На основі (6) можемо написати

Nous avons donc d'après (6)

$$W_0 = \frac{\varepsilon}{2}\Phi(0). \tag{8}$$

З попереднього бачимо, що всі простори схарактеризовані матричною формою (2), в яких для коефіцієнтів маємо $g_{00} = -\frac{1}{g_{11}}$, не можуть мати впливу на структуру електромагнітного поля і тому і на його повну енергію, яка стається тоді нескінчено велика, подібно енергії Куломбовского поля в просторі Мінковского. Коли метрика вибрана так, що потенціял $\Phi(r)$ для $r = 0$ не буде нескінчений, одержуємо скінчену повну енергію електричної точкової особливості. Ця метода полягає в тому, що шість добавочних сил в просторі Мінковского вибираємо відповідно простору Рімана.

Les résultats obtenus nous conduit a de considerations suivante. Toutes les éspaces caractérises par les formes métriques (2), oú les coéfficients satisfont à la condition $g_{00} = -\frac{1}{g_{11}}$, ne peuvent pas influencer la structure du champ. L'énergie est infini, analogiquement à l'énergie Coulombienne dans l'éspace de Minkowski.

Dans le cas où la métrique est telle que le potentiel $\Phi(r)$ est fini dans l'origine $r = 0$, nous obtenons l'énergie finie du champ de singularité ponctuelle. Par conséquent, nous voyons qu'il est possible d'obtenir l'énergie finie de l'électron ponctuel choisissant une métrique adéquate de l'éspace Riemanienne. Ceci vient du fait, qu'on peut substituer les forces agissantes dans l'éspace de Minkowski par une métrique dûment choisie de l'éspace de Riemann, dans lequel nous considérons les phénomène physiques.

## ELECTRIC SINGULARITIES IN THE GRAVITATIONAL FIELD

Antoni Raabe
*Chair for Mechanics, University of Lviv*

We offer to the readers an article by Antoni Raabe, an Assistant of the Chair for Mechanics of the University of Lviv, which was to be published in the *Scientific Notes...* of the Lviv University in 1940, however, the journal never appeared in print (see below). The author's texts based on the manuscripts in Ukrainian and French are reproduced with the spelling and style preserved. The article may be of interest from both historical and methodological point of view.

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## ANTONI RAABE (1915–1942)

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Antoni Raabe (1915–1942) was a Polish theoretical physicist. He studied at the University of Warsaw (1932–1938) and worked at the Jagiellonian University in Cracow and the Ivan Franko State University of Lviv. He was killed on 7 September 1942 in Auschwitz. His three papers were published after the Second World War.

Antoni Raabe was born on 2 May 1915 in Warsaw. In the years 1924–1932 he attended private Władysław Giżycki's Gimnazjum for boys in Warsaw and graduated on 28 May 1932. From the autumn 1932 to 1938 he studied at the Faculty of Mathematics and Natural Sciences of the University of Warsaw. During the first two years he studied mathematics and then physics. On 27 September 1937 he finished his studies with a master's degree in physics. His master thesis described new theories of light.

In the academic year 1938/39 Raabe worked as a volunteer at the Chair of Theoretical Physics of the Jagiellonian University in Cracow. During the first semester he conducted research on new mechanics of material systems together with Myron Mathisson (1847–1940) and the second semester he dedicated to the theory of mesons with Jan Weyssenhoff (1889–1972).

Raabe himself noticed (cf. [1]) that in 1937 he sent his paper on wave mechanics of material systems of points to Prof. Louis de Broglie (1892–1987). Moreover, in 1939 he did a paper on geometrization of the theory of mesotron, part of which was to be published in the autumn of 1939. This work was presented at the theoretical physics seminar of the Lviv University.

In the last months before the war, he lived in Vilnius and then he came to Lviv. Since January 1940 he was an assistant at the Chair for Mechanics of the Ivan Franko State University of Lviv, which was headed by Juliusz Paweł Schauder (1899–1943). In Lviv, Raabe continued his cooperation with Weyssenhoff who worked at the Lviv Polytechnic Institute at the time. In May 1941, Raabe was admitted to pass his candidate (doctoral) exams in the theory of relativity, theoretical physics, dialectical and historical materialism, and the German language, which were supposed to take place in the academic year 1941/42.

In the summer of 1941, following the German occupation of Lviv, he returned to Cracow, together with Weyssenhoff, where they continued collaborating on the relativistic theory of spin particles and spin fluid, which was a continuation of Mathisson's and Weyssenhoff's work [2, 3]. His three joint papers with Weyssenhoff were presented at a secret meeting of physicists in Warsaw in 1942, but could not be published during the German occupation. They appeared after the war:

[W46] J. W. Weyssenhoff, (1) Relativistic dynamics of spin-fluids and spin-particles; (2) Relativistic dynamics of spin-particles moving with the velocity of light, Nature **157** 766–767 (1946). Collaboration with A. Raabe is mentioned in the footnote.

[WR47a] J. W. Weyssenhoff, A. Raabe, Relativistic dynamics of spin-fluids and spin-particles, Acta Phys. Polon. **9**, 7–18 (1947).

[WR47b] J. W. Weyssenhoff, A. Raabe, Relativistic dynamics of spin-particles moving with the velocity of light, Acta Phys. Polon. **9**, 19–25 (1947).

The results of these works, especially from [WR47a], were later on cited by many authors [4, see especially p. 46]. In the summer of 1942, Raabe was arrested and sent to the Auschwitz concentration camp (now Oświęcim), where he was murdered on 7 September 1942.

Jan Weyssenhoff has written (in the footnotes of his paper [WR47a], p. 7):

** The main contents of the paper [WR47a] and the next one [WR47b], as well as most of the results of the three following, were a subject of a lecture at a secret meeting of physicists at Prof. Pieńkowski home in Warsaw, October 1942.*

*** Mr. Raabe was a highly gifted young physicist with whom I outlined in all its main features the contents of this paper and the next one in 1940/41 in Lwów. We tried to pursue our work in 1942 in Cracow, but unfortunately in June 1942 Mr. Raabe fell victim of a man-hunt in the streets of Cracow; he died four months later in the German concentration camp of Oświęcim* [*Auschwitz*].

In 1940, the 9th volume of *Studia Mathematica* and the journal *Naukovi Zapysky* (*The Scientific Notes*) of the Faculty of Physics and Mathematics were being prepared for publication. So far, *Naukovi Zapysky* were not published. Recently, the list of articles has been found, but the articles seem to have been lost. Fortunately, by now some of them have been found by the authors of this note, among them there was also A. Raabe's article [5]. It was written in French and Ukrainian.

At present, the authors prepare an article on the scientific research and papers of mathematicians and physicists from the Lviv University which were ready for publication in the years 1940–1941.

[1] Personal portfolio of Antoni Raabe, Lviv University Archive, Repository 119, Desc. 1, Case 560; contains the curriculum vitae in Polish date 29 December 1939 (2 pages) and autobiography in Russian of 25 July 1940 (2 pages).
[2] B. Średniawa, Kwart. Hist. Nauk. Tech. **24**, 759 (1979).
[3] B. Średniawa, in *Studies in the History of General Relativity*, edited by J. Eisenstaedt, A. J. Kox (Springer, 1992), p. 400.
[4] L. Maligranda, J. G. Prytula, Wiad. Mat. **49**, 29 (2013).
[5] A. Raabe, Scientific Notes of the Faculty of Physics and Mathematics, Ivan Franko State University of Lviv, 147–150 (1940) [in Ukrainian, did not appear in print; published preceding this note as: A. Raabe, J. Phys. Stud. **18**, 2997 (2014)].