

THE ROYAL SOCIETY MOND LABORATORY  
UNIVERSITY OF CAMBRIDGE

Tel. 1655

Free School Lane  
Cambridge

Our Ref.  
JC/AY

22nd January, 1936.

Dear Szilard,

Would you be able to come and talk  
to the Kapitza Club on some Tuesday in the near  
future on your Slow Neutron work ?

I am,

Yours sincerely,

J Bockliff

Dr Szilard,  
Clarendon Laboratory,  
OXFORD.

c/o Clarendon Laboratory,  
Parks Road,  
Oxford.

1st April, 1936.

Dear ~~Mr.~~ Cockroft,

~~May I ask your opinion in the following matter?~~

*Some two years ago*

~~Between March and September 1934 I applied for certain~~

patents and a patent has now been granted which claims the production of radio-active bodies by neutrons (Fermi's subsequent discovery) and the chemical concentration of the radio-active elements by the method of isotopic separation. It is not customary to patent scientific

discoveries and still less is it customary to patent future scientific discoveries of others. Being well aware of this, I still applied for

~~these patents, for the following reason: It seemed to me that we~~

*two years ago*  
have arrived in nuclear physics at a juncture for which there is no parallel in the past; I thought that <sup>discoveries of far-reaching</sup> importance <sup>might be</sup> are imminent and <sup>ought to be</sup> ~~that~~ some disinterested attempt <sup>ought to</sup> be made <sup>on the part of those</sup> by those who are responsible for these discoveries, to exercise some measure of control over their proper use.

Having discussed this matter with a few other physicists,

*in the circumstances, I felt*  
I made up my mind to act ~~as~~ a self-appointed trustee for a short time,

*a* ~~the~~ period of *between March & September 1934*  
~~and to take out - during~~ enforced leisure - ~~some patents which~~  
*with a view of handling as their own*  
~~obviously~~ ~~should~~ have to be considered public property.

*and to take out some patents*  
Now, however, since a patent has been accepted, it would

*hardly*  
not be right for me to take further decisions about it. It is now

for those whose work and discoveries this patent presupposes, i.e.

primarily Chadwick, you and Fermi, to decide to what use this patent

should be put, whether it should be withdrawn or whether it should

be used in some form for the promotion of industrial development

and further scientific research.

The purpose of this letter is to ask you to form, if possible, an opinion of your own on this issue. I am putting the

*are*  
~~the~~ *responsibility for the patent*

*are*  
*responsibility*  
*for the patent*

same question to Fermi.

I have some hesitation about raising the matter, because I do not know whether it is sufficiently important to trouble either you or others with it. However, I now have no choice left, since already some interest seems to have been awakened towards this patent and I may be faced at any moment with the necessity of taking a decision about it, which I do not feel entitled to make without being authorised in each case where such a decision is required.

Moreover, we should not entirely disregard the possibility of far-reaching developments in the near future. I have made some observations ( the publication of which does not at present seem to be warranted), which make it advisable to envisage the possibility of such a development, though no definite conclusion can as yet be drawn from them. My interpretation of these unpublished observations may be entirely wrong, but it is responsible for keeping up my interest in the possibility of attempting to exercise some control over the use of such discoveries through disinterested scientists. Perhaps it would be advisable for us to talk about these experiments and I should be very pleased to do so at any time which is convenient to you.

I understand that some of the Italian physicists have also taken out certain patents about the Fermi effect and I have in my correspondence with them attempted to suggest one way in which such patents could be used if a decision is reached that we should continue to maintain such patents. You will see this from the enclosed copy of my letter addressed to Segrè.

As long as the importance of practical applications of nuclear physics is doubtful, we need not tie ourselves down to any particular solution. If the view is taken that patents should be maintained, but that the time is not yet ripe for any further action, I should be pleased if I could submit in the meantime all issues on which a decision is required to you and Fermi, if both of you would be willing jointly to take the responsibility for such decisions.

It would seem that if a consensus of opinion can be reached in this matter, Rutherford ought to be consulted before a definite attitude is decided upon.

I am enclosing a booklet on the Research Corporation which might interest you. I do not think that the particular way in which they mix business and the advancement of science is a happy one, but I was interested to note that such a Corporation exists and to learn in what way it came into existence. Would you kindly return the booklet to me when you no longer need it ?

Yours sincerely,

(LEO SZILARD)

e/o Clarendon Laboratory,  
Parks Road,  
Oxford.

21st May, 1936.

Dear Dr. Cockroft,

Please forgive me for still being unable to talk about slow neutrons or any other similar subject in public (Kapitza Club). There are, however, some unpublished observations which I made in January and which I should very much like to discuss with you, Dee and Oliphant. They may or may not have a direct bearing on another matter on which I should like to have your advice. This concerns patents for the production of artificial radio-active elements for which I applied during a period of enforced leisure between March and September 1934.

I did not ever consider these patents as my property and the question now arises what to do with them. It is hardly for me to decide whether the patents should be withdrawn or maintained and in what form and by whom they should be administered. Though I should be glad to emphasise a definite point of view in this connection, it would seem that apart from Rutherford, it is for men like you, Chadwick, Joliot and Fermi to decide these questions, if the matter appears to be sufficiently important to deserve some attention.

Perhaps it is possible to envisage a proper form for a disinterested control of such patents. It would not seem right to me that physicists who take out such patents should derive financial or other privileges from them and if no disinterested form of control can be found, I personally would rather withdraw those patents which I have taken out. I am enclosing a booklet on the American Research Corporation which might interest you, though I do not believe that their example should be imitated.

Some two years ago I had a detailed conversation about these patents with Oliphant. I went to see him about them soon after Fermi's first discovery and I attempted to point out to him why I thought the existence of such patents might be useful. It seemed at the time that the possibility of an important industrial development hinges on the possibility of setting up enormously efficient sources of neutrons and that this possibility in its turn hinges on the question of the existence of a heavy isotope of the neutron.

If such multiple neutrons exist, we may envisage the remote possibility of an industrial revolution in the not too distant future. In that case patents might be used by scientists in a disinterested attempt to exercise some measure of influence over a socially dangerous development.

On the other hand, if no heavy neutron isotope exists, it would seem that an industrial development based on the application of nuclear physics must necessarily be very limited and there is no real need for any physicist to concern himself with such patents. The only use to which such patents could <sup>then</sup> be put, is towards obtaining funds for research purposes from persons interested in the promotion of industrial development. I personally felt inclined to think that good use could be made of such funds if they were forthcoming, especially in universities which are less well off than Cambridge or Oxford.

In these circumstances it appeared useful to apply for patents along two lines, i.e. the production of radio-active elements by neutrons and the construction of abundant sources of neutrons which is based on

the hypothetical existence of multiple neutrons. Since we do not know at present whether such multiple neutrons exist and can be used for setting up abundant sources of neutrons, references to multiple neutrons in patents are either misleading or dangerous and accordingly care has been taken that patents which contain such references should not be published.

When I applied for the first patents in March 1934, I had an unclear idea that all these patents might be assigned to the Cavendish or some similar institution. After Fermi's discoveries and my conversations with Oliphant, I realised that this would not be feasible and made an attempt to assign all the patents to a Government Department. In this I was not entirely successful; while one patent has been assigned in this way and remains unpublished, another patent, relating to the Fermi effect, could not be assigned and has been published.

Some observations which I have so far not published may have a bearing on the question of the multiple neutrons. These observations may allow of more than one interpretation. However, the only interpretation which satisfies my desire for simplicity involves a heavy isotope of the neutron of mass number 4. You will perhaps take an altogether different view of these experiments, but I feel that I have no choice but to find out the more direct methods of observation, whether ~~such~~ or not such a particle is involved in my experiments. A number of more direct experiments suggest themselves and about these I should very much like to have your advice.

It is fairly obvious that if such a particle exists, its mass exceeds 4.014. This again has rather obvious implications. One of them is rather frightening; and I felt it might be better not to publish anything on such a dangerous subject. It is quite likely that I am taking a rather exaggerated view of these things.

I may be in Cambridge in the beginning of next week and I shall then try to get hold of you and Dee. If I should not turn up, could you possibly let me know if you will be about during the second half of the week?

Would you be kind enough to pass on this letter to Dee?

With best wishes,

Yours sincerely,

P.S. I am sending a copy of this letter to Oliphant. Another copy is being sent to Rutherford, to whom so far I made only a passing remark about having taken out certain patents, when I had a short interview with him two years ago.

c/o Clarendon Laboratory,  
Parks Road,  
Oxford.

21st May, 1936.

Sir,

You might perhaps remember that I mentioned to you some two years ago patents for which I had applied in March 1934. One such patent has now been granted on the principle of production of artificial radio-active elements by neutrons and the question arises to what use such patents ought to be put.

I cannot consider patents relating to nuclear physics as my property in any sense whatever. It would seem that if such patents are important, they ought to be administered in a disinterested way by some disinterested persons. It is, however, hardly for me to take any decisions about the patents which I have taken out in the capacity of a sort of self-appointed trustee, and apart from yourself, one could perhaps think of Chadwick, Cockroft, Joliot and Fermi as being the proper persons to say whether these patents should be withdrawn or maintained and in what way and by whom they should be administered, if they are maintained.

About two years ago I attempted to point out to Oliphant in greater detail why I thought that the existence of such patents might be useful. I am referring to this in the enclosed copy of a letter addressed to Dr. Cockroft, which I am sending you in case you should care to have more detailed information.

If I were convinced that industrial applications of great importance were imminent, I should not hesitate to ask you to give your attention to the matter at this juncture. This not being so, I shall merely ask Cockroft to inform you about all this if he thinks it necessary or, alternatively, I shall of course be at your disposal at any time you should think the matter sufficiently important to give some of your attention to it. I hope to be able to get Cockroft's advice next week and to discuss with him and Dee some unpublished observations which may or may not have a direct bearing on these matters.

Yours very truly,

(Leo Szilard)

x  
c/o Clarendon Laboratory,  
Parks Road,  
Oxford.

27th May, 1936.

Dear Dr. Cockroft,

Please forgive me for being unable to talk about slow neutrons or any other similar subject in public (Kapitza Club) this term. There are, however, some unpublished observations which I made in January and which I should very much like to discuss with you. They may or may not have a direct bearing on another matter on which I should like to have your advice. This concerns patents for the production of artificial radio-active elements for which I applied during a period of enforced leisure between March and September 1934.

I am enclosing a copy of a letter which I have sent to Lord Rutherford for your information and I should like to add the following:-

It would not seem right to me that physicists who take out such patents should derive financial or other privileges from them and some form of disinterested control ought to be found, if industrial applications are considered to be of some importance. I am enclosing a booklet on the American Research Corporation which might interest you in this connection, although I do not believe that their example ought to be too closely imitated.

When I applied for the first patent in March 1934, I somewhat foolishly thought such patents might simply be assigned to the Cavendish. After Fermi's first discovery, I went to see Dr. Oliphant and explained to him my reasons for thinking that the existence of such patents might be useful, if they are controlled by the proper persons. (Subsequently the patent relating to Fermi's discovery has, along with others, been offered to a Government Department; although it was made clear that the question of a financial compensation does not arise in any way, this particular patent has not been accepted and has been published under my name). I also told Dr. Oliphant that in my personal opinion the possibility of an important industrial development depends on the possibility of setting up enormously efficient sources of neutrons and that this possibility in its turn depends on the question of the existence of a heavy isotope of the neutron.

If such multiple neutrons exist, we may envisage, if we wish to do so, the theoretical possibility of an industrial revolution in a not too distant future. In that case patents might be used by scientists in a disinterested attempt to exercise some measure of influence over a politically dangerous development.

On the other hand, if no heavy neutron isotope exists, it would seem that an industrial development based on the application of nuclear physics must necessarily be very limited and there is no real need for any physicist to concern himself with such patents. The only use to which such patents could then be put, is towards obtaining funds for research purposes from persons interested in the promotion of industrial development. I personally felt inclined to think that good use could be made of such funds if they were forthcoming.



I should very much like to have your opinion whether you think that some form of disinterested control of such patents can be found, since if this does not appear to be feasible, I personally should like to withdraw those patents which I have taken out.

In spite of the uncertainty of the assumption that a heavy neutron isotope is involved in my experiments, I have no choice but to try to investigate the matter by more direct methods of observation. I am not certain that the Wilson Cloud Chamber is the most suitable instrument in this case and I should very much like to have Dee's opinion on this question. Would you be kind enough to pass this letter with the enclosure on to him? I may be in Cambridge on Saturday and Monday morning. Could you let me know if you will be about on one of these days? I should then also attempt to get hold of Dee, if he happens to be free.

With best wishes,

Yours sincerely,

(Leo Szilard)

Encl.

CLASS OF SERVICE DESIRED	
DOMESTIC	CABLE
TELEGRAM	FULL RATE
DAY LETTER	DEFERRED <b>X</b>
NIGHT MESSAGE	NIGHT LETTER
NIGHT LETTER	SHIP RADIOGRAM

Patrons should check class of service desired; otherwise message will be transmitted as a full-rate communication.

# COPY OF WESTERN UNION TELEGRAM

Received 3:20 P. M.  
March 23, 1939

PEGRAM

*Joliet*  
~~Boillio~~ measured neutron production by Amaldi Fermi method using ammonium nitrate and uranyl nitrate solutions. Evidence of neutron production from increase of area under curve cross section greater than six ten minus twenty five. Conclude more than one neutron provided for each neutron absorbed.

Cockcroft

COPIED FROM ORIGINAL  
IN THIS COLLECTION

CLASS OF SERVICE DESIRED	
DOMESTIC	CABLE
TELEGRAM	FULL RATE
DAY LETTER	DEFERRED <b>X</b>
NIGHT MESSAGE	NIGHT LETTER
NIGHT LETTER	SHIP RADIOGRAM

Patrons should check class of service desired; otherwise message will be transmitted as a full-rate communication.

# COPY OF WESTERN UNION TELEGRAM

Received 3:20 P. M.  
March 23, 1939

PEGRAM

*Joliet*  
~~Boillio~~ measured neutron production by Amaldi Fermi method using ammonium nitrate and uranyl nitrate solutions. Evidence of neutron production from increase of area under curve cross section greater than six ten minus twenty five. Conclude more than one neutron provided for each neutron absorbed.

Cockcroft

THE ROYAL SOCIETY MOND LABORATORY  
UNIVERSITY OF CAMBRIDGE

Tel. 4655

Free School Lane  
Cambridge

15th April, 1940.

Prof. E. P. Wigner,  
University of Princeton,  
New Jersey,  
U.S.A.

Dear Wigner,

Dirac has given me your message about uranium. Up to the present I have felt that it is very unlikely that anything useable can come out of this in the next few years. However, under present circumstances we cannot afford to take any chances and I should be very grateful to receive privately any information as to any work going on in the United States.

Yours sincerely,

J. D. Bockalf

1155 East 57th Street  
Chicago 37, Illinois  
March 22, 1949.

Sir John Cockroft  
Atomic Energy Research Establishment  
Harwell  
England.

Dear Cockroft,

I expect to be in England in the second half of June - my first visit since the War - and I hope to see you at that time. My reason for writing you today you will see from the enclosed copy of a letter addressed to a friend of mine, Mr. George Meier. I wonder, if he should get in touch with you, whether you could advise Mr. Meier what the proper steps would be for him to take on my behalf.

I know, of course, that there was legislation in England on this subject but having had enough trouble with similar legislation in the United States, I did not have enough curiosity left over to keep myself fully informed. In any case, you are in a much better position to know both what is legally possible and what would be proper for Mr. Meier to do on my behalf.

With best wishes,

Yours sincerely

Leo Szilard

Telegraphic Address :  
"DEPATEN, ABINGDON."



ATOMIC ENERGY RESEARCH  
ESTABLISHMENT,  
HARWELL,  
DIDCOT,  
BERKS.

Our refL 11/1/10/1

5th April, 1949.

Dear Szillard,

Thank you for your letter of 22nd March. I will pass this on to Mr. M. W. Perrin of the Ministry of Supply, who is responsible for patent matters.

I shall look forward to seeing you in the second half of June.

Yours sincerely,

*J. D. Cockcroft*

J. D. Cockcroft

Professor Leo Szillard,  
The University of Chicago,  
1155 East 57th Street,  
Chicago 37, Illinois,  
U.S.A.