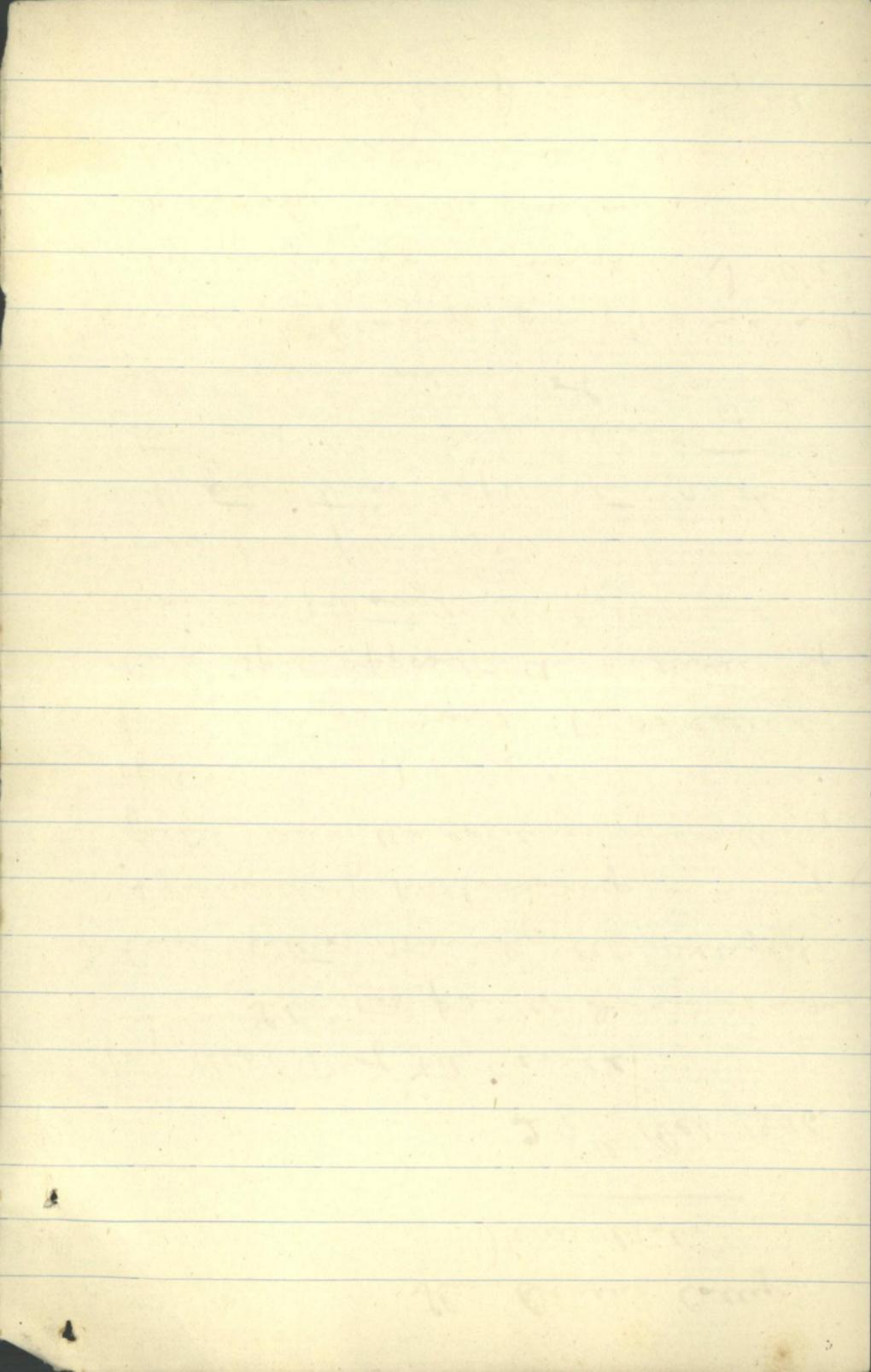


The Owens College
Manchester

15/73 29th Oct 1896.

My dear Prof Tily-Gerrard.

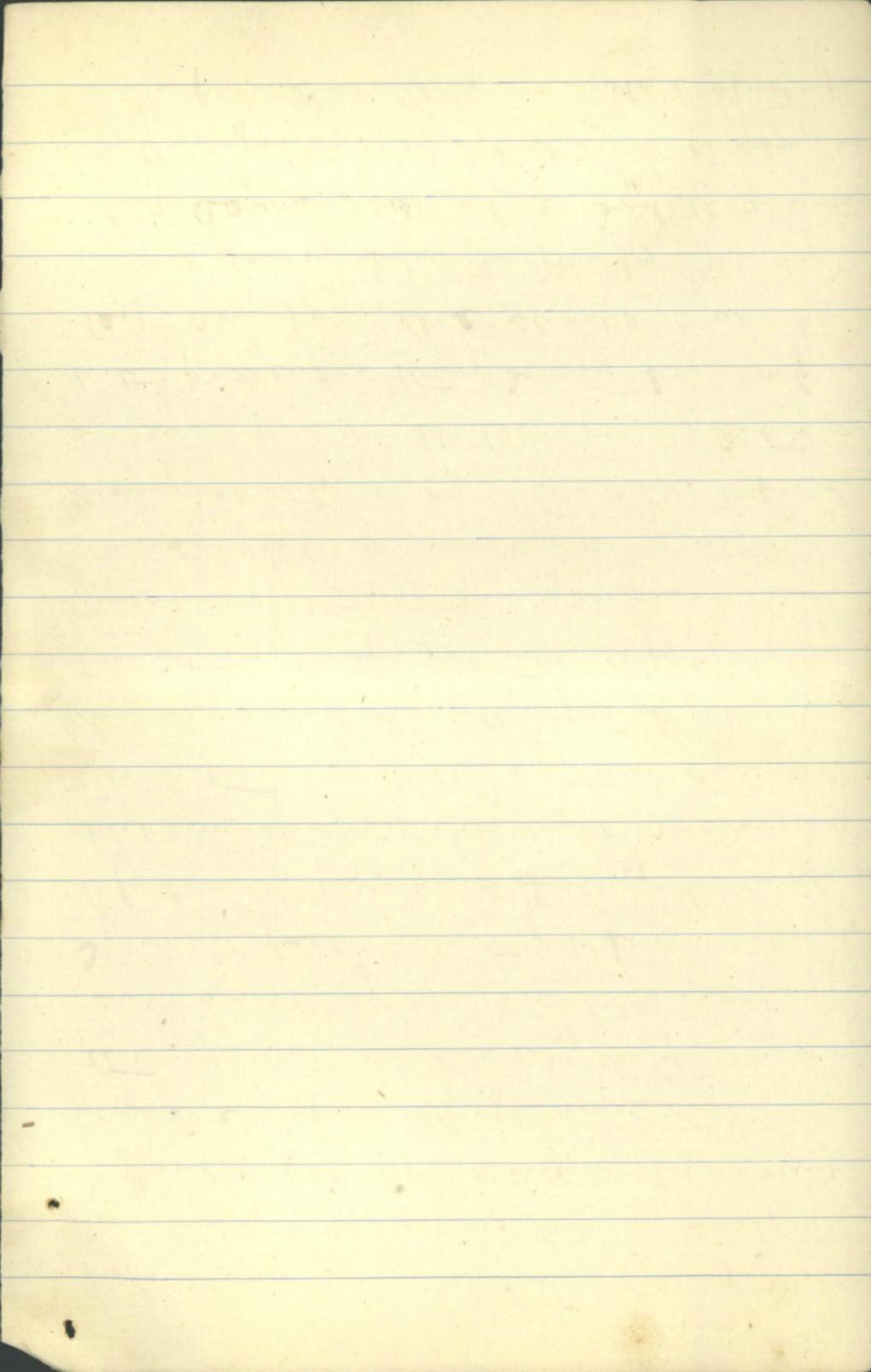
The two points I raised in my last letter, namely, the alleged specimen of Kalliope rays in a magnetic field, and the existence of something of the nature of a spectrum in the form of rings round the so called dark spot opposite the Kalliope, appear to me to be (though the latter is not new & the former ^{still} remains to be verified) whatever their explanation might turn out to be, very interesting phenomena & seem to have an immediate bearing upon phenomena of luminescence in general. I did not enter into the question, in my letter of the 23rd, in such a manner as to make what I was driving at



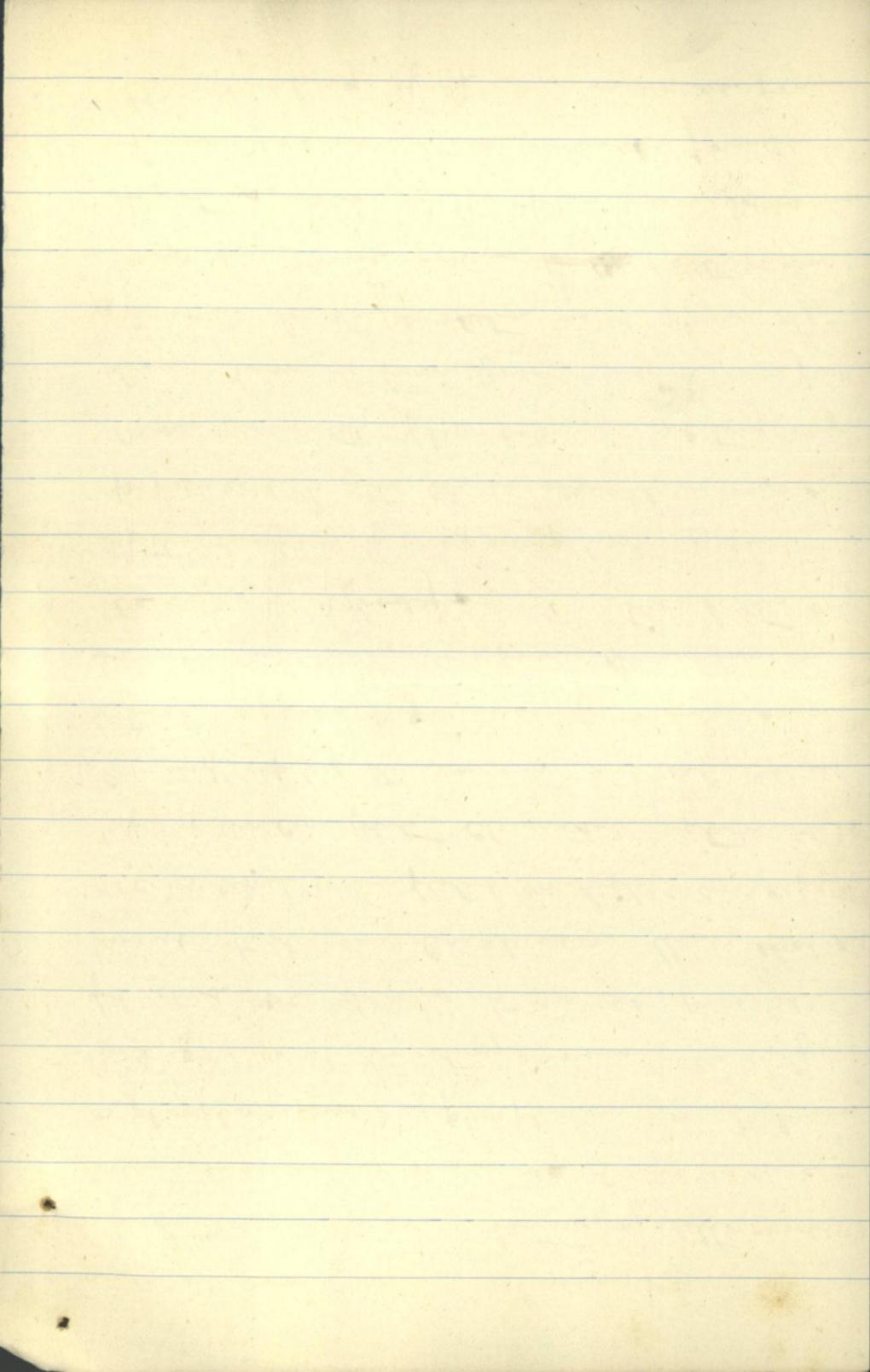
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2.

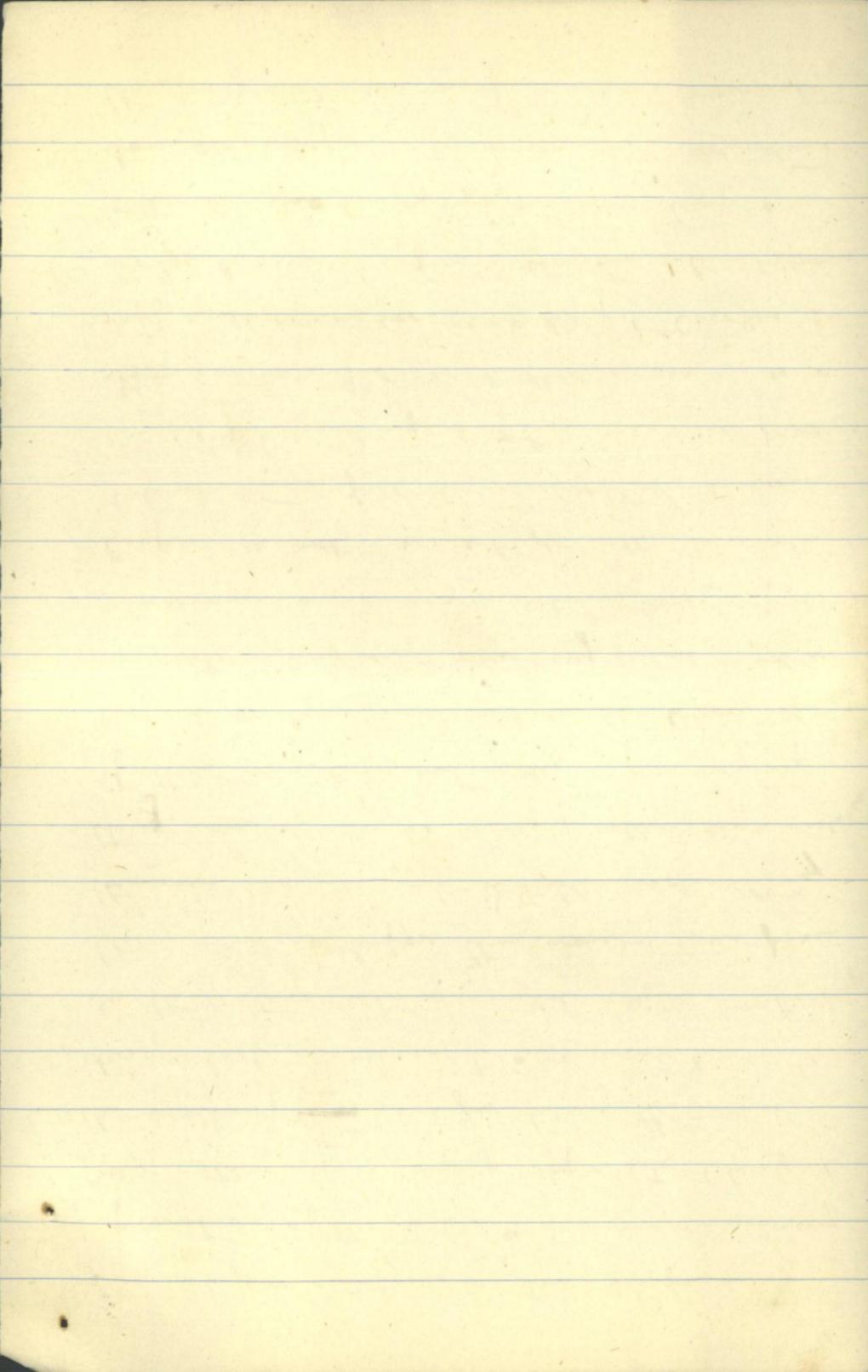
quite clear. I have been for some time trying to collect as many facts as I could get at whether old or new provided apparently genuine, and bring them under one heading by finding out something common to them all, I mean facts relating to luminescence. Of course any views I may have about such matters are I admit necessarily circumstantial as I think they can only be regarded as attempts to get at something by perpetually applying as much as I may come across to the one subject - I am working at, and seeing whether ^{they} it - can be made to fit in by every possible stretch of imagination, with ^{the} particular theory I may have on hand best - somebody else should arrive at a satisfactory solution of the problem by that course, well - which I shall abandon in the light of your criticism as soon as it - is proved wanting and ^{then} start afresh upon



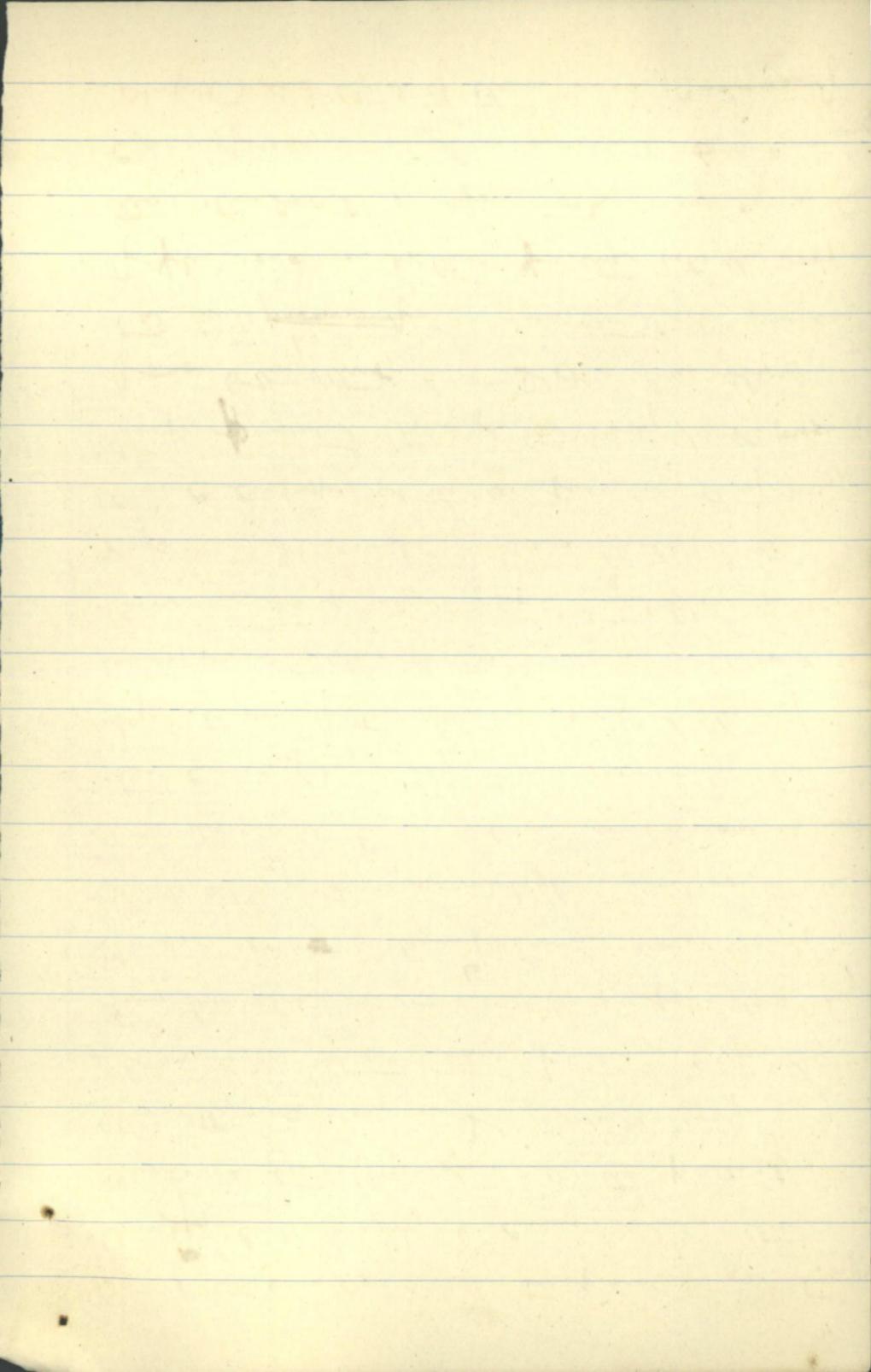
A new basis. 15(73) Every phenomenon
of luminescence whether of ultraviolet-
luminescence or cathode luminescence,
or phosphorescence of phosphorous, or the luminescence
of sugar or of bursting vacuum bulbs or of
flames &c seems to me at present to
point to the one conclusion, that electrical
oscillations manifested as light can kept
up by incomplete chemical action which
are set up by the various indirect causes
which appear to give rise to luminescence.
Sometimes at the surface, sometimes in
the interior of bodies. The latter being
of the nature of temporary catastrophes
produced by the chemically active rays or
more accurately fluorescence exciting rays
and which in turn give rise to new few
periods by the evolution, as it were, of
new atomic systems ~~little~~ ^{little} earth moon
systems. As to the phenomena of surface
luminescence it is probably formed by
the discharge of a condenser formed



light layers of atoms at the surface of
luminous separation of the solid & the surrounding
gas; the atoms being oppositely charged,
but the signs of ^{these} charges being the reverse to
those which conduct to chemical combination
so that these atoms would have to interchange
their charges before this would take place
^{and} according to J D Thomson's theory
they would do so under certain circumstances
if they were connected by a conducting
circuit or by a third substance whose specific
inductive capacity was very great. The
interchange would occur when rays of light
comparable ~~with~~ in wave length with the distance
between them fell on them, other conditions
would be discharged & luminescence produced.
The question of Kathode Annihilation is a
difficult one, for according to Crookes a
body like ruby for instance, when exposed
to the Kathode rays (^{every part of it}) becomes in turn a
source of light. Now if I understand
the projectile theory of Kathode rays right



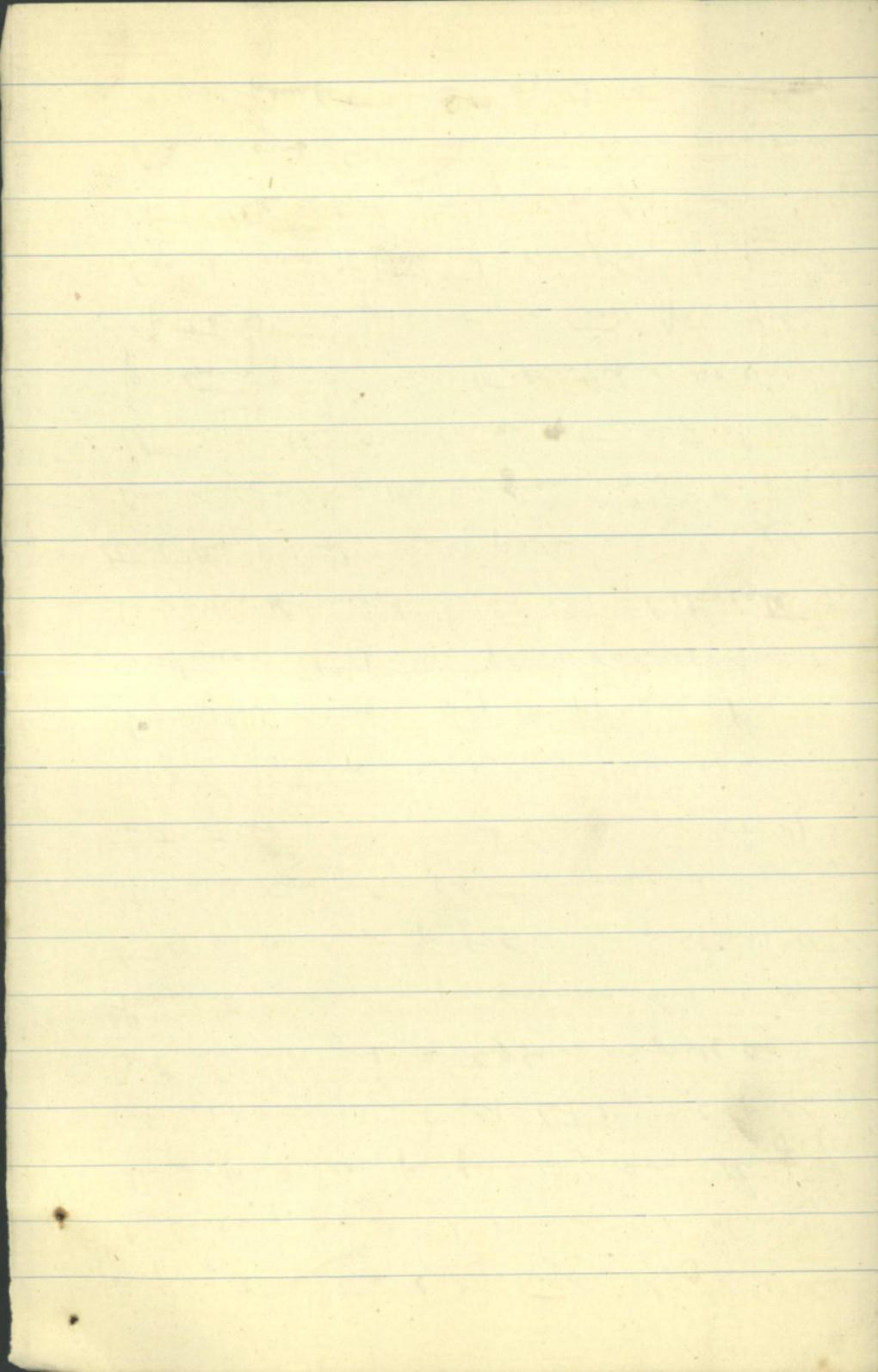
the particles are not supposed to go through
a body but merely to communicate their
momenta through it - to the particles on
the other side. It is not yet very
clear to me that these particles can by
their bombardment at the surface of a body
cause it - ^{in turn} ~~to become~~ an intensely
radiating source of light - unless it were
made red hot which we know is not
the case generally. And moreover the
spectrum of the luminescent light - if the
internal structure of the body is unaltered is
the same as if acted upon by ultra-violet
rays. It might be said that whatever
these catastrophes at the surface are, they may
be propagated through the body by the proximity
of one to the other, but - It has been shown
that there ^{is now} ~~process~~ evidence that the process
of fluorescence extends further into the body
than the exciting rays, which may in the
case of uranium glass penetrate to a consider-
able depth. So that if there is a means of



15/73

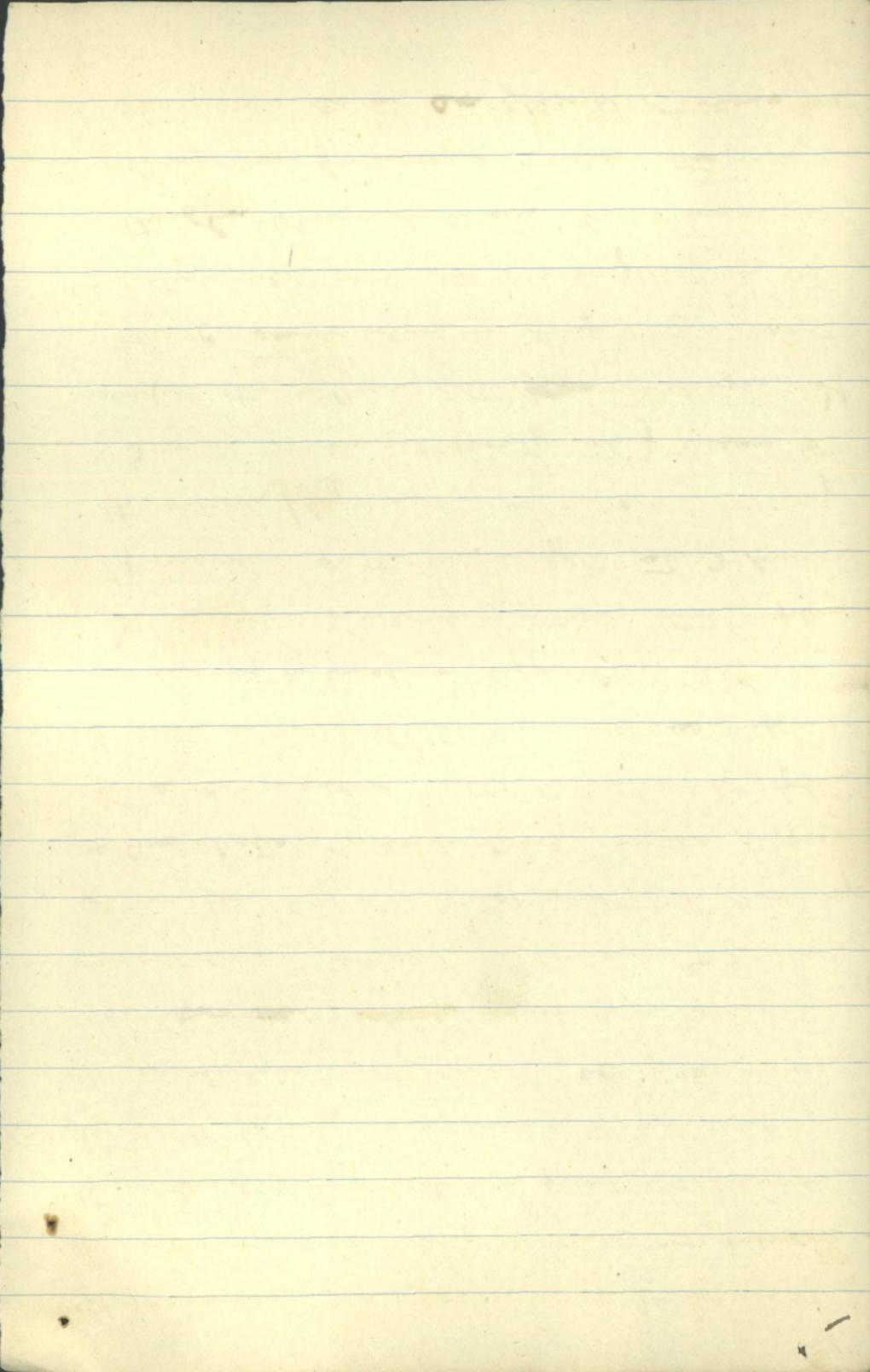
propagating the catastrophes beyond the disturbing points - it must be due to those particles performing something of which ordinary light - totally incapable. I am not yet satisfied myself as to how this may be performed, but it seems to be a matter of great importance that the question should be answered one way or the other.

I have a lot of vague notions as to how this may be brought about by supposing for instance that the fluorescent substance behaves somewhat as an electrolyte, so that the interchange of partners on the film condenser along the surface would be propagated through the substance after interchange of partners giving rise to electrical oscillations of the same period as those of the film condenser. & thus it might be possible that the whole body would become self-luminous. but this idea will require further development. It might be on ~~similar~~ ^{similar}.



that German glass which is a bad insulator is more transparent to the Kaltwasser rays than than lead glass which is a good insulator, so that the transparency would depend upon the "electrolytic conductivity" ~~of the substance~~ not ~~upwards~~ ordinary conductivity, because according to Lenard Aluminium & German glass are equally transparent to Kaltwasser rays & this "electrolytic conductivity" would appear to be connected with the density of the substance. Then one obvious difficulty in the way of such an hypothesis.

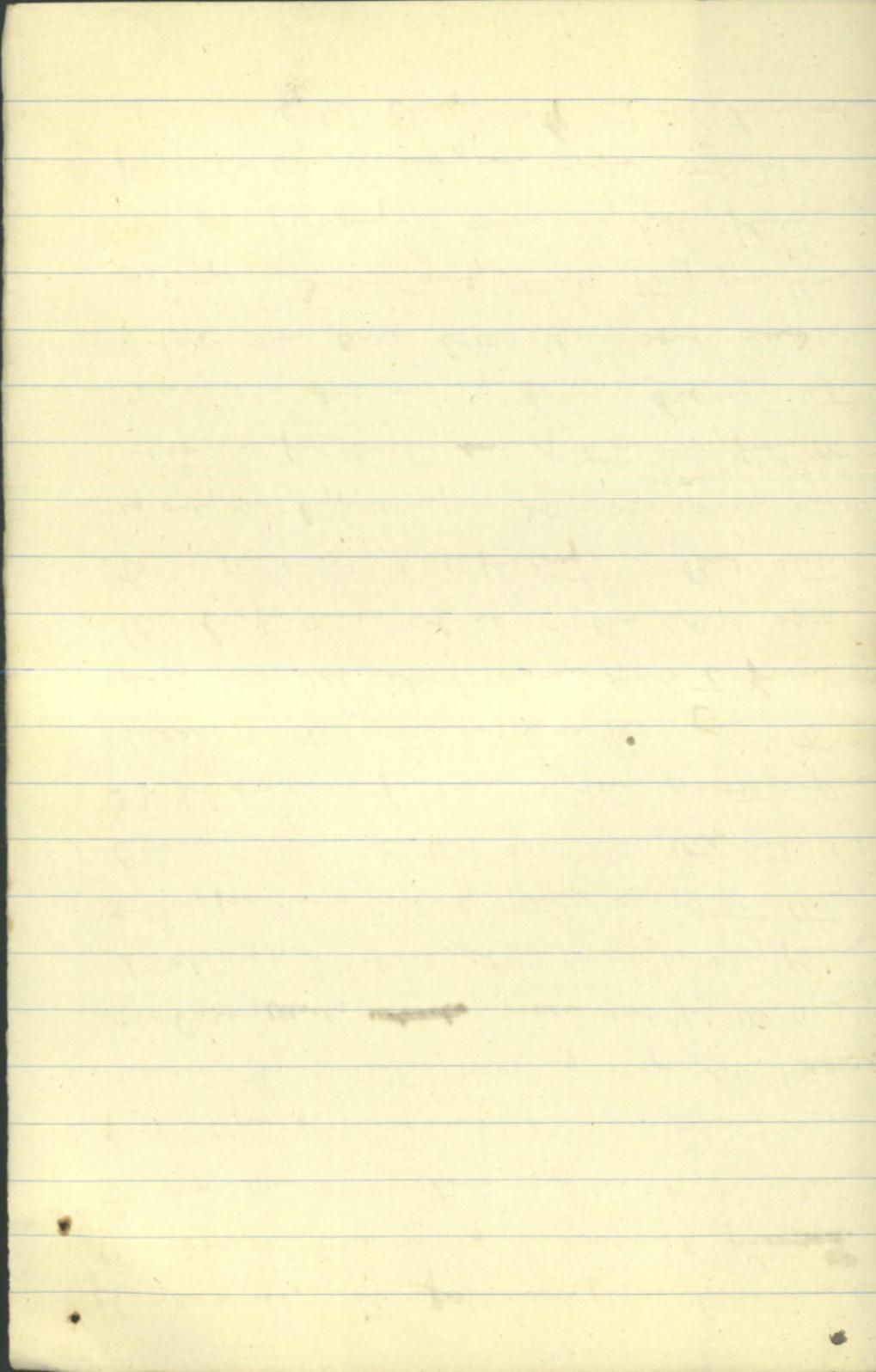
It is very remarkable however, that a film of moisture on the inside often ~~the~~ & even on the outside / by breathing on an exhausted tube (I mean a worn out Röntgen tube) seems to affect the brilliancy of the ~~fire~~ discharge. If this condenser when discharged gives out ultra-violet- or X-rays it might cause the glass to become luminescent, but German glass is not very fluorescent to either ultra-violet- or the X-rays since a glass plate shows but slight



15/73

8.

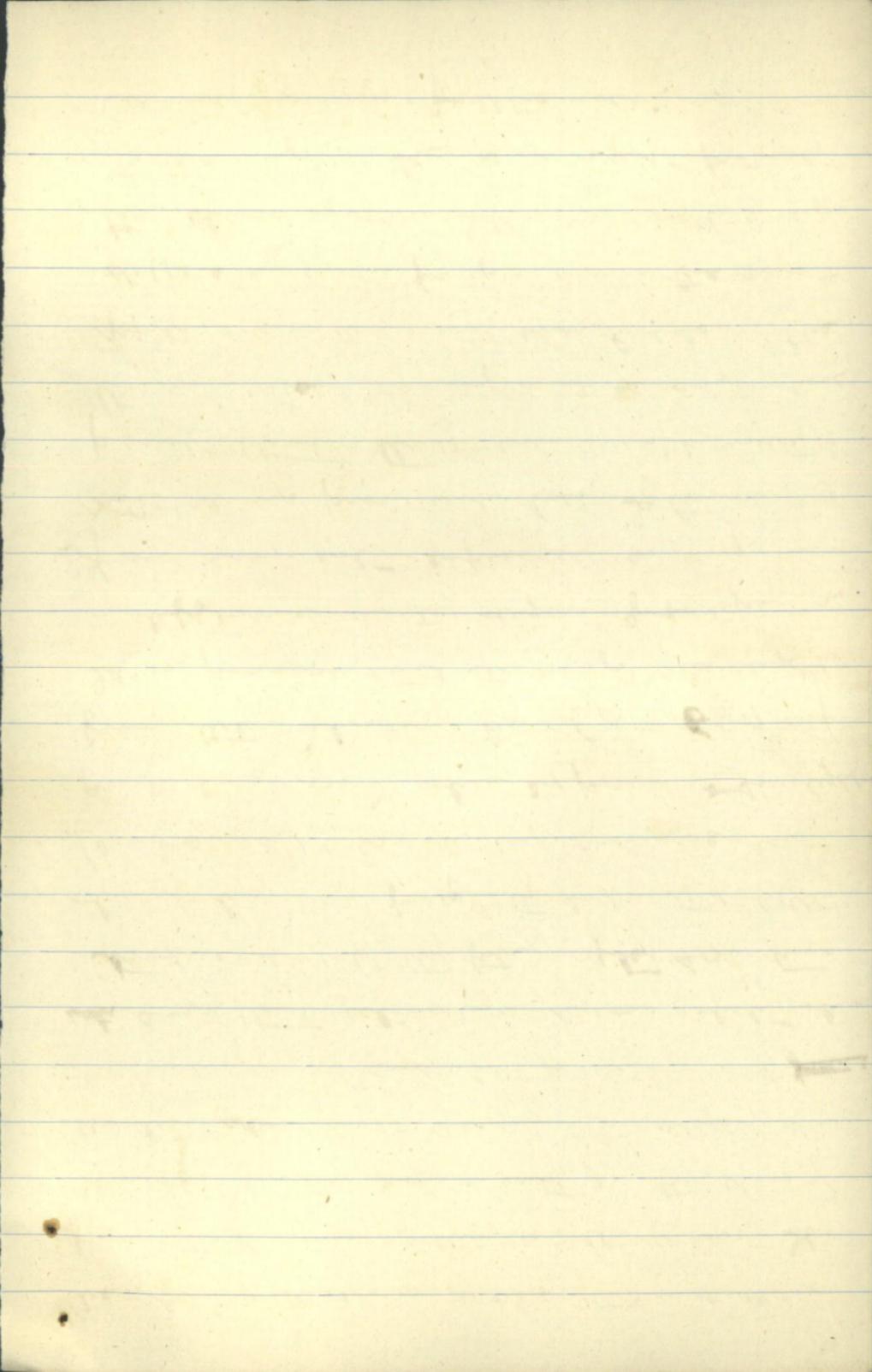
*fluorescer, the yellowish glass luminous in
the "Focus" tube being undoubtedly ~~due to~~
^{due to} the scattered Rutherford rays in all directions,
from the platinum plate. There may
however, be another brand of rays like Wiedemann
or Becquerel's ~~rays~~ given out by the Conduction
discharge to which glass may be very fluorescent
& therefore very intensely opaque so that they
cannot be detected outside the tube, but
J.J. Thomson's failure to obtain photographic
effects in the interior of a Röntgen tube
seems to detract to some extent from
this hypothesis while on the whole appears
to be the most satisfactory. But still it
is only an hypothesis, it is remarkable that it
accounts for the absence of these rays from the
radiation emanating from a Röntgen tube
We now come to the dark spots and
rings, I certainly think they are the
result "fatuizing" in some way of the glass
probably an analogous effect to that
described by Eddes & Gribble at Liverpool,



15/73

9.

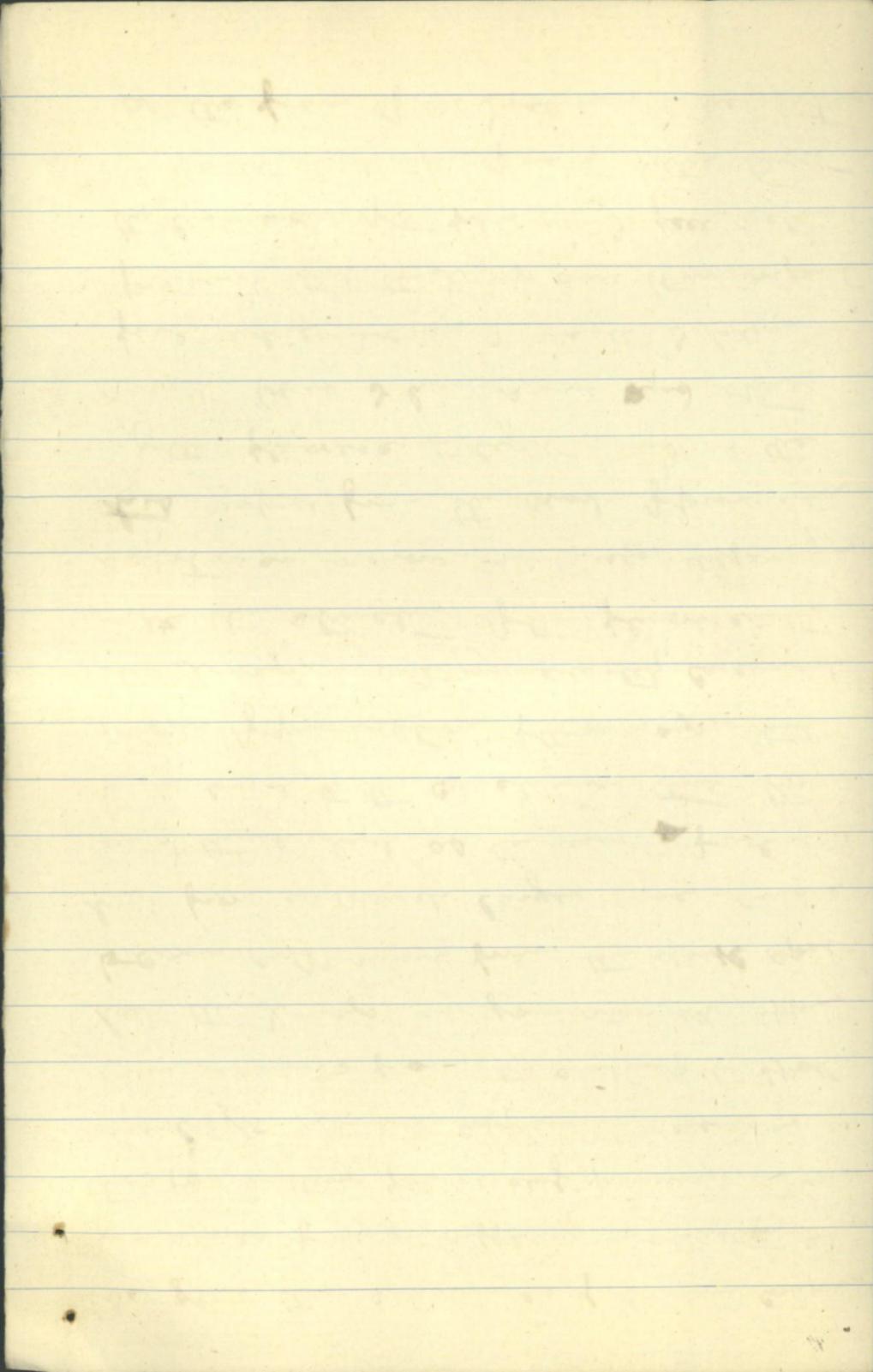
the glass particles or perhaps the solid ones from the Kautzode getting into the glass. It remains almost permanently on the glass if undisturbed but seems to be slightly diminished by heating. Crookes (Proc Roy Soc 1887) ~~says~~ says that alumina snow which when introduced into the tube, after some time when it has been frequently submitted to the bombardment gradually assumes a pink tinge and when exposed to sunlight gives the alumina line ($\lambda = 689.5$). It is possible that the rings are due to a difference in the degree of "fatigue" as you suggest especially as they are not always produced, but I think my point that they are due indirectly to the more slowly moving Kautzode rays which repel one another more, still holds. The difference in the "fatigue" between the rings & the dark spot is I think due to a difference in the rays. The dark spot probably consists of rings of ultra-violet.



15/73

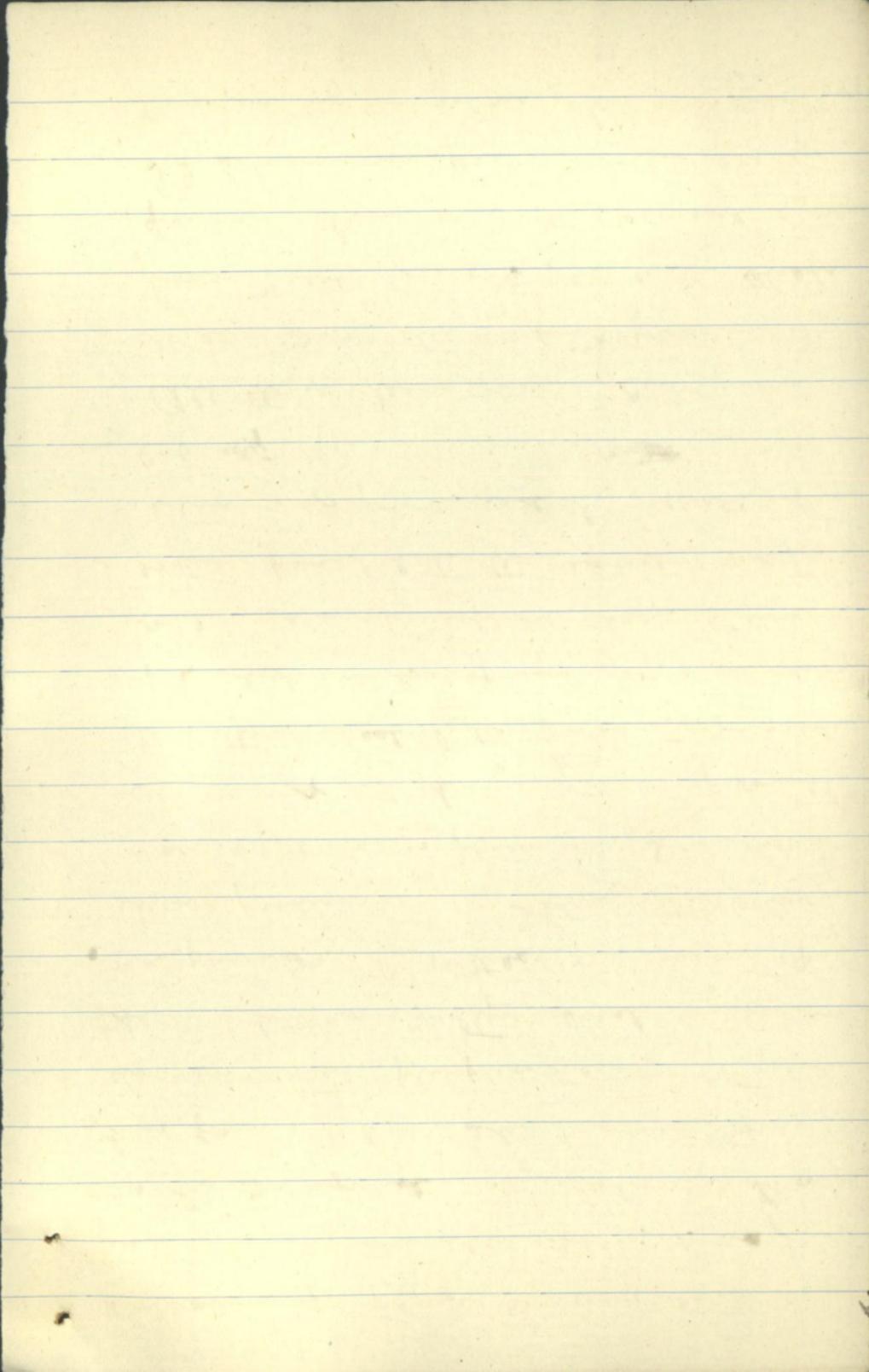
10.

The glass thus behaves as if it were composed of a series of rings differing in structure & therefore in their fluorescent powers, the wave-length would appear to increase as we move outwards from the centre of the spot, but the X-rays as you remark appear to come out mainly from the dark spot but from a much larger area and as I think led, as the result of what I have said, to the conclusion that the mode of production of the rays, that is the X-rays, is not immediately concerned with the structure of the fluorescent substance or now substances, differing in this respect from the mode of production of the fluorescent light, and as the result what I have said and other facts which I cannot recall I believe at present that the X-rays owe their origin to the luminescence of the film I feel inclined to doubt that the opacity of the target at the focus of a Jackson's tube, to the



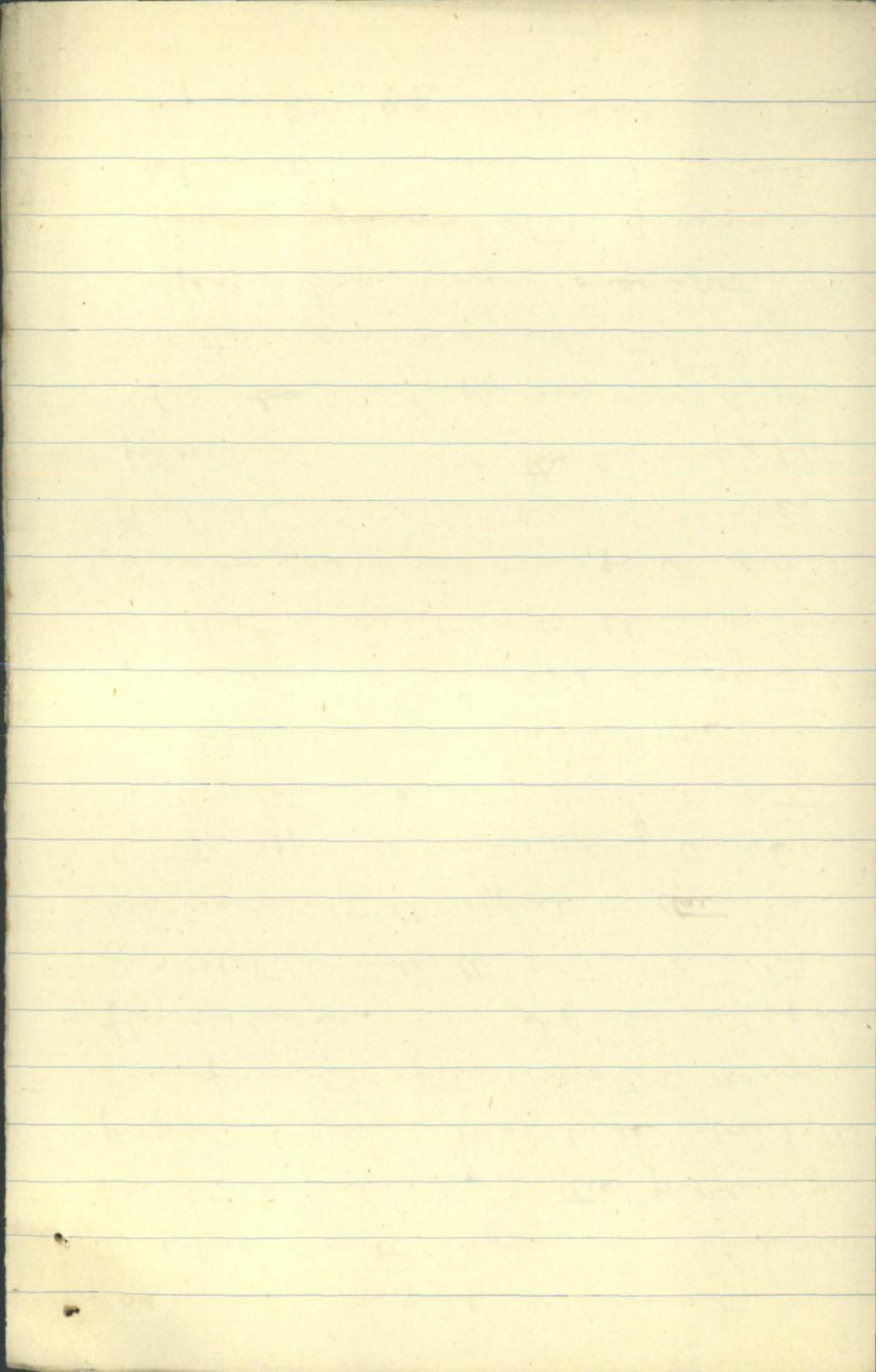
Kathode rays plays so important a part in the production of the X-rays as we imagined. Silvanus Thompson has found what I had been trying to do him that phosphorescent targets seem to behave better, such as the uranium compounds. but these are more expensive than platinum. I think aluminum does as well as platinum I am not sure at any rate it is quite possible that the electrolytic ^{Kathode} property of substances upon which its transparency to Kathode rays would seem to depend, may to some extent facilitate the exact nature of the rays produced by affecting the capacity of the condenser ~~or~~.

All these ideas above - Condenser discharges at the surface of bodies I have been trying to get into shape for some time and the perusal of J D Thomson's paper on the "charge carried by an atom" [Phil Mag Dec 1893]



15/73 12

has made me feel enthusiastic about
the whole matter again. When next
I visit Dr. Dingle go into the problem you
proposed to me at Malahide about the
transformation of the vibrations down a
fluorescence. If we suppose
gyroscopes inside the atoms and take
into account the effect on these caused
by the approach or recession of the charges
on the atoms or ends of Faraday tubes,
and take also into account the inertia
of these tubes we would get the atoms to
oscillate in addition to the charges on them.
I know you don't care for the idea
that these Faraday tubes are vortex
filaments. Do the two vortex filaments
when ~~they~~ they approach or recede get
twisted in such a manner that ^{they} would
appear to have crossed one another? Can
you imagine a state of affairs in
which this would occur? I am
trying to imagine all sorts and conduct

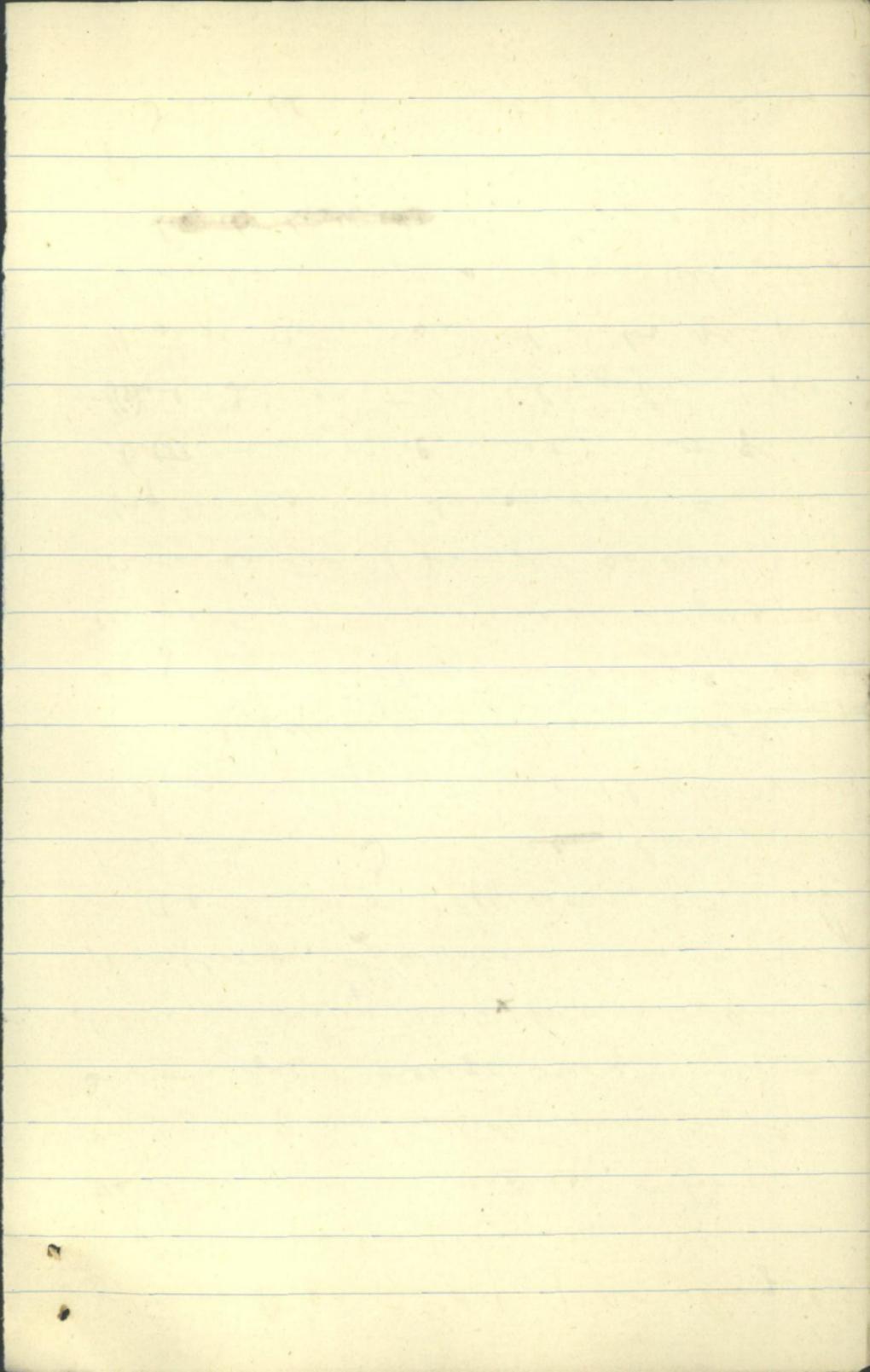


15/73

13.

* of things to get a hold of something that
* might be of some permanent value in
the theory of luminescence. I am
making up my hydrodynamics, as what
I mean fit-in college wasn't much so I was
as little interested ⁱⁿ vortex filaments then as in
morphology, ^{try} it seemed to have no bearing
on the luminous efficiency of Geissler's
tubes. I am ~~at~~ taking your
advice in trying to read Clerk Maxwell's
original papers on "the Dynamical Theory
of gases" his paper on "Saturn's rings" is also
interesting to me on account of the possible
association if I might so call it - of
big molecules surrounded by swarms of
little ones, in connection with fluorescence.
But I will take a long time to get
through them as I start too often perhaps
"to wonder away into regions yet untrod"
~~so to speak~~ - the original manuscript
for things.

I am ~~at~~ a stand still just in on my



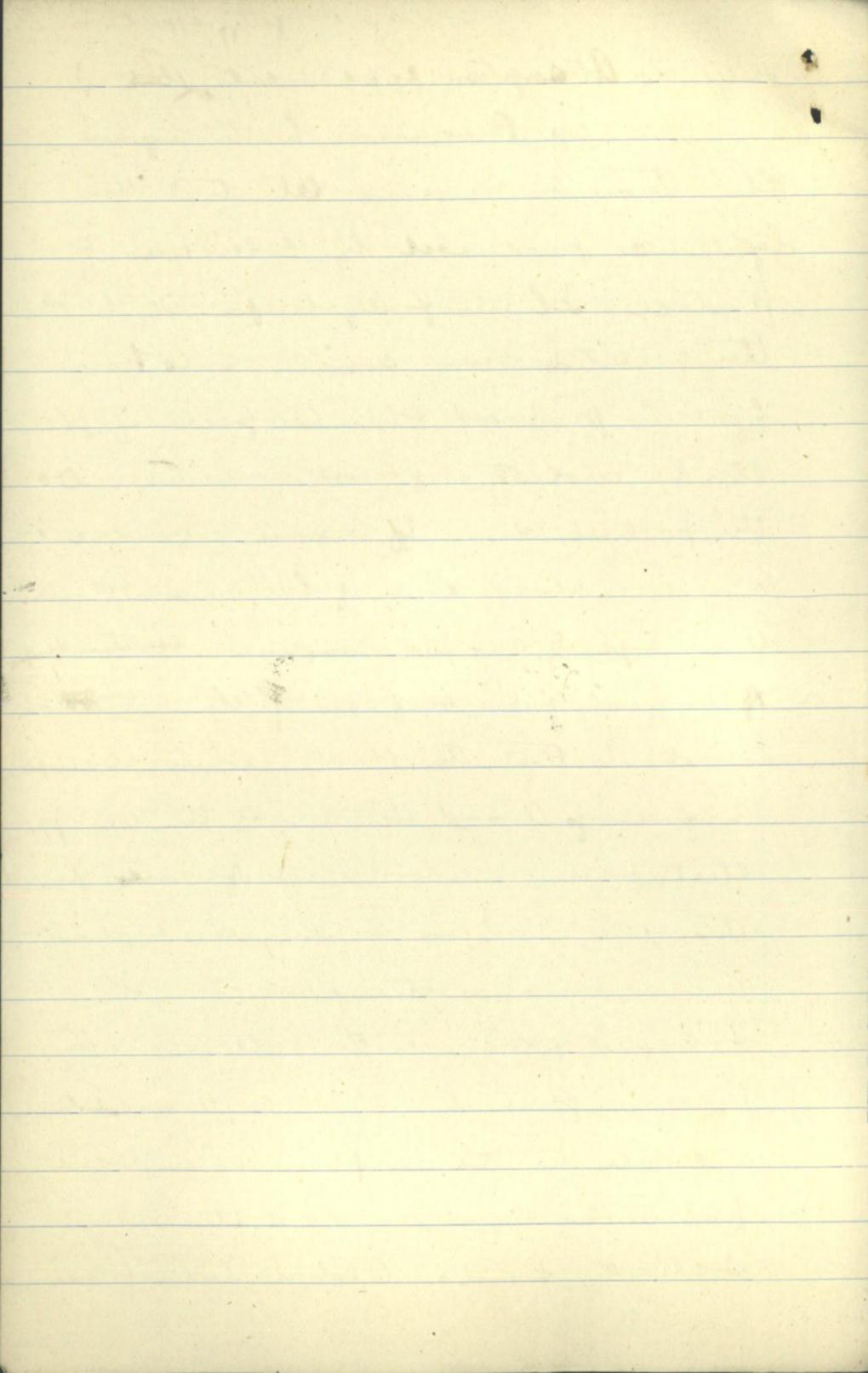
15/73

on account of getting apparatus made;

Röntgen & Absorption experiments.

I have taken up Beccaria's bulb again.

The theory we arrived at that the light was produced by collisions of particles I have fully confirmed, but the question now arises as to how light is produced when two pieces of glass strike violently against each other, do the particles driven off become conductive; or is it a phenomenon of luminescence by the discharge of my old condenser at the impact on the newly formed surfaces of glass? It might be that the glass becomes electrified in falling through the air & the air opposite electrified as when drops of water fall through it. I am making an experiment just now upon this point. It is strange I don't get the light when the pieces of glass are struck in vacuo which indicates that the air plays an important part in the effect; The phenomenon is I think similar to what takes place



15-

when two pieces of sugar are rubbed, which
is so familiar to us but of which we know
so little. It is generally attributed I
think to the formation of new crystals, &
it is remarkable in connection with this
that Crookes has observed that the
repeated bombardment of Kathode rays
on the amorphous powder of alumina
I have referred to, causes it to assume
a crystalline form. I think, however,
it is unfair to be taking up our time
like this ^{by writing} & I stop short & defer what
I mean to say till some other occasion.

Yours sincerely
J ohn Drinker.

15/73

