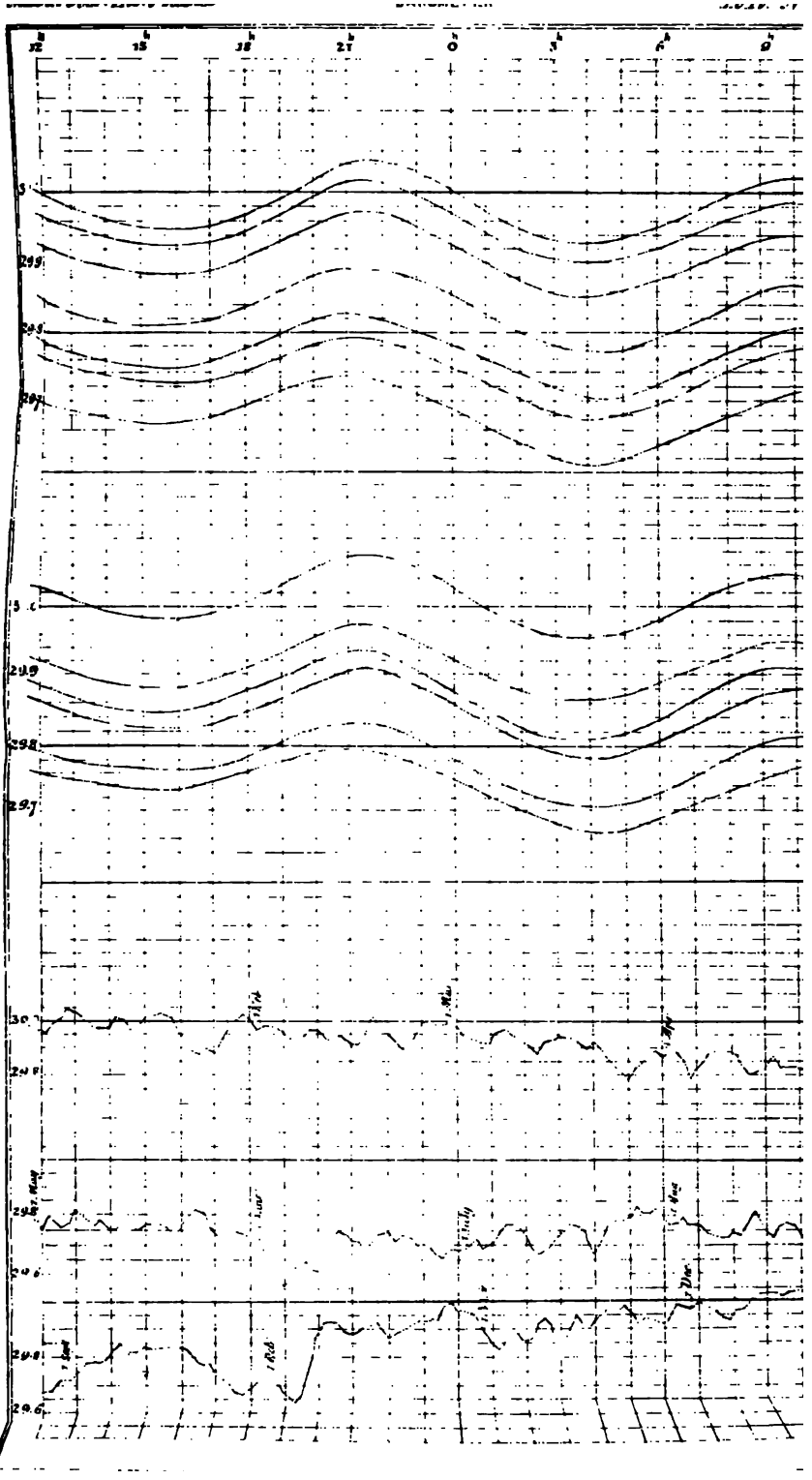

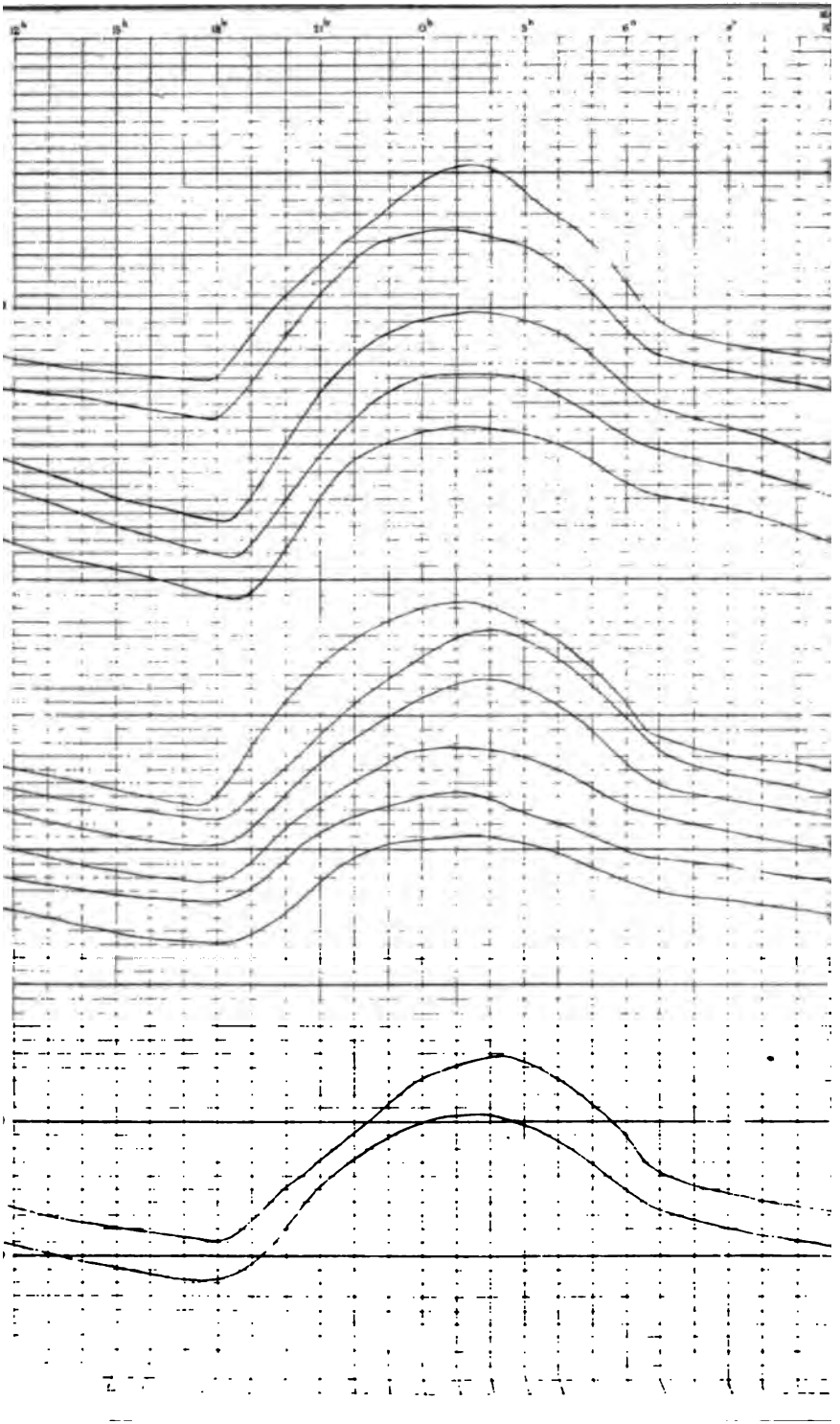
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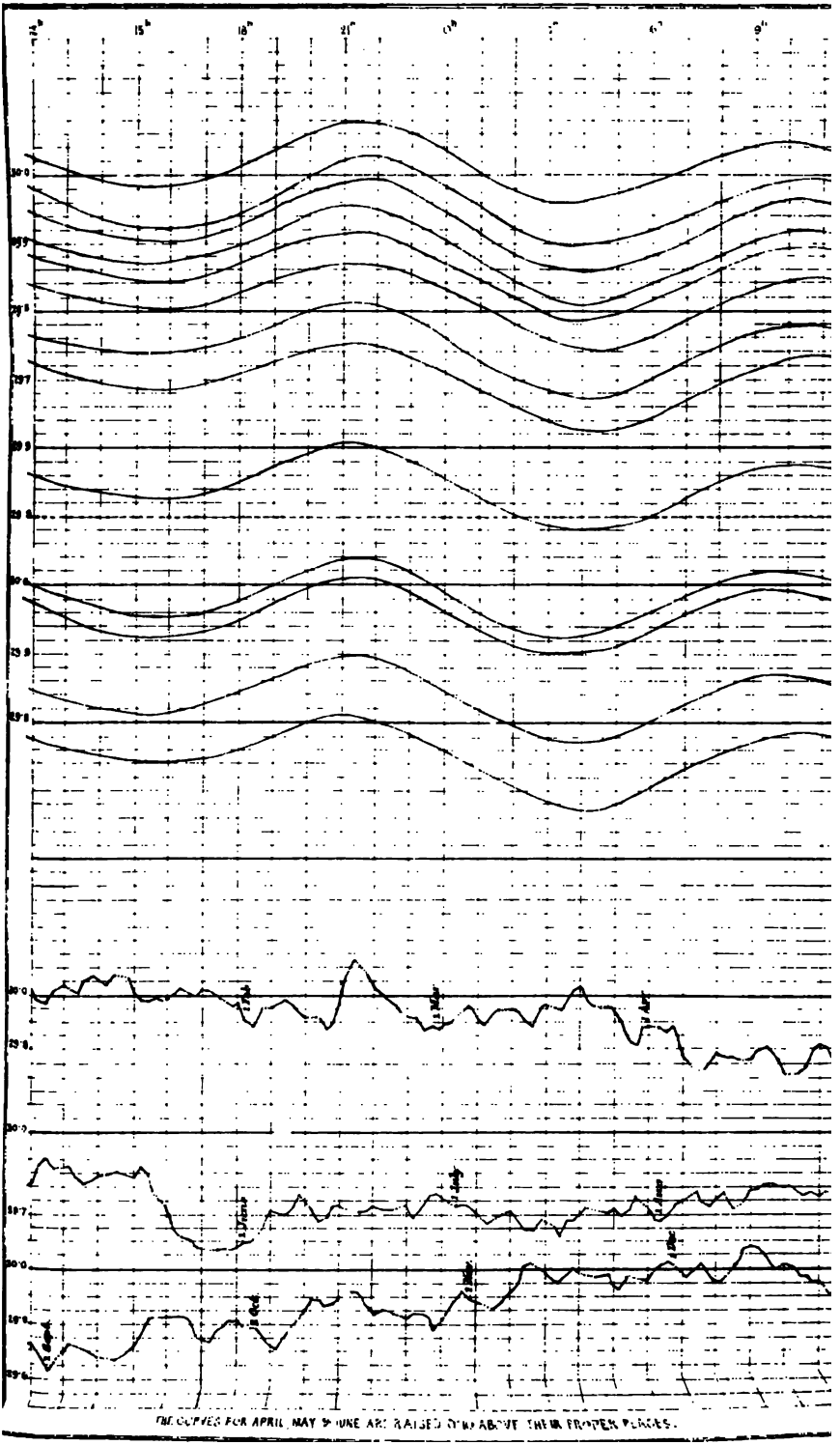
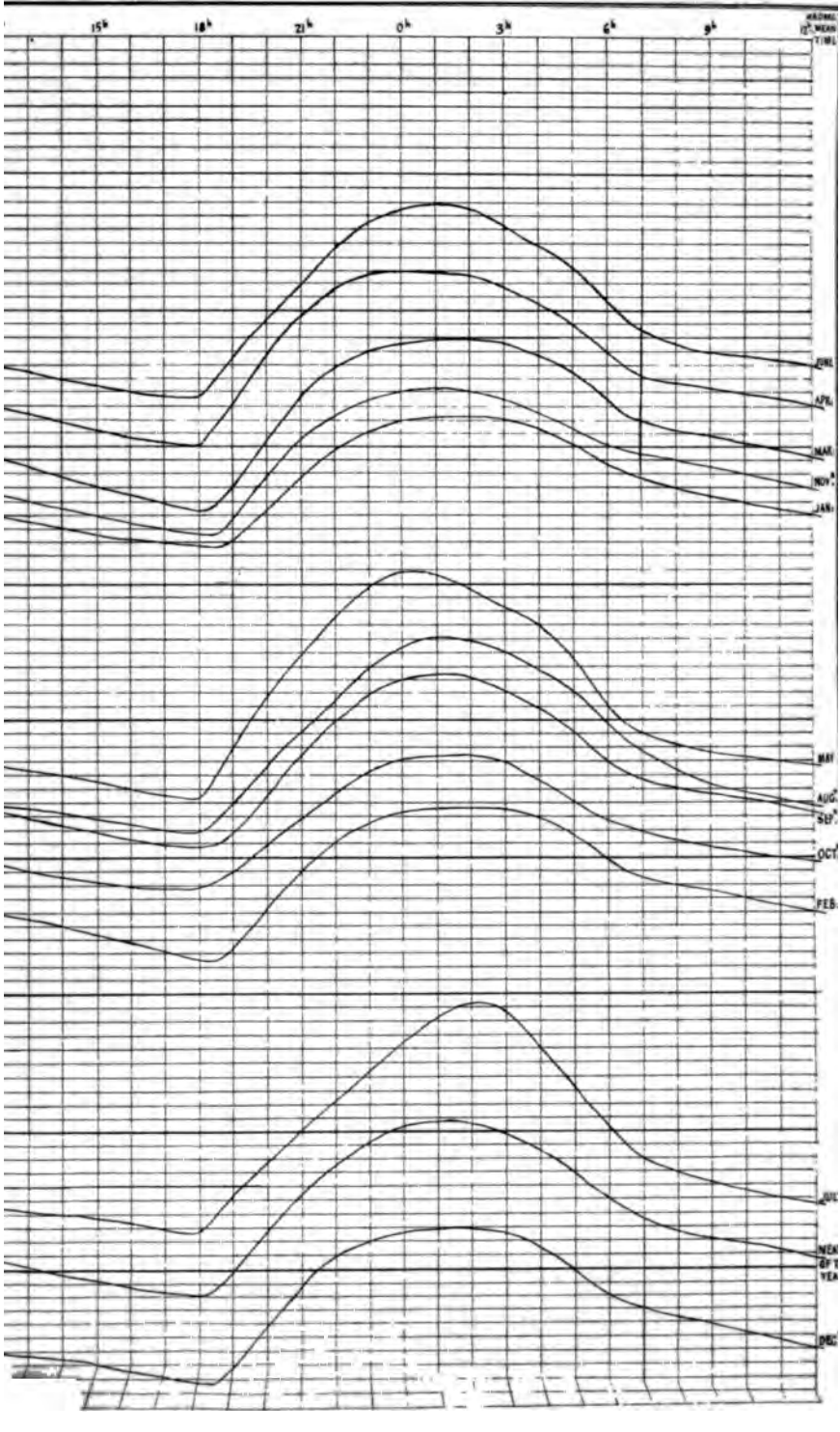


THE CURVES FOR APRIL, MAY & JUNE ARE RAISED [illegible] ABOVE THEIR PROPER PLACES.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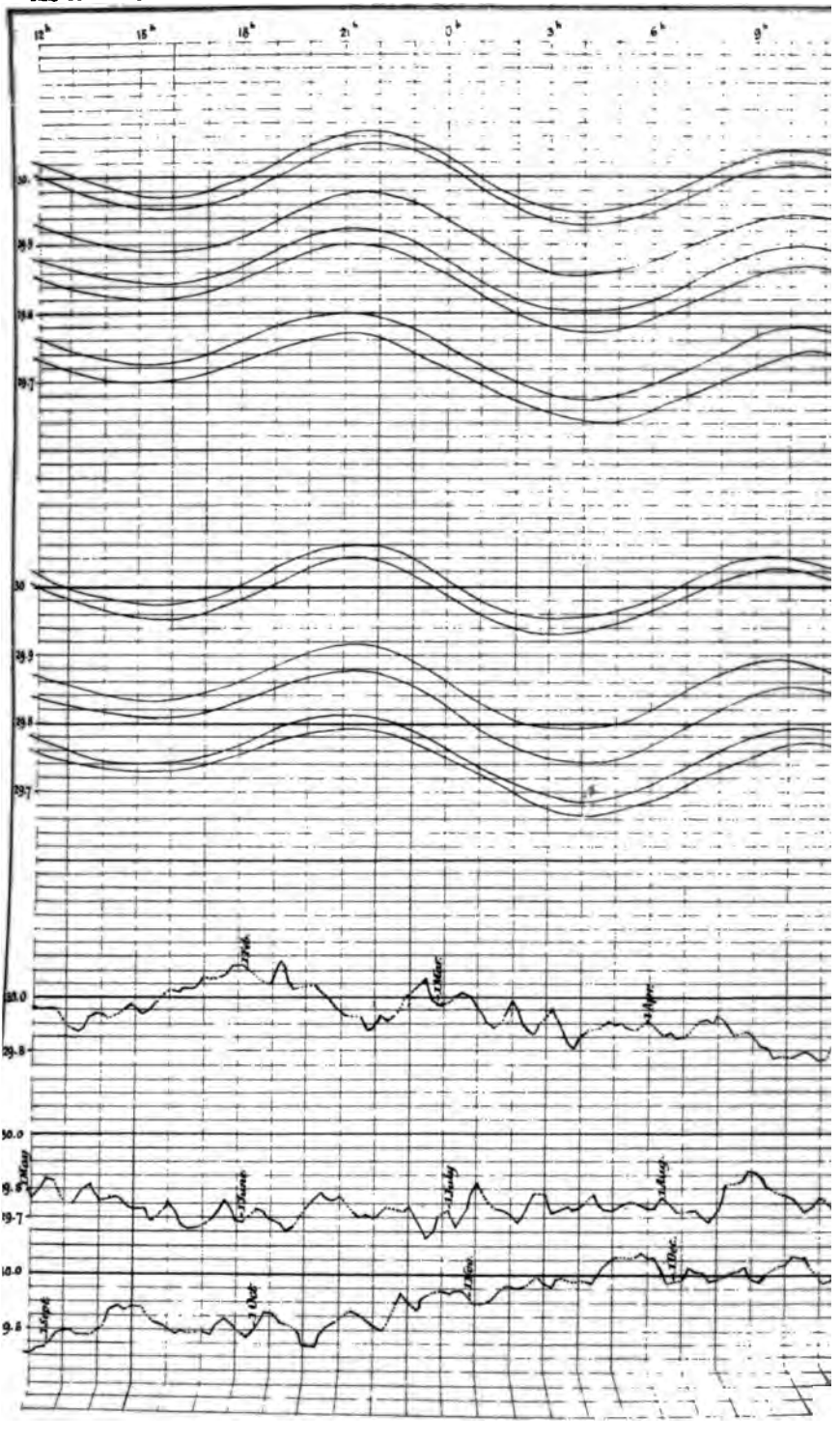
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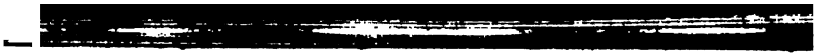

Plate IX. N° 2. V.S. *Madras Lit. Journal.*

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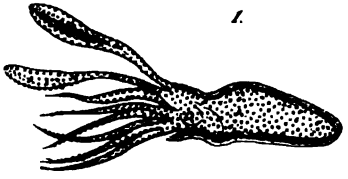

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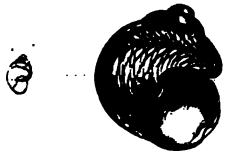

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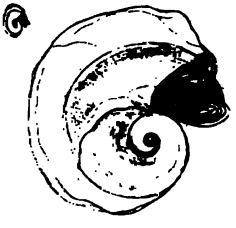

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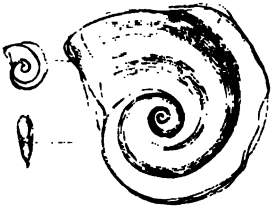

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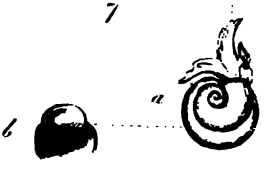

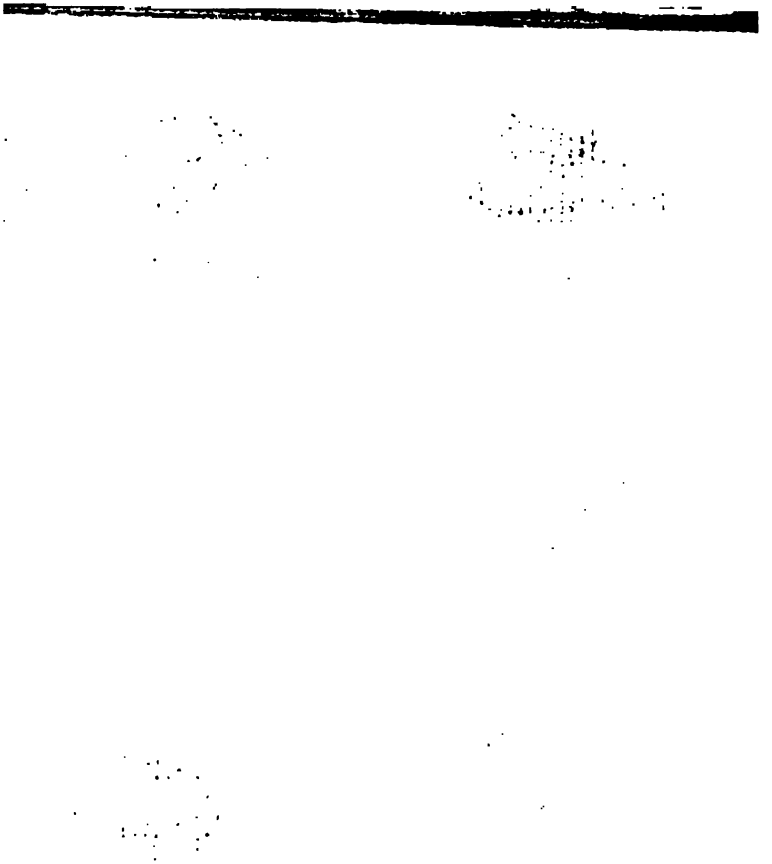

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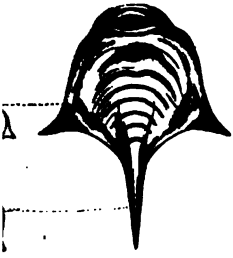

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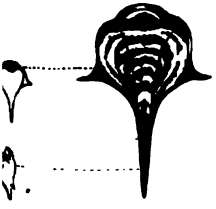

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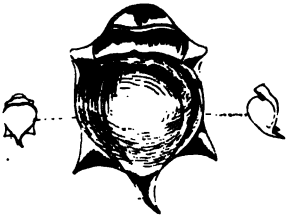

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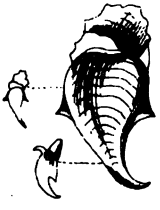

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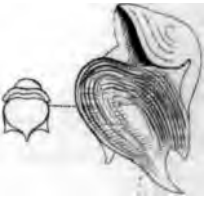

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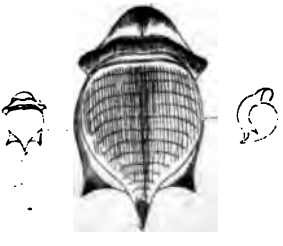
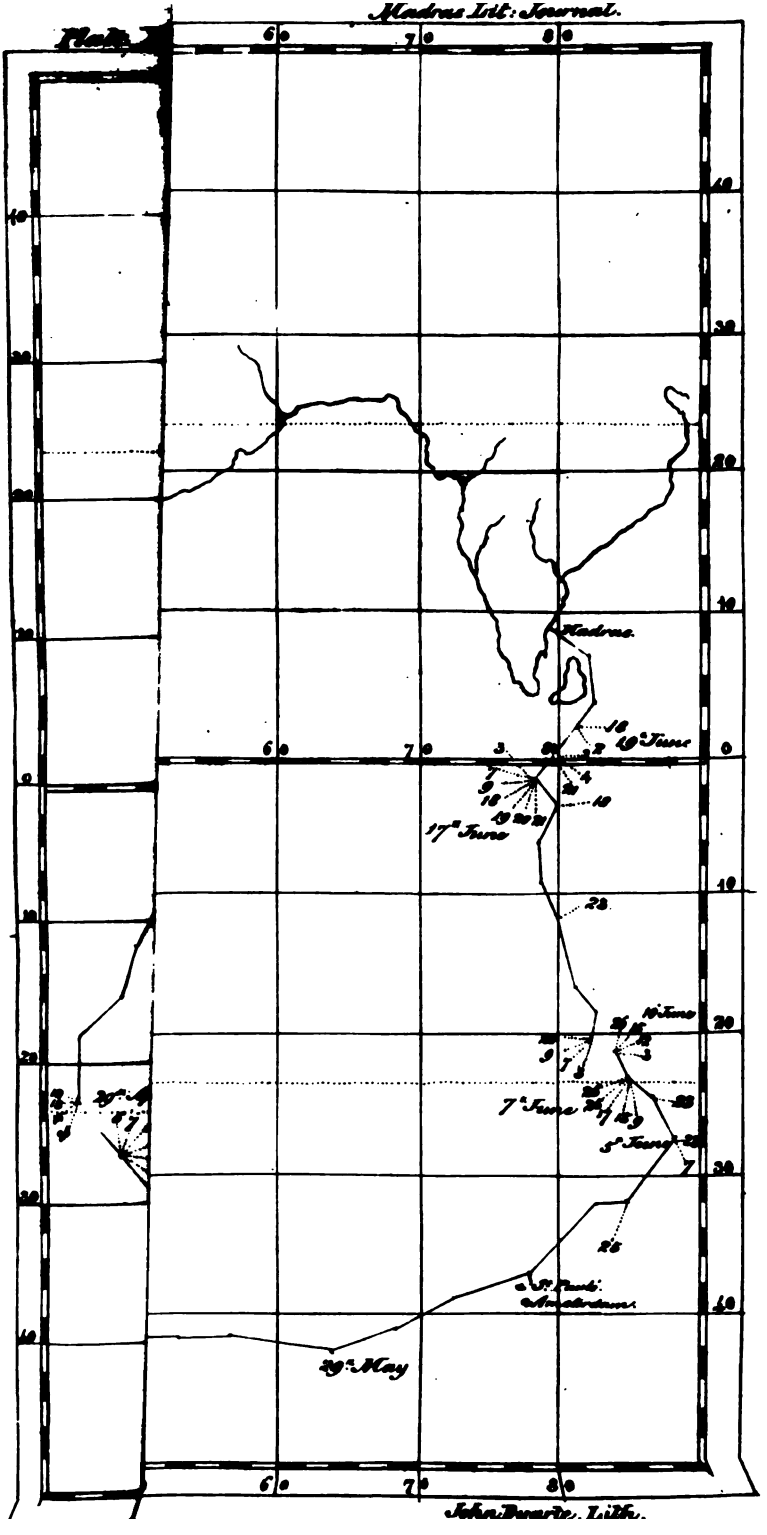
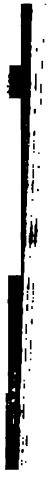
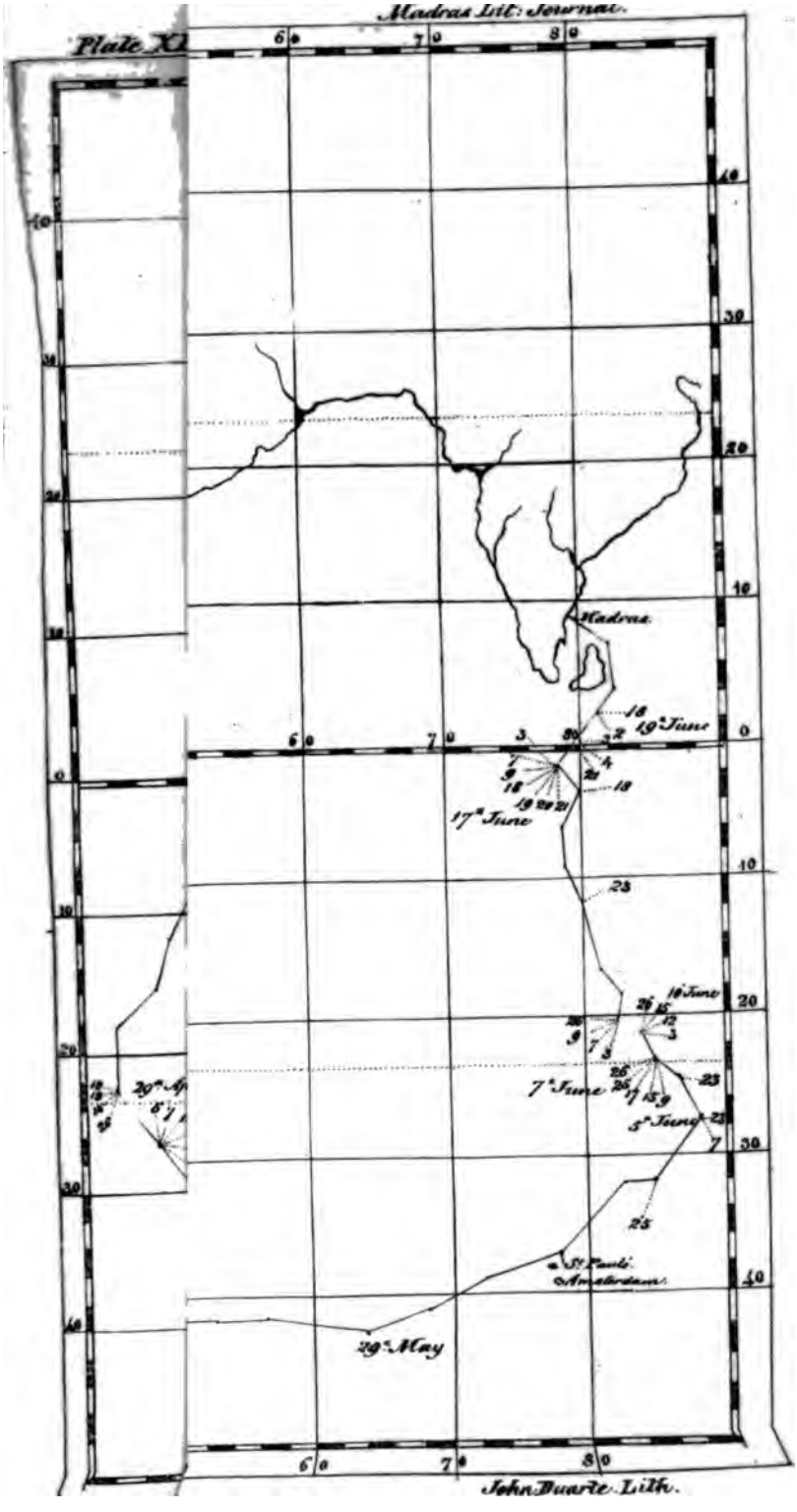


Plate X. N°2. N.S.

Madras Lit


Madras Lith: Journal.
Madras
6°
7°
8°
40
30
20
10
0
Kadiree.
16
19th June
3
2
4
9
18
19
20
21
17th June
23
19th June
7th June
5th June
25
St Paul's
Mountstuart.
29th May
John Bourne. Lith.




Madras Lit: Journal.
Plate XI
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19th June
17th June
7th June
5th June
29th May
St Paul's
Amsterdam.
John Duarte Lith.

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