ФИЗИКА ЭЛЕМЕНТАРНЫХ ЧАСТИЦ И АТОМНОГО ЯДРА
2015. Т. 46. ВЫП. 5

EARLY SCIENTIFIC DAYS OF LUDWIK TURKO

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I shall briefly describe the first ten years of Ludwik Turko's scientific activities — from his arrival to Wroclaw in 1967 through PhD studies (1967–1971) until the end of the 1970s.

PACS: 01.60.+q

The sixties of the previous century was definitely a good time for theoretical physics at Wroclaw University. After the foundation of the Institute for Theoretical Physics in 1960 it was expanding quite remarkably. At that time Jan Lopuszanski came back from the Institute of Advanced Studies in Princeton and New York University, who brought the latest research news in mathematical physics and field theory. The first director of the Institute, Jan Rzewuski, spent one year in Dubna during the early 1960s and then one year at CERN in Geneva. New generation was quickly gaining knowledge, in particular, Jerzy Czerwonko and myself; we both born in 1936, obtained master degrees in physics in 1956 at the age of twenty. In the mid-sixties the group of theoretical physicists at Wroclaw University was already well-known in Polish scientific community of physicists and attracted the students from other universities, interested in continuation of their studies at postgraduate level.

Ludwik completed his studies in 1966 at Lodz University, and after one year of stay there as an assistant, he moved in autumn 1967 with his wife Bogda, a charming mathematician, to Wroclaw, in order to join just opened PhD studies in theoretical physics. At that time, I suppose, he was not aware that his personal and scientific life would be linked for almost fifty years with this new town in Poland located on the banks of the Odra River.

Contrary to recent habits, at that time PhD students were not attached from the beginning to definite supervisor — during the first year of studies they could observe their older colleagues and ask the chosen one for supervising future PhD. Ludwik asked me quite soon about my prospects with the theme of PhD thesis. At

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that time I was studying some simple, even soluble field-theoretic models, in particular, the nonrelativistic field-theoretic model proposed by T. D. Lee in 1954 [1] and the relativistic soluble model by Zachariasen [2], describing in field-theoretic way the elastic scattering sector. Independently, I was at that time interested also in the so-called generalized free fields, introduced in 1965 by Licht [3], which were characterized by continuous mass spectrum replacing the constant mass parameter for standard free Klein–Gordon fields. Related problem which I also studied at that time was the incorporation of generalized free fields into generalization of the so-called LSZ (Lehmann–Symanzik–Zimmermann) framework for interacting relativistic quantum fields [4, 5], with standard and generalized free fields both appearing in asymptotic states. Following the remark by Thirring, I also became aware that the free fields with continuous spectrum could be applied to the description of Zachariasen model. In particular, using such a model one can provide the field-theoretic picture of a resonance, which in the sixties was observed in many scattering processes of strongly interacting hadrons.

We started to work with Ludwik on some calculational problems related with the description of unstable and composite particle sectors in Lee model, as well as on the interpretation in Zachariasen model of some particle-like singularities, called CDD (Castillejo–Dalitz–Dyson) poles. Our collaboration resulted in two publications [6, 7]. Subsequently, in 1970-1971 Ludwik wrote on the basis of these publications the text of his PhD thesis entitled "The Description of Unstable Particles with the Use of Fields with Continuous Mass Spectrum" and passed successfully all necessary steps for getting the PhD degree.

After 1971 I wrote another paper with Ludwik [8], where we applied the formalism of free fields with continuous mass spectrum to the description of vector dominance model, with virtual exchange of unstable ρ resonance. In 1974, perhaps my technically the most advanced paper about interacting clusters appeared, with the use of the scattering formalism for objects with continuous mass spectrum [9], which I understood were the self-interacting multiparticle states kept together by the so-called final state interactions. In the following years I, however, changed the subject of my research; only recently analogous concepts were reinvented as describing the objects with continuous mass spectrum which were named "unparticles" (see, e.g., [10]).

Ludwik continued for some time applications of the formalism using objects with continuous mass spectrum. He realized that such mathematical clusters could be employed to the description of multiparticle production in high-energy hadron–hadron collisions, in particular, for description of the so-called fireballs. Subsequently, he wrote the paper about the decay of fireballs, using the formalism of interacting clusters [11]; further, the method was used for field-theoretic description of clusters in statistical bootstrap model [12]. At the end of the seventies Ludwik started the collaboration with Krzysztof Redlich, young enthusiast of theoretical physics from Opole, who had just completed his studies of theoretical

physics at Wroclaw University. Their first paper on phase transitions in statistical bootstrap model with non-Abelian internal symmetries [13] became quickly recognized by international community as an important result and gained in short time more than 100 citations. With Krzysztof and new collaborators from the University of Bielefeld Ludwik entered a new track of his scientific career with the beginning of the 1980s, where he remains in principle till present days.

REFERENCES

1. *Lee T. D.* Some Special Examples in Renormalizable Field Theory // Phys. Rev. 1954. V. 95. P. 1329.
2. *Zachariasen F.* Relativistic Model Field Theory with Finite Self-Masses // Phys. Rev. 1961. V. 121. P. 1851.
3. *Licht A. L.* A Generalized Asymptotic Condition. I // Ann. Phys. (NY). 1965. V. 34. P. 161L.
4. *Lukierski J.* A Field Theory Describing Interacting Two-Particle Subsystems // Nuovo Cim. A. 1969. V. 60. P. 353.
5. *Karwowski W., Lukierski J., Sznajder N.* Field Theory Describing Interacting Two-Particle Subsystems // Ibid. V. 63. P. 509.
6. *Lukierski J., Turko L.* Lagrangian Formulation of the Zachariasen Model with a CDD Pole // Nuovo Cim. A. 1970. V. 66. P. 409.
7. *Lukierski J., Turko L.* Lee Model with Additional Fermi Interaction and the Composite Nature of V-Particle // Acta Physica Polonica B. 1971. V. 2. P. 741.
8. *Lukierski J., Turko L.* On the Field-Theoretic Formulation of Proton–Hadron Interaction. Wroclaw Univ. Preprint No. 288. 1974. 11 p.
9. *Lukierski J.* On the Scattering Formalism for Interacting Multiparticle Subsystems // Nuovo Cim. A. 1974. V. 23. P. 716.
10. *Georgi H.* Unparticle Physics // Phys. Rev. Lett. 2007. V. 98. P. 221601;
    Another Odd Thing about Unparticle Physics // Phys. Lett. B. 2007. V. 650. P. 275.
11. *Grabinska T., Turko L.* Chain Decay of Fireball in Field Theory // Phys. Lett. B. 1976. V. 62. P. 219.
12. *Turko L.* Field-Theoretic Model of Cluster Production for High-Energy Proton–Proton Collisions // Nucl. Phys. B. 1976. V. 114. P. 535.
13. *Redlich K., Turko L.* Phase Transitions in the Statistical Bootstrap Model with an Internal Symmetry // Z. Phys. C. 1980. V. 5. P. 201.