



VI. On the development of electricity in the act of muscular contraction

M. Becquerel

To cite this article: M. Becquerel (1849) VI. On the development of electricity in the act of muscular contraction, Philosophical Magazine Series 3, 35:233, 53-54, DOI: [10.1080/14786444908646298](https://doi.org/10.1080/14786444908646298)

To link to this article: <http://dx.doi.org/10.1080/14786444908646298>



Published online: 30 Apr 2009.



Submit your article to this journal [↗](#)



Article views: 2



View related articles [↗](#)

which, as x increases without limit, approaches to $c + \log \log x$ or $\log \log (x^c)$, where c or ε^c is a constant, which may be found by computation.

Now as x increases without limit, we have

$$\log \left(1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{x^c} \right) = \log \log (x^c);$$

so that the expression to which $\left(1 - \frac{1}{2}\right)^{-1} \left(1 - \frac{1}{3}\right)^{-1} \left(1 - \frac{1}{5}\right)^{-1} \dots \left(1 - \frac{1}{x}\right)^{-1}$ approximates arithmetically is not $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{x}$, as was before observed, but $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{x^c}$.

The expression here discussed was calculated by Legendre, and tabulated up to $x=1229$. (See *Théorie des Nombres*, tab. IX. vol. i.) The value of c , as derived from $x=1229$, is .581078; as derived from $x=1213$, it is .580693; and as derived from $x=947$, it is .58101; and it is not improbable that its theoretical value is the constant .5771213 of the ordinal series. It may be observed, that the difference between this constant and that which enters in the sum of the reciprocals of the primes corresponds exactly with the analytical value of this constant γ ; for the value of this difference is

$$\left(\frac{1}{2} + \log \frac{1}{2}\right) + \left(\frac{1}{3} + \log \frac{2}{3}\right) + \left(\frac{1}{5} + \log \frac{4}{5}\right) + \dots \text{ad inf.},$$

and the value of γ is

$$(1 + \log 1) + \left(\frac{1}{2} + \log \frac{1}{2}\right) + \left(\frac{1}{3} + \log \frac{2}{3}\right) + \left(\frac{1}{4} + \log \frac{3}{4}\right) + \dots \text{ad infinitum}.$$

The preceding investigations may be made available for the determination of the law which regulates the occurrence of numbers which are composites of two primes, of three primes, &c.; but I have not hitherto investigated this part of the subject with sufficient minuteness.

VI. On the Development of Electricity in the Act of Muscular Contraction. By M. BECQUEREL*.

I HAVE repeated unsuccessfully the experiment of M. Du Bois Reymond, relative to the production of an electric current in the act of muscular contraction, making use of the arrangements which he indicated in a letter addressed to

* From the *Comptes Rendus* for May 28, 1849.

M. Arago by M. de Humboldt, dated the 17th of May*, excluding however all those secondary causes which could give rise to electric currents, excepting that one the action of which is described.

I shall commence by recalling to mind the observations which I made in studying the electric effects obtained with a condenser, the plates of which were made of platinum or copper gilt (*Traité de l'Electricité et du Magnétisme*, t. v. 2^e partie, page 10):—

“The electro-chemical effects produced on the contact of acid solutions with the liquids which moisten the fingers, must be taken into account. In these various reactions the acids acquire the positive electricity, which is transmitted to the plate, and the liquids which moisten the fingers the negative electricity. With the alkalies the effects are inverse.”

It follows from this, that if one of the plates is covered externally by a very thin layer of hygrometric water, and that it is touched with a finger moistened with perspiration, electric effects, resulting from the reaction of the perspiration upon the water, ensue. It is also produced when a finger in a great state of transpiration is applied upon one of the plates, after having been previously moistened with water; in this case the water acquires the positive electricity, and the contrary electricity flows into the body of the experimenter. If we add to these effects those which take place when foreign bodies are adherent to the skin, we must conceive that a large number of complex electric effects would be produced in plunging two fingers, as is done by M. Du Bois Reymond, into two capsules filled with water in which are contained two plates of platinum in communication with a multiplier. This is not all: when, in virtue of these various causes, a current has circulated in the liquid and in the wire, the two plates of platinum are polarized in opposite directions, as may be shown by withdrawing the fingers and establishing the communication between the two capsules by means of a siphon filled with the same liquid as that which they contain. This current, during the first few moments, having the same intensity as the primitive current, annuls it; but if, in the act of contraction, the finger of the contracted hand become more or less immersed in water, the inverse current may be less or superior to the direct current. I guarded not only against the effects of the inverse current, but also against the effects resulting from the greater or less immersion of the fingers by smearing with fat those parts of the fingers which might temporarily come into contact with the liquid. By proceeding in this manner, I found it impossible to observe the effects described by M. Du Bois Reymond.

* See *Phil. Mag.* vol. xxxiv. p. 543.