

and there are very few corporations who would be willing to maintain a large, fully equipped research laboratory of the type discussed, although a few such laboratories are well known to be in existence, but British industry has been brought very much together during the past eighteen months and the organization of industry is already a familiar phrase. Why, then, should England not establish a National Industrial Research Laboratory to assist all British manufacturers and to develop the theory underlying the great fundamental industries on which British work depends? Such a laboratory could take the theory from the universities, or where the theory was lacking, develop it and apply it to the separate industries, working out the results on a semi-manufacturing scale and finally passing it on to the manufacturer. It may be of interest to glance at the possible size and scope of such an organization and I have attempted to formulate a scheme which will represent the minimum which would be required.

A laboratory on the smallest scale adequate to British industry would, at the beginning, require a staff of about two thousand men, one thousand of them scientifically trained and the other thousand assistants and workmen. It should have about three or four hundred men of the rank of professor or assistant professor in the universities or of works manager or assistant manager or chief chemist in the factory. It would require land and buildings costing about \$3,000,000 and its annual upkeep with allowance for expansion would be about \$4,000,000.

Vast as these figures are, they are infinitesimal compared with the value of the industries whom they would serve. They represent a charge of less than one per cent. and probably not more than one fifth per cent. of the net profits of British industry;

moreover, after the initial period has been paid for such a laboratory might be self-supporting and might, indeed, finally, make a very handsome profit on the original investment.

Suppose that such a laboratory patented all inventions and licensed manufacturers to use them, then, it is not too much to expect that after the first five or six years it would be paying for itself, and that five years later it would be able to establish a great many subsidiary institutions from its profits; at any rate, such a vast laboratory would produce far more results at lower cost than would result from any other expenditure of a comparable sum of money on industrial research by the British industries.

I believe, however, that within the lifetime of most, if not all, of us we shall see such extensions of industrial research as will make all that we now have in mind seem insignificant, and it is because I believe so strongly in the importance of the subject that I have endeavored to collect some impressions on the subject and to present them in this paper.

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BENJAMIN FRANKLIN AND ERASMUS DARWIN: WITH SOME UNPUB- LISHED CORRESPONDENCE¹

It is not generally known that Benjamin Franklin and Erasmus Darwin were correspondents and personal friends. They first met, as far as can be learned, some time during Franklin's second mission to England, between 1764 and 1775, and, attracted to each other by their common scientific interests, a

¹ I wish to acknowledge my deep thanks to Mr. I. Minis Hays, secretary of the American Philosophical Society, for his kind permission to transcribe and publish the correspondence here given.

friendship grew up between them which lasted to the end of Franklin's life. This friendship, after the fashion of the time, found expression chiefly in long letters discussing the scientific views and questions of the day, often accompanied by their own observations or reflections. Darwin, who it should be remembered was Franklin's junior by twenty-five years, was plainly proud of the regard of his famous contemporary, and this feeling is unmistakably reflected in his letters.

In the wonderful collection of *Frankliniana*² in the library of the American Philosophical Society in Philadelphia, there are three autograph letters from Darwin to Franklin, two of them still unpublished. These letters are of great interest for the glimpse they afford into the thoughts and hopes and problems that occupied two such lights of science as these men in the latter half of the eighteenth century.

The earliest of the three letters, and one of the two still unpublished, is dated Lichfield, July 18, [17]72, and is addressed: "Dr. Benjamin Franklin, Craven Street, London." It is remarkable chiefly for one sentence near the end, which contains the amazing information that even as far back as that, someone was puzzling over the idea of making a phonograph. "I have heard," writes Dr. Darwin, "of somebody that attempted to make a speaking machine, pray was there any Truth in any such Reports?"

The rest of the letter is not especially important, and is only interesting as showing the diversity of subjects discussed. Darwin first describes an experiment he performed with "unmix'd air, that rose from the muddy bottom" of a pond, and of which he took home a sample in a bladder and tested it with a lighted candle to see if it would catch fire; which it did not. Then he goes on to say.

I shall be glad at your Leisure of any observations on the Alphabet, & particularly on the num-

² The collection contains 16,678 pieces, or 78 per cent. of all the Franklin papers extant. See preface to "Calendar of the Papers of Benjamin Franklin in the Library of the American Philosophical Society," edited by I. Minis Hays. Philadelphia, 1908.

ber and Formation of vowels, as these are more intricate, than the other Letters.

He then devotes several paragraphs to a discussion of consonant sounds in various dialects as among the Welsh, Northumberland people and others. The letter closes as follows:

I am Sr. with all Respect your obliged & obedt.
Servant

E. DARWIN

Lichfield, Staffordshire.

I would return you Dr. Priestley's Pamphlet by the Coach but I suppose it is to be purchased at the Booksellers. My friend Mr. Day who saw you at Lichfield intends himself the Pleasure calling of you in London.

A second letter in the collection is a one-page quarto from Darwin to Franklin, dated Lichfield, Jan. 24, 1774. This is the most valuable of all the Darwin-Franklin correspondence extant; it shows Franklin's close relation to the Royal Society of London and also that he read papers before that body for up-country friends. This letter has already been published,³ but as it has such great general interest, and is so short, it seems worthy of being made more widely known.

Dear Sir,

I have inclosed a medico-philosophical paper which I should take it as a Favour if you will communicate to the royal Society, if you think it worthy a place in their Volume, otherwise must desire you to return it to the Writer.

I have another very curious paper containing Experiments on the Colours seen in the closed Eye after having gazed some time on luminous objects, which is not quite transcribed, but which I will also send you, if you think it is likely to be acceptable to the Society at this Time, but will otherwise let it lie by me another year. I hope you continue to enjoy [. . . torn . . .] Health & that I shall sometime again have the pleasure of seeing you in Staffordshire, & am, dear Sr.

Your affectionate Friend,

ERAS. DARWIN

N. B. If Dr. Franklin is not in England, I hope the person intrusted to read his letters will return the inclosed papers to Dr. Darwin at Lichfield,

³ Jared Sparks' edition of the works of Benjamin Franklin, Vol. VI., page 410, where it is printed with some slight errors in transcription.

Staffordshire, which will be gratefully acknowledged.

The last letter in the collection, also unpublished, is a three-page quarto dated Derby, May 29, 1787. It is addressed simply: "Dr. Franklin, America," and opens in the grandiloquent style of the time, as follows:

Dear Sir,

Whilst I am writing to a Philosopher & a Friend, I can scarcely forget that I am also writing to the greatest Statesman of the present, or perhaps of any century. . . .

I can with difficulty descend to plain prose after these sublime ideas, to thank you for your kindness to my son Robt. Darwin⁴ in France, & to converse with you about what may arise in philosophy, which I know will make the most agreeable part of my letter to you.

Then he speaks at length of some electrical experiments performed by a Mr. Bennet, "a Curate in my neighbourhood," who "has found out a method of doubling the smallest conceivable quantity of either plus or minus electricity, till it becomes perceptible to a common electrometer, or increases to a spark."

The end of the letter is interesting and worth quoting in full since it gives the history of the first translation of Linnæus's botanical writings into English.

In respect to other philosophical news, I have just heard from Mr. Wedgewood that Mr. Herschel has discover'd 3 Volcanoes in the Moon now burning.

Since I had the pleasure of seeing you, I have removed from Lichfield to Derby & have superintended a publication of a translation of the botanical works of Linnæus, viz. *The System of Vegetables* in two volumes 8vo. & the *Genera or Families of Plants* in 2 vol, 8vo. also.—I did this with design to propogate the knowledge of Botany. They are sold to the booksellers at 14/ the *System of Vegetables*—the *Genera* will be finished in a month, & will be sold to the booksellers at 12/ I believe,—but as we are to pay for advertizing & carriage, I expect we shall not clear more than 10/ on each set. If the work had been finished I should have sent you it by the favor of Mr. Nichlin, who is so kind as to take the care of this letter. If I thought 20 sets of each were likely

to be sold I would send them at 10/ a set of each, that is 20/ for the four volumes. And indeed would now have sent them by Mr. Nichlin, had the whole been ready, as I think they would not be worth reprinting in America, & perhaps 20 sets would be as many as could find purchasers.

A Line from you at your leizure, only to acquaint me that you continue to possess a tolerable share of health would be very acceptable to, dear Sr. with true esteem

Your most obed. ser.

E. DARWIN

L. HUSSAKOF

AMERICAN MUSEUM OF NATURAL HISTORY

SVEN MAGNUS GRONBERGER

SVEN MAGNUS GRONBERGER, of the library staff of the Smithsonian Institution, died at Georgetown University Hospital, Washington, on April 24, after an illness of about three weeks. He leaves two older brothers and a nephew, resident in Stockholm, Sweden; his estate he bequeathed to this nephew.

Mr. Gronberger, who was a native of Sweden, born August 19, 1866, was graduated in 1884 from the gymnasium of Norrköping, an historic old city on the Baltic about seventy-five miles south of Stockholm. In 1886, after visiting France and England, he went to New York City, where he studied law and in 1907 came to Washington. As a student of natural science he was preparing for the degree of Doctor of Philosophy at George Washington University, with topics zoology and geology, in which subjects he had published several papers, and articles in *Forest and Stream*. He was an accomplished linguist, knowing perfectly French (which was his home language as a member of the nobility of Sweden, his mother being a countess) and the Scandinavian tongues, including some Icelandic, and being versed also in English, German, Italian and other European languages and literatures, besides Latin and Greek. For a number of years Mr. Gronberger made a special study of zoological parks as factors in the popularization of natural science, especially in connection with the Bronx Zoological Park of New York and the National Zoological Park at Washington. He was a member of the Biological

⁴ The father of Charles Darwin.