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The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

PIHAMA,
Taranaki,
NEW ZEALAND.
21. 9. 1945.

Dear Dawson:

Your cheerful card has just arrived and it seems that you have not heard from me since my arrival here. I certainly received a note from you ages ago, with a snapshot of yourself enclosed which I was delighted to have, but I thought I had replied to that. Perhaps I really did not reply for I do not remember sending a snap of myself. I must ask my wife for one, if she can lay her hands on one, to enclose with this letter so you will get an idea of what a New Zealand beach-comber looks like.

I shall certainly be glad to receive the reprints you speak of. I, personally, have nothing new in that line to send, although, at the moment, there is one in the press, for I have been very busy trying to sort out our N. Z. Phaeophyceae and put the results in book form if I can get the book published. The drawings are taking a lot of time, but the greatest difficulty is in determining some of our latest discoveries and in weeding out species and genera recorded for N. Z. which actually do not belong here. Another matter, too, is to find descriptions of plants which have been definitely found but of which I have no descriptions or literature. Our only local authority, the late Mr. Laing, too, has given in his list, some conundrums which I am endeavouring to solve. However, things are progressing slowly and things are being cleared up by the laborious study of much material which comes to hand little by little. In any case, the book will contain as complete a survey of our N. Z. browns as is possible, and on which other investigators may build without the necessity of wandering in quite as much confusion as I have had to do.

Your trip to Chili sounds very jolly. When in the States we used to sing something about "Sweet Marimba", from whom I have learnt all my knowledge of Chili. However, it is a locality which Prof. Setchell wished to explore, and which has several representatives of our N. Z. plants, especially the browns. You will be doing useful work there and will no doubt clear up some of the many mysteries of those unexplored shores, or at most partly explored regions.

I think I shall make this a very short letter, just to give you my address, and forward it by air mail, in the hope of its arriving before you leave La Jolla. I trust you are in the best of health and spirits and that you will have a most successful expedition, full of interest and novelty.

Yours sincerely,

Lindauer, V. W.

Victor Lindauer.

UNIVERSITÉ D'ALGER

LABORATOIRE DE BOTANIQUE
GÉNÉRALE ET APPLIQUÉE
ET JARDIN BOTANIQUE

TÉLÉPHONE : N° 331.08

Alger le 5 Juin 1946.

Mon cher Cassie,

J'ai reçu il y a quelques jours votre lettre du 4 mai renfermant la photo de votre petite fille et la vôtre prise au cours de votre voyage en Basse Californie. Je vous en remercie vivement. Votre petite fille a "fait la conquête" de mon fils qui l'a trouvé très jolie!

Je vous envoie des photos de nos deux enfants et de ma femme ainsi que de moi.

J'ai bien reçu également votre dernière publication sur les algues du Mexique et les deux notices biographiques sur notre ancien Sethell. Je vous en remercie vivement.

J'espère que les paquets d'algues que je vous ai envoyés il y a un mois vous parviendront en bon état. Je vous en enverrai d'autres cet automne.

Je vais partir la semaine prochaine pour Paris avec ma femme. Nous y resterons jusque à la fin d'octobre sauf en août où nous irons au Laboratoire de Biologie marine de Roscoff en Bretagne.

Dès mon arrivée à Paris, je m'occuperai des ouvrages algologiques que vous désirez acheter (Okamura, etc..) Mon adresse à Paris est : 72 rue Gay-Lussac. Paris 5e.

J'ai reçu, il y a quelques jours une lettre de votre

ami David C. Fork qui désirerait savoir s'il peut acheter certaines de mes publications. Celles-ci ne sont pas en vente mais s'il en désire certaines, je lui échangerai volontiers contre des publications américaines qu'il est difficile de se procurer ici. Je lui écrirai de Paris dès que j'aurai un peu de temps. J'aurai beaucoup de travail là-bas je dois en particulier trier une collection d'algues de Madagascar au Muséum pour l'étudier ensuite. Cette collection renferme beaucoup d'espèces intéressantes et c'est une région très peu connue au point de vue algologique. J'espère d'ailleurs pouvoir y aller un jour !.

Croyez, Mon cher Cousin, à mes sentiments les meilleurs et les plus amicaux

J. Feldmann.

Photo of Feldmann in HI Port Files (#3)

Galway, 25-11-1947.

Dear Dawson:

Thanks for your letter which was received some days ago.

I am glad to hear that you are tackling the Gracilariaceae also anatomically as very little seems to be known of this group. On the whole, I think that you also have discovered what a tremendous lot of work lies ahead of us as far as the anatomy of the Rhodophyceae goes, considering that the number of completely investigated species is only a very small fraction of the whole number. It is thus also likely that many new genera should be erected.

I am at present exclusively working on Ascophyllum of Galway Bay hoping to find out something about the annual growth and a survey of present amounts. The first of these problems has been treated in a statistical manner. With many disappointments and few encouraging discoveries: One way or the other, Ascophyllum does not seem to behave the way one would like it

to behave!

I always find time to collect new species to me as often as I come across any. When I have reached a fair number, I shall send a set of them to you. As my stay here in Ireland is only temporary, you might as well wait until I come back to Norway before you send ~~with sending~~ me any specimens.

I am enclosing two pictures of my wife and myself. They are not too good, but I hadn't any better.

Best regards to your wife and yourself!

Yours truly

Ægil Baardseth.

P.S. I forgot to tell you there is another algologist here, Dr. Maisin de Valera, lecturer at Univ. Coll., Galway. She is, at present, working with Gelidium and has previously produced some smaller papers on seaweeds from Galway Bay. (Photograph to patholic coll. 6/52)

Gothenburg 15th December 1948.

Dear Dawson,

Just a few lines to thank you for your letter. I do hope you will be able to go to New Zealand. It is a very interesting part of the world and I myself hope to be able to go back one day. But then I want to see some of the islands too. It was so difficult now and the time was also too short. If you are going I shall be glad for a card from your journey. I enclose a picture of myself taken onbord our ship. I will later on send you some algological pictures from the journey.

And so I wish you and your family a Merry Christmas and a Happy New Year.

Yours very sincerely

Tore Levring.

Tore Levring
Bot. Garden
Göteborg, Sweden

116 High St
Launceston
May 4th /49

My dear Yale

You are a wonderful person to write me so
often when I do not deserve it, I am owing you a letter for a long
time now. I have not thanked you for the beautiful book on the
launching of the Velero IV. She is a most magnificent boat & I
do not wonder that you are finding her even better than you
thought; what more could you want? I have never heard of such
luxury in so much equipment. What a time you must be having
& how wonderful to explore such depths & so many new places,
of course you are finding new things! I guess I could too, if I
had the chance here. But even without such a ship, I have
recently found a lovely new weed, it is a Nitophyllum, I
am sending it to Mr Levring to identify or name.
What a thrill to get a message from your wife. I loved the photo
of your little girl you sent me recently, how fast she is growing.
I am glad she seems to like your work & botany, my girls have
not taken after me at all, & do not 'love' my work, they only
hold their noses & run away!! But Jean is a wonderful gardener,
& Eileen is good on her farm, keeps fowls & pigs & ducks etc!
What a glorious view you had from the boat of the lovely
Mts rising out of the sea, I can imagine it, as at Lord Howe
Id, the Mts rise sheer out of the sea at the South end & are a
wonderful sight. Will you write me a short account of
the natives & Puerto Escondido, so lovely & where no one can
has ever been. I would like to publish it in the Tasmanian
Countrywoman, please. I have just posted you a copy of of
our new magazine, there is a photo of myself in it, so you
will see what I am like.
My husband & I went for a beautiful trip to the far N.W.
corner of this island, we covered over 500 miles by car. We
went to Cape Grim, our farthest N.W. point, it is a lovely spot,
& the Cape is very grim indeed, rising straight out of the sea for

300 ft & beyond it are two twin islands like this
there are terraces all round the shore & wonderful deep pools
full of growing weeds, but the swell is strong & I was nearly
carried off my feet over & over. However I got some nice things.
Another day we went to a place called Marrawah on the West
Coast, it was a lovely spot too & I was fortunate in finding some
good weeds. I specially wanted West coast material to compare
with East coast & North coast, the East & West have a lot in

common, but the N. Coast is quite different. The North is Bass Strait, 300 miles wide & very shallow about 200 to 300 ft, while the W & E are bounded by the Indian Ocean & Pacific Ocean, this makes a great difference, for one thing there is no bull kelp, Sarcophicus, on the N. Coast, while the other two have it in masses. it is also on the S. Coast.

Thank you very much for the parcel of specimens you sent me, they arrived last week & are very interesting, I was specially interested to find one from Bahia San Franciscquito, which was almost identical with a specimen which came from Greenland. the nearest we have to it is Chrysymenia. Yours was Botryocladia pseudodichotoma & the Queensland one :- Botryocladia leptopoda. They are both beautiful & resemble each other sufficiently to see they are the same Family.

You have very nice note paper for your boat & she looks very fine cutting through the sea, while the marine growth rises from the bottom. Have just been to Hobart & back by train for one night, I went to make a protest against the Government letting any part of our National Reserve go to the paper mills, which border it & want the beautiful timber.

Kind regards & best wishes from us both, [illegible]

F. Perrin

To open cut at top

BY AIR MAIL

LAUNCESTON
12-30 PM
[illegible]
TAS. AUST

POST EARLY [illegible] H D[illegible]

AIRLETTER

POSTAGE AIR MAIL 7d 7d AUSTRALIA

Dr. E. Y. Dawson
University of S. California
Allan Hancock Foundation
Los Angeles 7.
California
U.S.A.

First fold here

Second fold here

Third fold here

If anything is enclosed, letter will be sent by ordinary mail.

September 7, 1950

Dr. T. Segi
Mie Prefectural University
Faculty of Fisheries
Otani-machi, Tsu, Mie Prefecture
Japan

Dear Dr. Segi:

I was pleased to receive your letter with its enclosed photograph of yourself and schedule of visits in this country. Working space will be ready for you when you come, and I will try to make your visit as pleasant and profitable as I can. I will obtain hotel accomodations for you as you requested.

It interests me that you now propose to study Gelidium intensively, for I have recently been working on Gelidium in Mexico and hope to continue the work this winter. I have not yet carried my study very far, so may not be able to help you very much, though I'm sure we will have much to discuss because of the similarity of the Japanese flora to that of Pacific Mexico. In this connection, I wonder if you could send, or bring with you a representative collection of the species of Gelidium in Japan. It would be of great aid if we could make direct comparisons of our respective species. I feel quite sure that in several instances there may be identical species which are known under different names in our respective countries. In Mexico there are quite a few of the very small species, several of which I have as yet been unable to assign to any known (named) species. Surely some of them are likely to be conspecific with Japanese ones. I shall look forward to discussing the problems with you.

When you arrive in Los Angeles, please call me by telephone at Richmond 4111 Extension 304 during the day; or if you arrive in the evening, call Adams 18709. If you would rather come directly to my home and have the opportunity to do so, you will find us at 721 West 49th Street. The University is about 4 miles from the railway station; my home is 5½ miles.

Best wishes for a pleasant trip,

E. Yale Dawson

Institute of Fisheries
Hokkaido University
Sapporo, Japan

March 4, 1952

Dear Dr. Dawson:

Your nice and interesting letter posted on November 1 was placed in my hand when I came back home from the journey of twenty days from the 2nd of that month. I went as far southwest as Nagasaki, famous old harbor in Kyushu Island. It is the second city in the world exposed to the attack of the atomic bomb, as you know.

The annual conference of the Japanese Scientific Fisheries Society was held on 6-7 Nov. at the Kyushu University, Fukuoka City, Kyushu. The phycologists attended were Dr. S. Segawa of the Kyushu Univ., Dr. T. Tanaka of the Kagoshima Univ., Dr. S. Arasaki of the Tokyo Univ., Dr. N. Segi of the Mie Univ., and I. I will show you a picture of us, except Dr. Segi, taken in front of the main lecture hall.of the Univ.

After the conference was over, I went to Nagasaki to pay a visit to some of my friends, most of them were once my students while I had been teacher of the School of Fisheries, and are now occupying important positions in fishery companies or other organizations. It was ten to twenty years since I met them before. To my great pleasure one of them, factory manager of a refrigeration company, is a Christian friend of mine, and he and his wife welcomed me with warm heart to their childless home where I spent three nights.

He took me to major sight-seeing places of the city, including the center of the area devastated by the A-bomb. I also visited the ruin of the famous cathedral of the Roman Catholic Church at Urakami on a hill a half mile away from the center of the explosion of the bomb, and beautiful hill along the bay which fortunately escaped the devastation.

The Kyûshu University has a seaside laboratory at Tomioka, Amakusa Island. I visited there and made a small collection of seaweeds on the stony beach at low tide. This is a good station for biologists.

The other day I received a letter and a parcel containing a copy of the excellent book entitled "Voyage of Velero III" together with a couple of pictures of the Allan Hancock Foundation Building from Captain Allan Hancock. It's my great pleasure to learn thru this book the history of the captain's family and the activities of your research boats which must have brought home pictorial records so numerous and so precious as we can guess from those reproduced fragmentally in this book.

I express here my sympathy to you for the ailment of your wife and for the trouble you have suffered so bitterly.

Sincerely yours,

J. Tokida

J. Tokida.

室蘭工業大學

Institute of The Algological
Research, Hokkaido University
Funami-chō, Muroran, Japan.

29 Nov. 1952

Dear Dr. Y. Dawson:

I have received a copy of your recent publication. Thank you very much for it.
I have sent you my photo, please send me your recent photo.

Truely yours,
K. Inagaki

AFD. DELTA-ONDERZOEK
HYDROBIOLOGISCH INSTITUUT
KONINKL. NEDERL. AKADEMIE VAN
WETENSCHAPPEN

YERSEKE, June 27 th, 1960.
VIERSTRAAT 28. GIRO 660118
TEL. 01131-642, CHEM. LAB. 01131-296

Prof.E.Y.DAWSON,
Beaudette Foundation, R.F.D.1,
Box 227,
S O L V A N G California
U.S.A.

Dear Dr.Dawson,

Enclosed in this letter I send you a picture of myself, which you asked me in the beginning of this year.

Further I can tell you, that I found in the herbarium at Paris a sample of a Diplanthera from the Caribbean Sea, agreeing with my recently described D.dawsonii. In future I think to study this interesting genus monographically. It appeared to me that also the malaysian material comprises more units.

With kind regards
yours sincerely,

den Hartog

(Dr.C.den Hartog)

Department of Botany
February 23,1966

Mrs. Emmy Backeberg
Im Sorenfelde 15
2 Hamburg 67 (Volksdorf)
Germany

Dear Mrs. Backeberg:

Your sad message was received with dismay. I feel so remiss in having failed for so long to write to Curt and to tell him of what I have been doing. Only a few days ago I read with such pleasure his honoring words for Scott Haselton in the Cactus Journal, and I thought then of writing to him. Now, I find he is already gone.

So many times my wife and I have thought of the pleasant time we spent at your home. I often look at the picture of Curt in his greenhouse among the plants he loved.

Just now I am using very often the magnificent volumes which resulted from his life-long work with the cacti, and I am so glad that he lived to see the fulfillment of his huge ambition to monograph the cacti.

I had hoped to visit him again in Volksdorf next year, and to see you both in home that we knew. How I shall miss knowing that he was there working day by day, but I shall never forget that brief time together with that wonderful man who was your husband. What pride you can take in the intense and productive life he led. Though he was not old, yet how very very much he did live.

You have our love and sympathy during this part of your life that you must now live without Curt's companionship. May God give you solace and contentment.

Sincerely yours,

E. Yale Dawson

Dawson - Peru 1963

Chaclacayo 770 m.
gentle rise - broad valley -
cotton - river a boulevard -
dry hills. - some Tillandsia
Chosia at 3000 ft begins
first Neoraimondia on bank hill
Hydroelectric plant
Canyon ravines - see both
sides
"Binghamia melanostele"
black stems
first Espostoa are all black
with white tufts - very slow
growth

Chosica - Santa - increasing
cacti Numerous forms.
Neoraimondia goes out at about
4500 ft. Weberbauerocereus +
Trichocereus dominate with
very fine Espostoa.
Canyon ravines. Cliffs show
pendant forms especially of
Trichocereus, but the
others, even some Espostoa +
Haageocereus become weak in
walls.

Haageocereus very abundant –
different spp?
Espostoa white

Pickett cactus around Surco
to Matucana +- 6-7000'
Pitcairnea abundant

San Mateo gets quite cold.
Last trees – slender Eucalyptus
This about 9500'
River Rimac runs through
town
Gorge narrows – El Infiernillo
Tunnels + switchbacks
No cacti.

First Opuntia across from
Casapalca

Best near Morococha
Natural high lakes – some
slight glacial evidence. Large
artificial lakes below mines
Very cold (summit 4843 m.)
Snow more abundant + lower
on trip over than return

Red cliffs
Bolys rolling hoops
mud; no fuel; wet feet

Railway through high
flat valley to Yauli

Llamas + goats

Start pampa grass - Stipa
on the Puna

Outline

History of discovery + geographical recognition of desert coast of Peru

Animal life on the desert
equable climate
agriculture – cotton + guano
fish
adobe – birds eggs binder

Origin of the dry climate – Andes
+ ~~st~~ coastal cold current
Compare Humboldt to Gulf Stream
Penguins + Sea seals at equator

The el Niño + northern rains

The years of plenty

The great rains – 1925

Natural history contrasts
desolation vs. rich life

Vegetation of the desert – succession + climaxes
Tillandsia ~~Lichens~~

blue-green algae

lichens

tillandsia

cactus

drought resistance of some annuals

Vegetation of the sea
Kelp beds north & south
intertidal vegetation
latitudinal comparison
extent of exploration & opportunities
subtidal unknown - world
of exploration for skuba botanist

Plant Paradox of Peru

"Sail the coast southward!
when there no longer are any
trees, you are in Peru!"

Such were the sailing direction
given by Bartolomé Ruiz to
early 16th Century navigators
seeking from Panama the current land fall
to the Inca kingdom of Gold.

The directions were surprisingly
precise, for at Tumpiz, the
northernmost coastal city of the
Incas, a remarkably sharp
line separates the lush
vegetation of the humid tropics
from the treeless desert. To
the north the jungle extends,
except for the semi-arid Salinas
Peninsula, through Ecuador to
Colombia & Panama. To the
south the vegetation fades gradually to
the most meager scrub & cactus and
then to absolute desert almost without
visible vegetation for over two
thousand miles.

To these intrepid
first voyagers of the wondrous
Peruvian seas the utter desolation

rocky
of this vast coastline pounded by breakers and backed by gigantic bare mountains was no less incomprehensible than their discovery of the towns & fortresses & roads within it. Indeed, the Inca empire had conquered & embraced all of it, and in this desert had accomplished some of the most stupendous feats of primitive man.

Here & there through V-shaped gorges — the coastal lomas the towering andes discharged turbulent streams ~~through~~ to the sea. Beside these the ancient coastal peoples of Peru began 5000 years ago to ~~peoples~~ built their towns of ~~sundried~~ ~~adobe~~ adobe bricks, and to spread ~~the~~ water over the valley floors desert to grow their corn & ~~cotton~~ manioc. By the year 1000 A.D. the Mochica civilization had completely dominated this arid environment and had built so extensive an empire that a single religious edifice commanded the use of 130,000,000 adobe bricks.

This fact, the use of sun-dried adobe bricks, and their method of making them point to some of the remarkable features of this environment unique in the world.

The sun, although often veiled by high clouds or by fog was always with them but did not bring rain. Sun-dried adobe was an ideal & durable building material in such a climate ~~and durable~~. To increase its strength they used the adhesive qualities of the white of eggs. ~~But~~ where else in the world could a people have the millions of birds eggs sufficient to build the bricks of their cities, but Peru? Only there, on numerous ~~[illegible]~~ off-shore islets dwelt the vast population of sea birds ~~that~~ supplied not only this material for his buildings but the fertilizer for his fields of ~~maize~~ es. By the time the 10th Inca conquered the ~~[illegible]~~ lowe coastal

desert, before the days of Columbus, extensive cities had sprung up there & vast irrigation works watered the desert fields of corn & cotton & beans. So great & significant to the Incan Empire was this coastal desert that a 24 foot highway was constructed throughout its length of over 2500 miles.

A remarkable combination of natural features and forces created this unique environment that shaped an ancient civilization and now continues to support the descendants of the last conquerors. It is the study of these natural features and the responses of plant & animals to them that will enable man better to utilize & conserve his resources and to extend his age old occupation of the desert.

The first cause is the mountains, the vast expanse of the Andes that running the full length of the continent and

so excessively high as to trap effectively on its east side nearly all of the moisture pressed against it by moist air from the East Atlantic lowlands. Most of the little that reaches the western slopes falls as snow on the peaks and as meltwater gushes down steep gorges to the sea. Only a treeless belt of grassy herbiage occurs above 10,000 feet. Below that lived a nameless assemblage of drought-resistant succulent plants of numerous families covers the precipitous slopes, but even the most luxuriant of these quickly way to bare rock & sand at about 3000 ft.

Then the great second came, — the cool sea. up from the frigid antarctic & hugging the coast of the continent the Humboldt Current sweeps irresistably all the way to the equator, as

the Gulf stream of the
N. Atlantic carries warm
water far north to bring
temperate climates to the
high latitudes of Europe,
so the cold Humboldt
stream tempers the coastal
climate of Pacific South
America all the way to the
equator. While the tropical
North~~east~~ Pacific swelters
in heat born of the warm sea
whose bordering lands are
the "tierra caliente", The South ~~Pacific~~
East Pacific ~~South American~~ has none of this,
for cool waters bathe the whole
coast and have carried
with them to the equatorial
Galapagos Islands such
unlikely animals for the tropics
as fur seals and penguins!
Not only does the Humboldt flow
north with its cool water, but
this water is kept cool,
despite incessant insolation,
along the desert shore by ~~continuous~~ the upwelling of
colder subsurface ~~cool~~ water under

the influence of prevailing southerly winds. The result of this is the unique coastal phenomenon of the tropical world - an entire continental coast from the tropic of capricorn to the equator in which the coastal sea water is colder than the air over the adjoining shore. Such a situation invariably results in coastal aridity even without the influence of other factors, - but coupled with the rain shadow of the Andes, the Peruvian coast is doubly guarded from precipitation to the point that it receives essentially no rainfall as such. Such moisture as does fall upon this barren land comes in the form of a fine mist, the Garúa, which shrouds the coast during much of the winter season from May

to September and moistens the very surface of sand & rock sufficiently to supports the peculiar fog-dependent vegetation of lichens & Tillandsia as will be shown.

However this fog & mist is not always sufficient to moisten the soil for germination & vegetative growth of rooted plants accordingly, except at infrequent irregular intervals such plants are hardly to be seen on the coastal desert. Another interesting oceanographic factor, nevertheless does provide for occasional true rain and an unbelievable change in the desolate shoreline to flowering greenery. Such are the "years of plenty" long known to the desert agriculturists as those in which the long-dry coastal mesas & flats can be planted with cotton. They come from the influence of another current, known as El Niño.

In the far north of Peru at the boundary of Ecuador the Humboldt Current

~~At North of the Peru-~~
~~Ecuador boundary in the~~
~~region of the south of~~
the Cabyas River the

In the far north of Peru, at the boundary of Ecuador the Humboldt Current suddenly turns due westward and moves toward the Galapagos Islands. It does this in convergence with the southward moving warm waters of region of the Gulf of Panama which likewise are forced westward at the point of contact. On the one side the warm current carries with it the characteristic tropical rainforests of the jungle coasts of Columbia + Ecuador while on the south the Humboldt cold Stream effectively guards its coast from rain. This accounts for the sharp

line of demarcation between the forest & the desert at Talara in North Peru. However, this point of convergence of the warm & the cold streams is not absolutely stationary and characteristically makes a slight southward shift during most years at about Christmas time. Because of this southward extension of the warm (during Holy Years) water, and with it rain to areas ordinarily 10 months or so in drought, the current came to be known as El Niño, the coming of the Christ Child.

There exists regular So. Ecuador & North Peru thus, receive quite regularly a pronounced but short-lived rainfall that favored the development of a succulent & thorn-bush vegetation capable of sustaining itself through long months of droughts.

South of Tumbes however, the El Niño with its rains does not regularly extend. And there begins the true desert.

Nevertheless, there are such irregularities in the position of the Humboldt-El Niño convergence that occasionally roughly at intervals of 5-8 years the warm current extends farther south for a brief period and brings rain as far as Pisco or even Trujillo. Some of the finest cotton in the world is grown in north central Peru from plantings made during these occasional heavy rains.

Still another irregularity in the oceanic convergence occurs, of longer cycle, and rather than "years of plenty" it usually provides instead widespread disaster. Here in the rare far-southward extension of El Niño which

does not quickly return to the normal convergence point in south Ecuador. These extraordinary displacements occur two or three times a century and bring with them ~~terrible~~ great changes in the established pattern of life on the land & in the sea, ~~and~~ so much so as drastically to affect the lives of men on the desert shore.

The last great displacement occurred in 1925 and was chronicled by Robert Cushman Murphy who was then to observe the disaster. Rains began to fall in February and continued with brief interruption for five months. The warm current spread southward all the way to Callao and killed, with its heat, ~~as it~~ came the marine life of the normally cold-water coast. Fish that did not succeed in moving southward fast enough died & were cast on the beaches in ~~ending~~ stinking windrows.

With the destruction of the fish the vast sea-bird population began to starve. Millions of birds fled south but millions were dead of starvation, including some two million nestlings. Beaches & harbor were littered with carrion. The phenomenon of the "Callao painter" appeared, so named by the early Spanish from the development of such high concentrations of H_2S from decaying bodies in the harbor as to blacken the paint of vessels at anchor. Thousands of tons of precious guano was washed from the bird islands into the sea. With the pollution and the nutrient flush many dinoflagellate blooms cause the "red tide", streaking the sea with red.

On the land terrible erosion of the barren soil occurred and destruction of the unprotected adobe dwellings of the people. Their supply of fish gone and normal ~~transport~~ of supplies cut off by wrecked communications they too began to starve. Standing pools bred mosquitoes, and malaria broke out among

those who had not known it in a lifetime. Even the rats became starved & weakened from disruption of accustomed food supplies and in their weakened condition began to die of plague which spread to men who lived in squalor with them. So badly were railways & roads destroyed by the incessant rains that one witnessed in Inca's the age-old sight of files of ~~burros~~ llamas being driven down from the sierra bearing loads of foodstuffs for the city.

But then in June the cold water reappeared on the shore, the rains stopped; flowers bloomed & died in the sand; the fish & the birds returned; the sun came out to bake the land again. and it was desert again.

In all of this we see a remarkable contrast in life on the land & in the sea of Peru, depending upon seawater temperature. The cold water of the Humboldt Stream supports rich marine life which cannot tolerate the high-temperature, low-oxygen waters of El Niño. On the other hand the all-but-lifeless desert shores burst in to greenery & bloom with the warm tropical rains. On the one hand the limiting factor is water, on the other it is oxygen.

In the sea neither water nor carbon dioxide are in short supply for the growth of ~~plants~~ algae which are the pastures of the oceans. During daylight the seaweeds & phytoplankton make food and oxygen for their respiration, but at night oxygen is often in short supply while respiration

goes on. Accordingly, it is in areas of higher oxygen concentration, whether in colder water where the solubility is higher, or in sunny places where more atmospheric mixing occurs, that we find the richest development of marine plants. Where the decent conditions of these both of these conditions are met, and we find an abundant vegetation in the sea in turn supporting enormous populations of marine invertebrates, and of fishes, and of fish-eating sea birds.

On the land, where water is the limiting factor, we find that the climax vegetation consists usually of the most elementary phases of plant succession.

One usually thinks of succession

in terms of gradual
development of a plant-supporting soil, beginning with
bare rock upon which
crustose lichens begin to grow,
followed as the soil build-up ~~for~~ proceeds with mosses,
annuals, shrubby perennials
& finally forest, — provided, of
course, that water is not limiting.
Here, however, the intense
aridity provides no further
advance in the composition of
the flora than rootless
plants capable of surviving
on the ephemeral surface
moistening of the garuas.
Several kinds of plants have
successfully met these difficult
conditions and ~~survive~~ succeed on
the desert with the most
meager moisture.

One of these is the blue-green algae, Nostoc, which
lives most of the year as ~~a~~
dry, black, granules & crumbs, loose
in the ~~sand~~ surface of sandy clay

dehydrates to the extreme, but withholding in its drought resistant aplanospores the a residue of life. With the coming of the rains [illegible] these crumbly fragments expand as the colloids of dead cell walls absorb the moisture. The aplanospores germinate & spread a skein of filaments that cover the ground with a dark, glutenous slime so long as the moist remains. Then they shrink & crumble again to wait another year.

Similarly the lichens on bare rocks survive by this technique, but instead of algae alone, the food making algae is surrounded & protected by interlacing filaments of a fungus that may assume the most bizarre forms. This association of plants grows only during the time of moisture adding cellular material which serves

like a sponge to hold & conserve water even after it is dead. Thus, the lichen may consist largely of dead cells that serve the living by their absorbent qualities.

Throughout most of the Peruvian coastal desert, the lichen is the most advanced component of the flora, and often there ~~is~~ is a great diversity of species from thin, crustose ones to intricately branched, bushy foliose ones that catch & ~~absorb~~ imbibe the most minute & meager droplets of water from a sea borne fog.

Apart from these algae & lichen that ~~survive~~ persist by ~~a technique~~ of alternate growth & retreat to minute resistant spores, two other kinds of plants survive perennially by means of highly efficient adaptations for water absorption & conservation.

The most widespread of these on the Peruvian coast are species of Tillandsia, related to

our widely known "spanish moss" Tillandsia and more distantly to the pineapple.

Tillandsia occurs in great dark patches on hillsides & sand hills throughout the coastal desert. It needs no soil, for its roots are of very little functional only for anchorage, and, indeed are essentially absent from old ones. Tillandsia is truly an "air plant" and here in the Peruvian desert is strictly a mist-catcher. Its leaves are so arranged that during foggy season, the moisture condenses on minute epidermal protuberances runs down into a small catch-basins at the leaf bases where specialized absorptive cells take it in much in the manner of root hairs of most higher plants. And the water has

by its succulent leaves
been absorbed & it is
vigorously conserved over the
ensuing dry months by
an impervious epidermis.
So effective is this conservation
that ~~plants~~ even a the hot,
~~dry~~ parched season is well
advanced Tillandsias may
be found using a bit of their
reserve water to send up a
flowering shoot for the
fulfillment of their reproductive
function.

In a few favored spots,
another perennial plant
succeeds in a life dependent
upon roots. This is the cactus,
and it is scarce indeed,
on the very dry crest, for
there are few places suitable
for a shallow rooted plant.
However on some rocky
hills the presence of smooth,
shale-like rock permits
even the most meager pre-
cipitation to be shed by the
rock to the cracks between

wherein the roots of
Hoagcoreens quickly
pick up all that there is
& immediately store it
in the hydrophilic tissues
of their water-impervious
stems. Such plants
scarcely grow at all except
during the rare years of
more appreciable rainfall
during which seeds may germinate & a young plant survive under a protective rock long enough to receive the marginal sustenance of the next gama.

Then of course there are the numerous desert annuals that meet the problem of survival somewhat like the algae by going into a drought resistant stage. But these really are not "annuals" for their seeds may lie on the parched ground ten years or more without receiving sufficient moisture for germination. The last time there was

a flowering of "annuals" in the coastal hills around here was 1957. The extraordinary longevity of many of these minute seeds in under the most severe conditions of heat & drought is a fact that cannot help but stir one's imagination.

Whereas the life of the land is so frugal, so scant and so ephemeral that of the sea is rich and varied and free. The shallower waters of the rocky shores teem with invertebrate & fish among dense beds of kelp & sea palm, while the off-shore waters support so much plankton that great schools of anchoveta abound followed by and fed upon by plunging gannets, by tuna & porpoise

The vegetation of the inshore waters is of especial

extract, for one sees in
it much resemblance to the northern
Pacific marine flora but
latitudinally displaced by some
20 degrees. Thus, at 12° So.
Lat. the intertidal flora of
the limu area corresponds closely
with that of some Southern California
areas at N. Lat. 32°. Some of
the same spp. are present, & the
genera are mostly identical.
The large brown algal genera Ecklonia
& Macrocystis show the most
striking counterparts, while
rock covering Gigartina, Corallina,
provide associations extraordinarily
like those in the northern hemisphere.
Yet, we cannot now go far
with the comparison for we are
only now exploring this Peruvian
coast for its marine plants.
To date only a fraction of the
species have been recorded in
the literature and essentially
only for intertidal & dry & wash
collections from a few
localities. The rich flora
of the infratidal belt along

~~Interest for~~

This rugged coast has yet to be observed & reported. But we are now in the age of the botanist who will one day soon, with scuba-diving will help to complete the exploration of this desert coast begun 500 years ago by its first Indian aquanauts.

inició began

hizo - made

se construyó - was constructed

se hicieron - were made

Living snow of the Andes

Of all the extraordinary adventures and experiences in the life and travels of the first great naturalist-cosmographer Alexander von Humboldt, that which he seemed most to embrace was his trips over the Andes in a basket, carried back to back over fearsomely precipitous trails at awesome altitudes by the incredibly strong Indians. It was from that unusual vantage point of seeing only where he had been and not much of the way, that without foreknowledge of new panoramas to unfold from behind, that we got our first comprehensive descriptions of the andean world from the pen of a scientist.

It was in 18__ that
he made the remarkable crossing
__ __

Of all the groups of plants peculiarly American none show a greater diversity of vegetative form and of climatic adaptability than do the cactis. Although extraordinarily successful in semi-desert areas and prevailingly distributed in the arid parts of the America continents, they have not confined themselves to such habitats but have ~~spread~~ as well occupied ~~the~~ such dissimilar environments ~~some of the~~ as the ~~wetted~~ dripping limbs of ~~epiphytic~~ ~~habitats~~ treetops of tropical forests and the alternately humid-hot and blizzard-cold grasslands of the great plains. Such ~~[illegible]~~ extreme tolerances for high and low moisture and temperatures are unique among the succulent plants. ~~Another remarkable tolerance is that of altitude~~ and in the cacti are further paralleled by an extraordinary

altitudinal range from below sea level ~~the~~ in the desert valleys of California to the puna of the Andes at as much as ~~over~~ 15,000 feet. At this upper extreme we find our present subject, Op. (Tephrocactus) floccosa, the Andean Living Snow:

Leaking & dries.

Whereas Humboldt took nearly 6 mos. for his crossing of the Cordillera it is now possible in the space of a single day to glimpse a transection of the andean terrane & flora by means of the quite direct but harrowing Lima ~~to~~ Oroya – Tarma – road over Anticona Pass. One climbs consequently on this route an almost continuous 6% grade ~~for~~ ~~stra~~ ~~tued~~ (for some 50 miles) to reach the summit saddle at hardly less than 16,000 feet. In so doing he witnesses in a few hours the transition from the utter desert of sand ~~to~~ on the seacoast to the desolate of snow & glaciers on the heights and passes between a varied vegetation of extraordinary interest.

To Chaclacayo at 2500 ft one proceeds up the broad valley of the Rio Rimac through irrigated cotton fields ~~bordered~~ between barren brown hills destitute of plant life but for

black patches & mottlings here & there of the air plant Tillandsia. Not until an elevation of about 3000 ft is reached at Chosica does the first evident rooted vegetation appear on the sun scorched ~~hills. The~~ looming hills. Gigantic candelabra of Neoraimondia stand starkly on ~~among~~ the rocky slopes & cliffs persisting ~~[illegible]~~ on the most meager moisture and often for years on end with virtually none.

As the canyon narrows & steepens the Rimac river becomes a torrent in its rocky bed and one enters a xerophytic vegetation replete with cacti of varied form. Black columns of Espostoa with shining white tops, reflect the age & slow growth at the region's lower levels while at 4500 ft & above ~~their white hair~~ a favorable rainfall provides such comparatively

rapid growth that the white ~~stems~~ leaves remain freshly & little changed to near the base. At some 7000 ft at Malmyo along the gorges the cliffs are studded with the rosettes of Pitcairnia and draped with pendent stems of Trichocereus ~~with~~ in the manner of great snakes with head-like tips ~~upturned~~ upcurved.
Then at San Mateo 9500 the mountains are all green the succulent vegetation essentially disappears it is cold and the last groves of slender Eucalyptus ~~on~~ edge the Town of San Mateo through which the churning Rio Rimac streaming whose icy ~~that~~ Now the gorge is so narrow & the way so steep that tunnel & switchbacks carry the tortuous road through El Infiernillo's ~~and~~ ~~massive~~ towering rocks upward & steady upward toward the snowy crags.

8

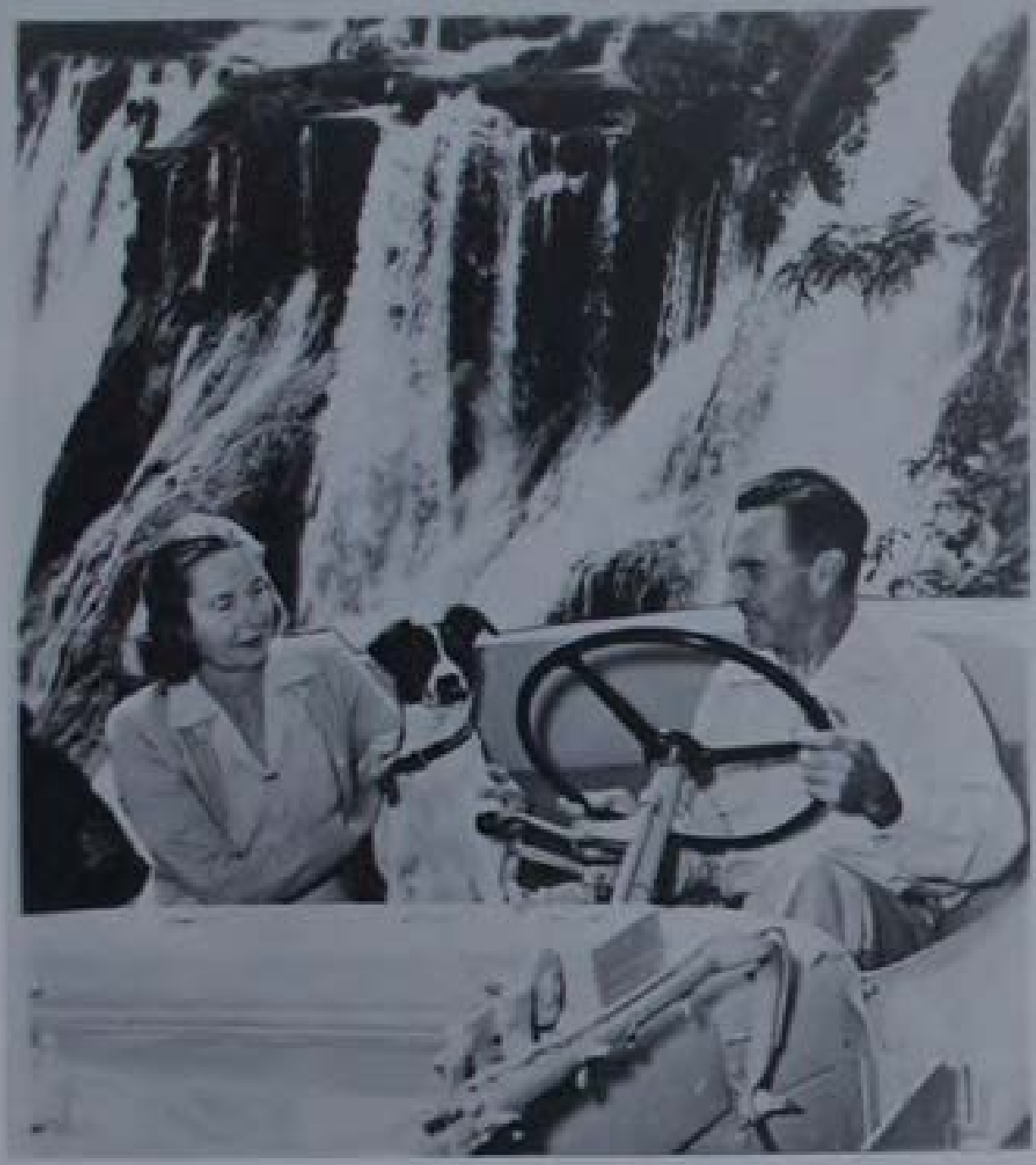
As one enters the [soggy] alpine grassland a mist rain begins to fall & then turns to [gentle] snow. At 14000 ft, ~~so~~ to step fr the car is to find oneself suddenly dizzy, & frail & breathless fr the altitude. Snow patches merge above ~~and~~ join a ~~fall~~ white cover of ~~snowy~~ glaciers & of clouds. Now & then the black & white peak of Antuin emerges fr the clouds over ~~the~~ nearly 16000 ft pass.

Just over the pass are glacial lakes & more gentle alpine grassy slopes. The sun comes out and ~~one~~ now one sees that some of the snow patches are not snow at all but ~~being~~ white spreading mounds of living plants. Here at 15000 ~~ft~~ Opuntia floccosa, ~~the~~ living snow! blends with the real thing.

The imitation

Individual plants may be ~~[illegible]~~ few small dome-like mounds of a hundred [compact] stems or spreading cushions [to 20 hundreds of] made (strange that it should be a cactus)

up of thousands. Although
the whole looks from a
distance like a white
cotton bed, close inspection
reveals ~~that~~ sharp +
rigid spines protrude through
the white hair and
provide an ~~effective~~ inconspicuous but complete
armament for the succulent
~~stems~~ pulpy. So tender + juicy are
their spring stems that
~~nevertheless~~ an occasional
ardent goat attempts to
savor them, + one finds the
edges of some mounds nibbled
+ the green flesh exposed by these omnivorous creatures
The extraordinary compact pastures
of the mounded stems ~~often~~
~~[illegible]~~ render them
inconspicuous, with above, below + between multitudes of
bristling needles there renders them
effectively protected from the
the attack of vegetarian animals



SEASON'S GREETINGS AND BEST WISHES

FOR THE NEW YEAR

Holiday Greetings
and
Best Wishes
Dan and Ginger Lamb
of
Salto de Agua, S.L.P.

11405 Seaview Ave., Coronado Mar, Calif.

Season's Greetings

Dan and Ginger

Dear Friends -

This year we were successful in reaching the Lost City of the Mayas. This picture was made at the entrance to the central Temple.

Hope to see you one of these days.

As ever

Dan and Ginger

Dear Friends--Hope we'll see you soon, and our best wishes to you for this New Year.

As ever,

Ginger + Dan