Huba L. Szöcs

A Forgotten Hungarian Scientist: Sándor Gaál (Alexander von Gaál)

1. Abstract

Sándor Gaál who was an engineer and polyhistor-physicist was not destined to be in scientific publicity; he seemed to share those discoverers' and scientists' destiny who made something significant but the discovery is linked not with their names but with the names of men of a greater and more successful nation. We can say that his main aim was to search for contradictions (antinomy) and to solve them if possible.

Sándor Gaál was born on 4th October, 1885 in Gógánváralja (which can be found in a region called Erdővidék in Transylvania in Baróti-szék) as a collateral of a colonel Sándor Gál (Gaál) - who was a commissary and military commandant of the former Csík-county in 1848 - in a land-owning family. His great-grandfather, József Gaál was the major of the Austrian army and when he was an elderly man he lived on his land in Csíkszentgyörgy.

Sándor Gaál studied at the Military Academy in Wien at the beginning of the 20th century. Many excellent mathematicians and physicists of that age could always be found as lecturers in this famous institute.

Sándor Gaál died of cardiac failure at the age of 86 at 4 a.m. on 28th July, 1972 in the local general hospital.

We hope that his long but hard life was not vain if we think about science - especially Hungarian science. It seems that the Hungarian world of science did not take care of him, but he never gave it up: even in his hour of death he explained his results and maintained his attitude against the counter arguments brought forward and mainly against dogmas.

So Sándor Gaál was true physicist-polyhistor: He was on firm ground in every field of physics, so his life work is very rich. If we want to sum up his life-work only in one sentence then we can say that his main aim was to search for contradictions (antinomy) and to solve them if possible.

He achieved significant results in the field of thermodynamics, relativity theory and mathematical logic.

We shall try to recall Gaál's important works (most of which have not been published yet) on the basis of one of his notes which was written on 3rd, March, 1972.

> The main points and the intended order of publishing of the papers which were finished until 20th, February, 1972 and were ready to be published by me the undersigned (that is Sándor Gaál, *remark of the author*).

1. The linear translation ... (its physical invariants, *addendum by the author*).
2. The continuation and addendum of paper 1:
   a. Proof of the fact that only one universal potential can exist.
   b. The axioms of the causality principle and its connections with universal potential.
   c. Proof of the fact that no linear decisive experiment (the critique of the Michelson-Morley-experiment) has been made yet in connection with the existence of ether, taking the "four identities" by Hilbert as an initial point.
   d. Formal geometry is always a subjective "establishment" because of the subjectivity of the definition of measure (method of measurements), only topology has objective reality.
3. The identity of the causality principle and the existence of the unique world-potential.
4. The explanation of two mathematical antonyms of set theory necessary for the dissertations 1-3.
   a. Proof of the fact that the syllogism, which was applied to the logico-deductive foundation of atomism by Democrit, is correct (consistent).
   b. The antinomies, which can be induced by mathematical induction, are to be solved in set theory, which was established by Cantor but now has various kinds of systems of axioms.
5. The system of axioms of topology on the basis of the results of dissertation 4.
6. H.A.Lorentz pointed out as a will that solving the inherent contradictions of quantum theory is unavoidable. This is performed in a detailed dissertation like this. Its results:
   a. If the causality principle does not hold in the micro-world (in the case of atomic scale) then it does not hold either in the macro-world (in spite of the Ehrenfest-principle). So in this case the laws of nature cannot be established.
   b. The introduction of nonlinearity and continuity is unavoidable.
   c. On the basis of item 2.a. I solve the body of the wave problem which L. de Broglie, E. Schrödinger, D. Bohm, I.P. Vigier, etc... tried to solve without success. I prove that a central-symmetric body of the wave can originate from the pure electromagnetic radiation free from charge even in the case of linearity. The body of the wave has rest mass (and gravity, too), can move at lower speed than light does, has spin, has charge in the case of nonlinearity (capable of interaction

and gravitates). I describe the origin of resonances from pure radiation and the way they decompose.

7. Thermodynamics: The axiomatic-topological analysis of statistical mechanics that was discussed by Boltzmann, Gibbs, Poincaré and Zermelo. The possible existence of ergodic systems in the case of multiple connection of the phase space. The topological proof of the reversion postulate. Degenerated systems. The general differential equation of thermodynamics is a Pfaff-form; if it has no integrating factor then it is impossible to induce a closed circle process so that the value of the Gibbs-potential could be zero contradicting the basic principle II. Proving the real existence of such systems.

8. Biogenetics:The question is the following: how probable is it that a protobion comes into being in a real and uniform physico-chemical system (e.g. in a very large closed tank containing certain compounds under the effect of given physical parameters. Probability regarding this matter in the presence of adequate initial substances can be calculated. So the transition from the azoic state (without life) to the biofor state (keeping life) occurs as a steep, sudden jump in consequence of the effect of megascopic parameters, the existence of the protobion before change and its non-existence after change are quite improbable. Probability theory postulates the formation of sexual multiplication and ortogenesis by Osborne.

9.

a. It can be proved that in infinite distances the barometer-formula of the atmosphere of planets does not turn into zero but it registers very low gas-density. This implies the law of distribution of cosmic isostasy and cosmic radiation. And this holds without postulating any ad hoc hypothesis (synchronic effect).

b. On this basis it can be proved that in a certain cosmic atmosphere the so called "Kippresonanz" (= overturning resonance) which causes the frequent periodic change of the glacial periods over to interglacial in the geological recent past, occurs concerning the average surface temperature of a planet. This shows the casual bases of the Milankovic-periods.

Dated from Sepsiszentgyörgy on 3rd, March, 1972.

(signature: Sándor Gaál)

We must complete the above list of data with a dissertation of Gaál's the subject of which is analysing the article "Experimentum crucis for proof of the space-time absoluteness" written by S.Marinov who was cited by Gaál.

1. About the Dissertation "The Physical Invariants of Linear Translation"

We think further on that we follow a correct course if we turn the Reader's attention to one of Gaál's most significant work - to the dissertation "The invariant physical

constants of linear transfer" in such a way so that we publish the following reviewer which Gaál wrote in 1972 about his dissertation:

The subject and results of the dissertation

I. In 1871 - about 128 years ago J.C. Maxwell pointed out that the absolute speed of the solar system relative to static ether can be determined from the phase change of the moons of Jupiter.
II. But in 1991 Burton proved that probable average errors of the observations carried on at that time exceed the expected effect.
III. In 1913 H.A. Lorentz proved in his three courses about relativity in Harlem that the Maxwell effect occurs even if relativity is represented by the Lorentz-transformation, but this paradox is tried to be eliminated by the effectiveness of some gravitational phenomenon which is still indefinite and is supposed ad hoc. 12 years later, in 1916 Einstein published his first gravity theory, but the two paradoxes have not been solved so far.
IV. In 1922 E.Fermi proved that in the general Riemann-geometry the Lorentz-transformation can be applied continually not only in the infinitesimal neighbourhood of a point but also at every point of an arbitrary curved line. This means that the rotation-experiment by Michelson-Gale, Herres, Sagnac and Pogány (all having positive result) can be rectified to be linear, whereby the reality of the Maxwell effect can be deductive-uniquely proved by Lorentz-transformation.
V. Finally S.Marinov publishes his article "Experimentum crucis for the proof of the space-time absoluteness" in *Physical Letters* (vol. XXXII A.2.June 1970, p. 185). The subject of the paper by me as follows: 4. The occurence of Maxwell-effect which was mentioned in Doppler-antinomy in Doppler effect.

I begin my investigations connected with this subject with a short article published in *Naturwissenschaften* whose offprint is inserted here. But the detailed results, which I promised in this report, were very surprising so I did not venture to publish them for a long time. Only connections which I obtained in a clear way in 1951was published in the essay *Die Vermessungsvorschrift* which was handed over to professor Teofil Vescan (university of Jasi) and the substance of which is the isomorphism postulated between the real method of measuring transformations and co-ordinates. There could be no question about it, but it seems that I forced on open door. But there were the later results under the travesty. Because later I succeeded in making my results axiomatic and giving them so primitive and evident exact-deductive form so that publishing the results became already an inevitable duty. I outline my results as follows:

1. Lorentz-transformation is independent of relativity principle or any other ad hoc result of similar type. It can be deduced from three formal axioms

representing the causality principle in a clearly exact-deductive (so without using any principle) and very simple way. [1]

2. The third axiom postulates that every transformation which describes motions with constant speed v must turn into its inversion by the reversal of the sign of parameter v. Determining it naively if I take ten steps forward and ten steps back I stay in my place.

In the deduction of 1. the concept of light velocity cannot appear explicitly because of its abstract character, the light velocity occurs there as the unit of velocity which clocks parameter v. So in this case the Lorentz-transformation of x_0 is

$$\begin{aligned} x_1 &= \beta(x_0 - vt_0) \\ t_1 &= \beta(t_0 - vt_0) \end{aligned} \qquad L$$

where $\beta = (1-v^2)^{-1/2}$ is the Fitzgerald-Lorentz-factor. The classical Galilei-transformation

$$\begin{aligned} x'_1 &= x_0 - vt_0 \\ t'_1 &= t_0 \end{aligned} \qquad G$$

also satisfies the axioms. So we can write down the inversions L^{-1} and G^{-1} relating to L and G respectively:

$$\begin{aligned} \beta(x_1 - vt_1) &= x_0 = x_1 + vt_1 \\ \beta(t_1 + vx_1) &= t_0 = t_1 \end{aligned} \qquad P$$

from -v-symmetry it emerges that we can choose independently the sign of v with which the Lorentz-transformation can be regarded as L and G or L^{-1} or G^{-1}. So the cardinal theorem holds inevitably:

R: The results of transformations L and G of co-ordinates x, t with the same parameter v are equivalent if we think about their values but their forms are not the same.

The different forms are induced by the differences in the definition of measure. So R implies that the physical phenomena L and G are described as they are equivalent because their scales are equivalent. This can be proved in a very simple way at once.

[1] The deduction of the generalized form of Lorentz-transformation and some of its direct consequences were published by H. Szőcs, [Szőcs (1995), pp. 176-80, Szöcs (1996), pp. 253-8, Szőcs (1997), pp. 217-20, Szőcs (1998), p. 69, Szőcs (1998), p. 70].

Unfortunately we cannot publish the dissertation "The physical invariants of the linear transformation" (about 40-45 pages) written by S. Gaál owing to lack of space but we call the physico-historians' attention to this dissertation and to another dissertation by Gaál "Barometric reversion" in which the author analyses the antinomies and contradictions of thermodynamics with particular respect to the ergod processes.

Light velocity is independent of parameter v and constant in systems L and G if we clock it by reflecting forward and backwards in the possible way: $(1/2)[(c+v)+(c-v)] = c$. If we clock velocity in one way (NB: Nobody has succeeded in carrying out an experiment like this yet and the super-precise atomic clocks which were applied recently make it possible to succeed. But the time of line sight (so its speed) according to G is obviously not equivalent in both directions. Namely if $x/t = c = 1$ then $t'_1 = (1-v)t_0$ in case of $+v$, and $t'_2 = (1+v)t_0$ in case of $-v$, so the value relation is $(t'_1/t'_2) = (1-v)(1+v)$. This must hold in case of L with the same value. And indeed: $t_1 = \beta(1-v)t_0$ in case of $+v$ and $t_2 = \beta(1+v)t_0$ in case of $-v$, so the value relation here is also: $(1-v)/(1+v)$ which is not equal to 1. (Here $x = t$ because $(x/t) = c = 1$). The difference in value:If we take G $t'_2-t'_1 = 2vt_0$, and if we take L then $t_2-t_1 = 2\beta vt_0$ because $t' = \beta t_0$ (if $x_0 = 0$) according to R.
These and other descriptive connections that are based on R solve the clock-paradox descriptively as a Doppler- antinomy occuring through Maxwell-phenomenon. After all the exchange of G for L could bring about nothing new in physics.

V. Further on we do the rectification of rotation experiment by using the Fermi-theorem and this immediately implies the experimental proof of the existence of the absolute basic system – the ether in connection with R (every rotation experiment has a positive result).

VI. I would like to emphasize that my aim is not to disprove the relativity theory, I just point out some simple-formal connections which exist, whether it is pleasant or not. Naturally it is very unpleasant that these are all exact-deductive axiomatic results, so they can be approached and criticised only in this way. Citation dogmas and authorities, using philosophy, can be only empty evasion. A disproval is valid only if the inherent contradiction of the thing that is to be disproved can be shown similarly. It is decisively significant to examine the whole article thoroughly from end to end.

The above sections are just samples which describes “the character of the mentioned facts”.
Sepsiszentgyörgy, 10th March, 1972

BIBLIOGRAPHY

SOMBORI, S. (1995), "A solitary in Szentgyörgy: Sándor Gaál, the scientist", *Háromszék* 16, 17, 20, 21, 22/June.

SZÖCS, H.L. (1995), "On Physics Work In Relativity Of Alexander von Gaál", *Proceedings of International Conference "Medacta" '95 On Educational Technologies For the Third Millenium Nitra (Zbornik)*, vol. IV, 1995, pp. 176-80.

ID. (1996), "On Physics Work In Relativity Of Alexander von Gaál Part II.", *Proceedings of International 7th Biennial Conference On History and Philosophy of Physics in Education*, Bratislava, 1996,pp. 253-258, *Proceedings Of International Conference On Non Euclidean Geometry in Modern Physics*, Uzghorod, 1997, pp. 210-6.

ID. (1997), "On Physics Work in Relativity of Alexander von Gaál Part III. The Clock Paradox as Consequence of the Doppler Antinomy", *Proceedings of International Conference on Non Euclidean Geometry in Modern Physics*, Uzghorod, 1997, pp. 217-20.

ID. (1998), "Essays Upon Special Relativity Part IV. On Basic System Of Lorentz-Group", *Abstract Volume of International Cologne-Biefeld Workshop On "Superluminal Velocities"*, Köln, (1998), p. 69.

ID. (1998), *Abstract Volume of DGA 98 International Conference On Differential Geometry and Applications (as Satellite Conference of ICM International Congress of Mathematicians Berlin, 1998)*, Brno, 1998, pp. 44-45, Subpress in *Proceedings of DGA 98.*

ID. (1998), "Essays Upon Special Relativity Part IV. The Rectification Of Rotating-Experiments And The Possibility Of Existence Of One Basic-System", *Abstract Volume of International Cologne-Biefeld Workshop On "Superluminal Velocities"*, Köln, 1998, p. 70.

Abstract Volume of DGA 98 International Conference On Differential Geometry and Applications (as Satellite Conference of ICM International Congress of Mathematicians Berlin 1998), Brno, 1998, pp. 44-45. Subpress in *Proceedings of DGA 98.*