A message from Roland Eötvös

László Szarka¹, Béla Lukács^{2,3}

¹Institute of Earth Physics and Space Science, Sopron, 9400, Hungary
²Doctoral School of Linguistics, University of Debrecen, Debrecen, 4032, Hungary
³Institute of Linguistics and Literature, University of Nyíregyháza, 4400, Hungary

Correspondence to: László Szarka (szarka@ggki.hu)

Abstract. On the 175th anniversary of the birth of Roland Eötvös (in Hungarian: Eötvös Loránd), we make available in English one of his lectures, given at the 1877 meeting of the Hungarian Society of Scientists, entitled "On the question of influence at a distance". We omitted detailed physical explanations and equations, and concentrated to the thoughts of a 29 years old scientist from the 19th century, which contain some messages and touches on issues that are still relevant today.

1 Roland Eötvös

10

Baron Roland Eötvös (in Hungarian: Báró Eötvös Loránd, Buda, July 27, 1848 – Budapest, April 8, 1919) is one of the bestknown Hungarian physicists. The foundation and culmination of his results related to the gravitational field was the Eötvös

- 15 torsion balance. In addition, the rule that describes the relationship between the surface tension of liquids and the temperature is also named after him. He was not only an outstanding scientist, but a Homo Publicus, too. Everywhere in public life, he did value-creating and renewing work (as President of the Hungarian Academy of Sciences, rector, minister, leader of various associations). He was also exceptionally demanding and original in his hobbies (hiking, alpinism, photography etc.), as presented on the occasion of the Roland Eötvös Commerative Year (Eötvös 100, 2019). This talk is "a persuasive speech of an upright soul who does not do violence to the truth for the sake of any predetermined goal". The quote comes from a contemporary philosopher, Bernát Alexander and refers to the entire oeuvre of Eötvös (Károlyházy
 - 1998). From his original lecture (Eötvös 1877), detailed physical explanations and equations are omitted. The English translation was based on a slightly modernized text version (Környei 1964).

2 Roland Eötvös: On the question of influence at a distance: details

25

Showing interest in science is a typical feature of our age.

Seeing the profit yielded for mankind through the use of physics, the practical-minded people follow the new achievements of the science because they are expecting additional profit. The scientist, who deals with another field of human knowledge,

30 tries to grasp the method whose application promotes the conscious, determined and apparent advance of sciences forward.

Some request the scientist to communicate the knowledge using unintelligible technicalities, and indeed both the competent and incompetent wish to satisfy this demand. Associations for scientific dissemination are created, and so are such lectures and books, which are placed on the shelves of almost every erudite person – or who wishes to seem so at least. Despite this

35 huge demand for products popularizing science we must admit that we encounter misconceptions regarding the real significance and philosophical esteem of science most of the time.

In my opinion, the mistake shall be sought mainly in the recently fashionable way of making science popular. Most of the authors making science popular are not concerned with presenting their science correctly; they try to be liked and to entertain, therefore they want the public to like what they do. Causing surprise among the readers – this is the device most authors use to achieve their goals. A few years ago, the miracles of plant life, the starry sky, palaeontological miracles and other 'miracles' were the most wanted on the book market. Nowadays, apart from a few fine and new products, there is still a huge number of works on the same topics or at least resulting in the same, albeit under different titles, because the presentations and experiments used by the modern, popularizing authors, do enchant the outsider, but conceal the truth from him.

Still, there are so many of those who make a judgement on science on the basis of such popularizing works! We can hardly expect their judgement to be just.

- 50 The gullible are taken by the result's magnificence, they admire science, which, as the fashionable saying goes, 'harnesses nature's forces for mankind', the science, which is capable of predicting several phenomena on the basis of perceptions and calculations. Ignoring the logic behind the result, such people and they are really numerous believe it blindly that science explains phenomena in an absolutely true way, or at least it shall do so in the future. This is how most of them come to their conclusion, also making a bold logical step as though it was the tenets of materialism that were supported by science.
- 55

60

Unlike these gullible people, those being used to critical thinking by means of some kind of serious study adopt a completely different point of view; they are not satisfied by merely knowing the results, but also look for their scientific grounds and ways. Such questions may be answered by serious studies, and hardly any popularizing works might substitute them. The researchers of history, linguistics or social sciences are convinced that only those committing their lives to them may understand scientific methods in a profound way; still, they judge science on the basis of farcical readings many a time. Their judgement is rarely positive, but I am not surprised, because when compared to the superficial discussion, to which all

the popularizing works confine themselves to some extent, scientific explanations may easily seem to be childish nonsense. [...]

65 I want to reveal how exaggerated is the request of those seeking the absolutely true explanations for phenomena in science, and how hasty is the judgement of those who curse our science for its assumptions.

In what manner and according to what rules do bodies affect one another from a distance? – an ancient question which I have chosen as the title of my lecture. Making clear the standpoint adopted by physical sciences against this question, it is their true significance, strength and weaknesses that I shall reveal the most. I could not amuse you with my subject; I do not intend to do so, but this misbehaviour might be pardonable if I substitute conscientious fidelity for the missing flashiness of

And now, a few words about the tasks of the physical sciences. We expect explanation for natural phenomena from this group of sciences; let us see to what extent it can fulfil this task. Its first task is to find facts through perception and experiments. By means of comparing the facts of the same kind, we obtain laws based on experience. Such are the laws of free fall, Kepler's Law taken from the perception of planetary movements, the theorems regulating the refraction and reflection of light, and the like. Such theorems, called empirical laws, are insoluble in themselves; explaining them is the most delicate task of physics, and a subject of the theoretical realm of this science. [...] the theory explains unsolved phenomena through unsolved assumptions. At first we might say that we have not advanced in understanding nature in such a way. [...] even if we have not obtained complete and absolutely true explanation, we have advanced, because we face only a few unsolved theorems instead of a multitude of unsolved phenomena.

Theory's task is to reduce the number of assumptions being inevitably necessary for the explanation, if possible; trying to exclude them completely would be useless. The explanation obtained through it shall never be the only possible one, but only one of the possible ones. [...]

Ultimately, we must accept that science does not provide us with any absolutely true explanations for natural phenomena, but it simply takes us closer to the limit where the inconceivable begins.

90

Whoever looks for more shall give a disappointed cry as read in Byron's Manfred:

"[...] science

the lecture.

But an exchange of ignorance for that

Which is another kind of ignorance."

95

Still, could we not reduce the inconceivable phenomena to basic principles conceivable in themselves? No, we could not, because so completely solid theorems may be found in a kind of science which analyses not the content of its theorems but simply discusses its formal chain. It would be nonsensical to create a physical theory out of so purely formal theorems, since even geometry needs empirical axioms in a certain regard.

100

No matter to what extent our physical theories are improving, they shall always rely on assumptions that cannot be proved any further. In contrast to this, with the conviction matured during scientific progress, we ought to regard it as one of the most surprising faults of our days that there are so many who take heed of the false prophets offering scientific dogmas instead of religious ones, with medieval intolerance, but without historical authorization.

105

Such self-illusion is foreign to a true scientist's nature. The true scientist knows that it is renunciation that has fallen to his lot in terms of understanding nature's ultimate causes; he, however, does not get disheartened like Faust, who requests an unlimited reward for his limited work, but keeps going towards the unreachable target, and enjoys research itself and the results which he utilizes for the promotion of the material good of mankind.

110

Those dissatisfied with such pleasures and going on looking for the ultimate causes should pay attention to the witty Galiani's apologue, which, I believe, is the best for them to survey the value of their efforts.

To conclude my lecture, please let me tell you this apologue and the story of its origin as told by the master of oratory, Du 115 Bois-Reymond. (Emil Du Bois-Reymond: Darwin versus Galiani. Berlin 1876.)

It was a hundred years ago that a fastidious company of wits assembled in Holbach's home in an afternoon. There were those women whose redoubtable charms are immortalized in Rousseau's Confessions; there was Diderot himself, the most German-like of the French, and Grimm, the most French-like of the Germans; the morose Hoop, and the little and lissome abbey from Naples, Galiani, in whom playfulness and levity often concealed profound thinking.

[...]

120

They were talking about Voltaire's views on the world and his deistic dispositions.

"How childish" remarked the host, "is his conception of the universe as a watch from which we may infer the watch-maker! 125 Inasmuch as nothing is certain save the existence of matter, why look for any other causes than the forces of matter? What is there so inconceivable in the idea that an infinity of atoms, acting upon one another from eternity, should assume a definite arrangement, and so form worlds; that when in these worlds light, heat, moisture, and certain elements were present in the right proportions, the phenomenon that we call life arose and developed; that this is how the animal and ultimately human machinery was created with its expediency and faults, strength and weaknesses, joys and much more bitterness." There was general assent, but then were heard coming from a corner Galiani's high voice:

"Ladies and gentlemen, for Heaven's sake, no metaphysics to-day! Let us talk of something else. Suppose I tell you of an occurrence I once witnessed on the Marina at Naples. A juggler had set up his booth, around which stood a group of Lazzaroni and other folk, myself among them. After performing sundry tricks which have escaped my memory, the fellow

offered us a wager that he could every time, with his dice, throw sixes. One or two of the gapers took up the bet. He did, in fact, throw sixes the first time, the second, third, fourth –"

"But, monsignor, this is a farce; either you are joking, or else the dice were loaded."

140 [...]

"Of course they were [Galiani replied] loaded, and that was just the trick. The juggler did not say that he would throw sixes every time with honest dice. Any man in his senses might have known beforehand that the dice were loaded, and the fellows who found this out only after their money was gone were laughed at heartily. But the point of the story is this: If two dice fall on the same side four times in succession, you, [...] hold it to be impossible that the thing should happen by accident. You

145 conclude, with undoubting certitude, that a hidden cause, designed to produce this effect, has been incorporated in the dice, in the shape of a little lead.

But, when you see all around you this universe, with its innumerable suns, planets, and moons, which, floating around in outer space, have for thousands of years been rhythmically travelling in their orbits; when you see on this globe continent,

- 150 sea and atmosphere, sunshine and rain, so distributed that myriads of plants and animals enjoy life; when, the alternation of day and night, of winter and summer, beneficently satisfy all the requirements of life activity of all these creatures; when, in your own body, you see each particle of its ineffably complicated structure performing exactly the functions which the good of the whole organism demands, while in turn it can itself subsist only in the whole; when, further, in all these instances you see the agreeable combined with the useful, and magnificence, ornament, and grace everywhere lavishly displayed Flora's
- 155 children clothed with beauty, the gaudy butterfly flitting about among them, the peacock spreading his tail feathers; when you see a drop of water populated by millions of living creatures; finally when you see the thousands of worlds that only the telescope can penetrate you confidently say that all this is chance. And yet the spectacle presented to us by nature is the same as though someone were every instant, with an infinite number of dice, to make exactly the throw which he announces in advance. I judge differently, ladies and gentlemen. I say that nature's dice are loaded, and there the greatest of jugglers is
- 160 smiling at us from above.

Ladies and gentlemen! One hundred years have elapsed since Galiani told his apologue, a century, in which a Fresnel, a Gauss, a Faraday and others matching them have devoted their lives to promoting sciences, one hundred years, in which

130

135

mankind has been liberated from the rough load of material work, and in which we have learnt to draw with sunbeams and to

165 communicate with our most distant brothers at the speed of thought; and still, we are standing before Galiani's dice just as astonished as Holbach's guests were. No matter if we call the lead causing the dice to roll chance, force or God, the inside of the dice shall always remain inconceivable to us.

References

Károlyházy, F.: Hungarae gentis decus. Fizikai Szemle, 48, 12, 397-403, 1998.

170 Eötvös 100: <u>https://eotvos100.hu/en</u>, 2019.

Eötvös, R.: On the question of influence at a distance. Yearbooks of the Hungarian Academy of Sciences, Volume 16, 1877–1882, pages 57–68, http://real-j.mtak.hu/4724/1/MagyarTudomanyosAkademiaEvkonyvei_016_1877-1882.pdf, in Hungarian, 1877.

Környei, E.: Eötvös Loránd, 86-98, Gondolat Kiadó, Budapest, in Hungarian, 1964.

175