

Darwin's Letters: Collecting Evidence

To J. D. Hooker 13 April [1855]

Down Farnborough Kent
Ap. 13th

My dear Hooker

Thank you very much for the information about the seeds. I had fancied you had some definite opinion that seeds of certain groups could not possibly withstand salt-water. I am not yet prepared to try the experiment on so large a scale as you suggest: indeed I have hardly the means; but I am glad to find I have commenced very much on the principles you suggest, but on a much smaller scale. I have had one experiment some little time in progress, which will I think be interesting, namely seeds in salt water immersed in water of 32°-33°, which I have & shall long have, as I filled a great tank with Snow. -- When I wrote last, I was going to triumph over you, for my experiment had in a slight degree succeeded, but this with infinite baseness I did not tell in hopes that you would say that you would eat all the plants, which I could raise after immersion. It is very aggravating that I cannot in the least remember what you did formerly say, that made me think you scoffed at the experiments vastly; for you now seem to view the experiment like a good Christian. I have in small bottles out of doors, exposed to variations of temp., but in shade, exposed to light, as yet only Cress, Radish, Cabbages, Lettuces, Carrots, Celery; & Onion seed; 4 great Families. These after immersion for exactly one week, have all germinated, which I did not in the least expect, (& thought how you wd. sneer at me) for the water of nearly all & of the cress especially, smelt very badly, & the cress-seed emitted a wonderful quantity of mucus (the Vestiges would have expected them to turn into tadpoles) so as to cohere in a mass; but these seeds germinated & grew splendidly. The germination of all (especially Cress & Lettuces) has been accelerated, except the cabbages, which have come up very irregularly & a good many, I think, dead. One wd. have thought from native habitat cabbage wd. have stood well. The Umbelliferae & onions seem to stand the salt well. I wash the seed before planting them. I have written to Gardeners' Chronicle; though I doubt whether it was worth while. If my success seems to make it worth while, I will send a seed list to get you to mark some different classes of seeds. To day I replant the same seeds as above after 14 days immersion. As many sea-current go a mile an hour: even in a week they might be transported 168 miles: the Gulf-stream is said to go 50 & 60 miles a day. -- So much & too much on this head; but my geese are always swans

Goodbye | My dear Hooker Most truly yours | C. Darwin

I plant my salted seeds in glass tumblers (having first tried & recorded rate of germination of same seeds unsalted) so that I can see the seed all the time, before & after germination, on the chimney piece. --

To J. D. Hooker 12 April [1857]

Down Bromley Kent
Ap. 12th

My dear Hooker

Your letter has pleased me much, for I never can get it out of my head, that I take unfair advantage of your kindness, as I receive all & give nothing. What a splendid discussion you could write on whole subject of variation! The cases discussed in your last note are valuable to me, (though odious & damnable) as showing how profoundly ignorant we are on causes of variation. --

I have just been putting my notes together on variations *apparently* due to the immediate & direct action of external causes; & I have been struck with one result. The most firm stickers for independent creation admit, that the fur of *same* species is thinner towards south of range of same species than to north -- that *same* shells are brighter coloured to S. than N.; that same is paler-coloured in deep water -- that insects are smaller & darker on mountains -- more lurid & testaceous near sea -- that plants are smaller & more hairy & with brighter flowers on mountains: now in all such (& other cases) cases, distinct species in the two zones follow the same rule, which seems to me to be most simply explained by species, being only strongly marked varieties, & therefore following same laws as recognised & admitted varieties. I mention all this on account of variation of plants in ascending mountains; I have quoted the foregoing remark only generally with no examples, for I add there is so much doubt & dispute what to call varieties; but yet I have stumbled on so many casual remarks on *varieties* of plants on mountains being so characterised, that I presume there is some truth in it. What think you? do you believe there is *any* tendency in *varieties*, as *generally* so called, of plants to become more hairy & with proportionally larger & brighter coloured flowers in ascending a mountain. --

I have been interested in my "weed garden" of 32 feet square: I mark each seedling as it appears, & I am astonished at number that come up. & still more at number killed by slugs &c. -- Already 59 have been so killed; I expected a good many, but I had fancied that this was a less potent check than it seems to be; & I attributed almost exclusively to mere choking the destruction of seedlings. -
- Grass-seedlings seem to suffer much less than exogens. --

I have *almost* finished my floating experiments on salt-water: 72/94 sunk under 10 days -- seven plants, however, floated on *average* 67 days each.

I *think* it will turn out on average from my very few experiments, of **very** little value, but better than mere conjecture, that about 1/10 of all plants of a country will float when dried 30 days & *the seeds then germinate*; & this on *average* current of 33 miles per day will carry them a good way. I would wager that the pods of the Acacia(?) scandens which get to the Azores had been dried first. -- I suppose the oriental species does not fruit at Kew: if it did, I shd. like to try.

Farewell | C. Darwin

P.S. Strictly according to my experiments a little above 1/7 (.140) of the plants of any country could be transported 924 miles & *would then germinate!*^for 18/94 have floated above 28 days & 64/87 is

proportion of seeds which germinate after 28 days immersion. -- & average of current in Atlantic is 33 miles per diem. –

To T. C. Eyton 31 August [1856]

Down Bromley Kent
Aug. 31st

Dear Eyton

I thank you heartily for your note & for your promise of more information on Pigs, about which I am very curious. -- By the way Bechstein asserts that the number of incisors varies greatly in domestic pigs: I am myself going to collect Pigs jaws (no other part) to see whether he is to be trusted. Have you ever noticed this? I shd like to confirm Bechstein on your authority.

One of the subjects which gives me most trouble for my work, is means of distribution in the case of species found on distant islands; I have lately been trying the powers of resistance of seeds to sea-water, -- their powers of floating -- the number of living seeds in earth & mud &c &c. -- Would you render me a little assistance in this line? My walking days are over, never to return. I want to know whether on a wet muddy day, whether birds feet are dirty: I am going to send my servant out with some keeper & he shall wash all the partridges feet & save the dirty water!!

But I want especially to know whether herons or any waders (we have no ponds hereabouts) or water-birds when suddenly sprung have ever dirty feet or beaks? I found in 2 large table-spoon full of mud from a little pond from beneath the water 53 plants germinated. --

Do you know when owl or Hawk eats a little bird, how soon it throws up pellet? Can it throw up pellet whilst on wing? How I shd. like to get a collection of pellets & see whether they contained any seeds capable of germination. Could your gamekeepers find a roosting place, & collect a lot for me? --

Lastly (if you are not sick of my enquiries) have you ever examined the stomachs of dace & other white fish? Do they ever eat seeds; I know it is good to bait a place with grains. For like the house which Jack built, a heron might eat a fish with seed of water plant & then fly to another pond.

Your's most truly | Ch. Darwin

To J. D. Dana 29 September [1856]

Down Bromley Kent
Sept. 29th

My dear Sir

I am working very hard at my subject of the variation & origin of species, & am getting M.S. ready for press, but when I shall publish, Heaven only knows, not I fear for a couple of years but whenever I do the first copy shall be sent to you. -- I have now been for 19 years with this subject before me; but it is too great for me, especially as my memory is not good. I have of late been chiefly at work on domestic animals, & have now got a considerable collection of skeletons: I am surprised how little this subject has been attended to: I find very grave differences in the skeletons for instance of domestic rabbits, which I think have all certainly descended from one parent wild stock. But Pigeons offer the most wonderful case of variation, & as it seems to me conclusive evidence can be offered that they are all descended from *C. livia*.

In the case of Pigeons, we have (& in no other case) we have much *old* literature & the changes in the varieties can be traced. I have now a grand collection of living & dead Pigeons; & I am hand & glove with all sorts of Fanciers, Spital-field weavers & all sorts of odd specimens of the Human species, who fancy Pigeons. -

I know that you are not a believer in the doctrine of single points of creation, in which doctrine I am strongly inclined to believe, from *general* arguments; but when one goes into detail there are certainly **frightful** difficulties. No facts seem to me so difficult as those connected with the dispersal of Land Mollusca. If you ever think of, or hear of, any odd means of dispersal of any organisms I shd. be *infinitely* obliged for any information; as no one subject gives me such trouble as to account for the presence of the same species of terrestrial productions on oceanic islands; for I cannot swallow the prevalent fashion in England of believing that all islands within recent times have been connected with some continent. -

You will be rather indignant at hearing that I am becoming, indeed I shd. say have become, sceptical on the permanent immutability of species: I groan when I make such a confession, for I shall have little sympathy from those, whose sympathy I alone value. -- But anyhow I feel sure that you will give me credit for not having come to so heterodox a conclusion, without much deliberation. How (I think) species become changed I shall explain in my Book, but my views are very different from those of that clever but shallow book, the Vestiges. -

It is my intention to give fully all the facts in favour of the eternal immutability of species & I have taken as much pains to collect them, as I possibly could do. But what my work will turn out, I know not; but I do know that I have worked hard & honestly at my subject.

Agassiz, if he ever honours me by reading my work, will throw a boulder at me, & many others will pelt me; but magna est veritas &c, & those who write against the truth often, I think, do as much service as those who have divined the truth; so that if I am wrong I must comfort myself with this reflection. It may sound presumptuous, but I think I have to a certain extent staggered even Lyell. -

But I am scribbling (in a very bad handwriting moreover) in a shameful manner all about myself, so I will stop with cordial good wishes for yourself & family, & pray believe me, my dear Sir | Your sincere & heterodox friend | Ch. Darwin

To Philip Henry Gosse 27 April [1857]

Moor Park | Farnham | Surrey
April 27th

My dear Sir

I have thought that perhaps in course of summer you would have an opportunity & would be so very kind as to try a *little* experiment for me. -- I think I can tell best what I want, by telling what I have done. The wide distribution of some species of F. Water Molluscs has long been a great perplexity to me: I have just lately hatched a lot & it occurred to me that when first born they might perhaps have not acquired phytophagous habits, & might perhaps like nibbling at a Ducks-foot. -- Whether this is so I do not know, & indeed do not believe it is so, but I found when there were many *very* young Molluscs in a *small* vessel with aquatic plants, amongst which I placed a dried Ducks foot, that the little barely visible shells often crawled over it, & that they *adhered* so firmly that they cd. not be shaken off, & that the foot being kept out of water in a damp atmosphere, the little Molluscs survived well 10, 12 & 15 hours & a *few* even 24 hours. -- And thus, I believe, it must be that Fr. W. shells get from pond to pond & even to islands out at sea. A Heron fishing for instance, & then startled might well on a rainy day carry a young mollusc for a long distance. -

Now you will remember that E. Forbes argues chiefly from the difficulty of imagining how *littoral* sea-molluscs could, cross tracts of open ocean, that islands, such as Madeira must have been joined by continuous land to Europe: which seems to me, for many reasons, very rash reasoning. -- Now what I want to beg of you, is, that you would try an analogous experiment with some sea-molluscs, especially any strictly littoral species, -- hatching them in numbers in a smallish vessel & seeing whether, either *in larval* or *young shell state* they can *adhere* to a birds foot & survive say 10 hours in *damp* atmosphere out of water. It may seem a trifling experiment, but seeing what enormous conclusions poor Forbes drew from his belief that he knew all means of distribution of sea-animals, it seems to me worth trying. -

My health has lately been very indifferent, & I have come here for a fortnight's water-cure. --

I hope you will forgive my troubling you on the above point & believe me, | My dear Sir | Your's very sincerely | Ch. Darwin

P.S. Can you tell me, you who have so watched all sea-creatures, whether male Crustaceans ever fight for the females: is the female sex in the sea, like on the land, "teterrima belli causa"? I beg you not to answer this letter, without you can & will be so kind as to tell about Crustacean Battles, if such there be. --

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