

PREFACE

This issue of *Acta Physica Polonica B* is dedicated to Andrzej Białaś on the occasion of his 90th birthday. It contains write-ups of most of the plenary talks presented at the 66th Cracow School of Theoretical Physics, entitled *Physics of Strong Interactions under Extreme Conditions* (15–19 June, 2026). Unlike most of the other Schools, which he founded and organized for many years, and which were traditionally held in Zakopane, this year's School is taking place in Kraków, on the premises of the Polish Academy of Arts and Sciences, bringing together one hundred participants from Poland and abroad.

The current School follows the one-day workshop organized at the same venue ten years ago to celebrate Białaś's 80th birthday. The lectures delivered at that time can be found in a special volume of *Acta Physica Polonica B* **47** (2016), pp. 1761–1997. Some of the participants and authors from ten years ago are also attending this School, which, however, lasts five full days.

Andrzej Białaś was born in Kraków in 1936, and throughout his life, he has been associated with Kraków, first as a student and as a professor of the Jagiellonian University, as a professor of the Institute of Nuclear Physics Polish Academy of Sciences, and from 2001 to 2018, as the President of the Polish Academy of Arts and Sciences. He has been — and still is — serving as the Chairman of the International Editorial Council of *Acta Physica Polonica B*.

Andrzej Białaś has an outstanding record as a theoretical physicist, who created in Kraków a still growing group of scientists working in theoretical high-energy and particle physics in close collaboration with local experimental groups and with theorists and experimentalists worldwide. His academic career started in 1962 when he earned his doctorate in general relativity under the supervision of Professor J. Weysenhoff. However, his most important and most recognized contributions are in the physics of strong interactions.

In 1976, together with M. Błeszyński and W. Czyż, he published a paper [1] proposing a simple, phenomenological model of multi-particle production, known as the *wounded nucleon* model. This model, along with subsequent modifications [2], is still used today to describe collisions of protons as well as heavy ions, and serves as a benchmark in studies of the quark–gluon plasma [3]. He was one of the first to propose using the quark model to describe hadron interactions at high energies [4–7].

The study of quark–gluon plasma produced in heavy-ion collisions and the possibilities for observing it have been one of his primary areas of interest for many years. The most important issues here include correlations between particles produced in the plasma, plasma oscillations [8], the phenomenon of limiting fragmentation, entropy production, and coalescence models. Białaś was also among the scientists who developed the research program for the PHOBOS detector installed at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory on Long Island, USA [9].

Professor Andrzej Białaś’s most cited works, written together with R. Peschanski [10, 11], concern the phenomenon of intermittency in the multiplicity distributions of particles produced in high-energy hadron collisions. The phenomenon of intermittency manifests itself as a power-law dependence of the factorial moments of the multiplicity distributions as a function of rapidity intervals and does not occur in most standard models of multi-particle production.

One should also mention the works on diffraction in hadron collisions [12, 13], and in particular the diffractive production of the Higgs particle [14].

This volume presents a collection of articles by speakers invited to give lectures at the 66th Cracow School of Theoretical Physics. It is a gift to our colleague and friend, collaborator, and teacher.

The School was organized by the Institute of Theoretical Physics and the M. Smoluchowski Institute of Physics of the Jagiellonian University in collaboration with the Institute of Nuclear Physics Polish Academy of Sciences, the AGH University of Krakow, and the Polish Academy of Arts and Sciences under the auspices of the Polish Physical Society. The organizers extend special thanks for financial support to the W.E. Heraeus Foundation, the City of Kraków, the Faculty of Physics, Astronomy, and Applied Computer Science of the Jagiellonian University, and the Institute of Nuclear Physics Polish Academy of Sciences.

Editor of the Proceedings

Michał Praszalowicz

Kraków, June, 2026

REFERENCES

- [1] A. Białas, M. Bleszyński, W. Czyż, «Multiplicity distributions in nucleus–nucleus collisions at high energies», *Nucl. Phys. B* **111**, 461 (1976).
- [2] A. Białas, A. Bzdak, «Wounded quarks and diquarks in heavy ion collisions», *Phys. Lett. B* **649**, 263 (2007); *Corrigendum ibid.* **773**, 681 (2017), [arXiv:nucl-th/0611021](https://arxiv.org/abs/nucl-th/0611021).
- [3] A. Białas, W. Czyż, «Wounded Nucleon Model and Deuteron–Gold Collisions at RHIC», *Acta Phys. Pol. B* **36**, 905 (2005), [arXiv:hep-ph/0410265](https://arxiv.org/abs/hep-ph/0410265).
- [4] A. Białas, K. Zalewski, «Systematics of the relations following from the quark model (I). Relations between differential cross sections», *Nucl. Phys. B* **6**, 449 (1968).
- [5] A. Białas, K. Zalewski, «Systematics of the relations following from the quark model (II). Constraints on decay distributions of resonances», *Nucl. Phys. B* **6**, 465 (1968).
- [6] A. Białas, K. Zalewski, «Systematics of the relations following from the quark model (III). Comparison of decay distributions of resonances produced in different reactions», *Nucl. Phys. B* **6**, 478 (1968).
- [7] A. Białas, W. Czyż, W. Furmański, «Particle Production in Hadron–Nucleus Collisions and the Quark Model», *Acta Phys. Pol. B* **8**, 585 (1977), TPJU-5/77.
- [8] A. Białas, W. Czyż, A. Dyrek, W. Florkowski, «Oscillations of quark–gluon plasma generated in strong color fields», *Nucl. Phys. B* **296**, 611 (1988).
- [9] PHOBOS Collaboration (B.B. Back *et al.*), «The PHOBOS detector at RHIC», *Nucl. Instrum. Methods Phys. Res. A* **499**, 603 (2003).
- [10] A. Białas, R. Peschanski, «Moments of rapidity distributions as a measure of short range fluctuations in high-energy collisions», *Nucl. Phys. B* **273**, 703 (1986).
- [11] A. Białas, R. Peschanski, «Intermittency in multiparticle production at high energy», *Nucl. Phys. B* **308**, 857 (1988).
- [12] A. Białas, R. Peschanski, Ch. Royon, «Towards an unified description of total and diffractive structure functions at HERA in the QCD dipole picture», *Phys. Rev. D* **57**, 6899 (1998), [arXiv:hep-ph/9712216](https://arxiv.org/abs/hep-ph/9712216).
- [13] A. Białas, R.B. Peschanski, «Hard diffraction in the QCD dipole picture», *Phys. Lett. B* **378**, 302 (1996), [arXiv:hep-ph/9512427](https://arxiv.org/abs/hep-ph/9512427).
- [14] A. Białas, P.V. Landshoff, «Higgs production in pp collisions by double pomeron exchange», *Phys. Lett. B* **256**, 540 (1991).