

Editor's Preface

Year 2017 marks the 100th anniversary of premature death of Marian Smoluchowski, an outstanding Polish physicist, a pioneer of the kinetic theory of matter currently known as statistical physics. On this occasion, we present the volume containing translations into English of some of Smoluchowski's most important scientific papers, as well as essays on his life and contribution to science. A part of the materials included here was previously published in the book *Marian Smoluchowski. His Life and Scientific Work* (PWN 1999). In the preface, Roman Ingarden, the scientific editor of this book, characterized the materials included there as follows:

"Marian Smoluchowski's biography is in two forms, a chronological table of the principal dates and facts of Smoluchowski's life by Alojzy Burnicki and a descriptive biographical sketch by Smoluchowski's son, Roman, professor at the University of Texas, Austin, Texas. Roman Smoluchowski [1910–1996 – ed. note] was seven when his father died in 1917, thus the sketch is based only partially on direct recollections.

The chapter dealing with the importance of Marian Smoluchowski's work is also in two parts, giving slightly different but complementary points of view. Mark Kac's essay concentrates on the problem of stochasticity introduced for the first time by Smoluchowski. Subrahmanyan Chandrasekhar's essay is more general in order to give a fuller account of Marian Smoluchowski's contributions to physics. There is also a [...] selected bibliography of publications about Smoluchowski [compiled by Alojzy Burnicki – ed. note].

Mark Kac (1914–1984), an American mathematician, was of Polish origin and between the two world wars he studied under Hugo Steinhaus and Stefan Banach at the John Casimir University in Lwów (Lvov) where Marian Smoluchowski had been professor of physics some twenty years earlier. Kac never met Smoluchowski (he was three years old when Smoluchowski died) but has always credited Smoluchowski with inspiring his own work on stochastic methods.

Subrahmanyan Chandrasekhar (born 1910 [died in 1995 – ed. note]) of the University of Chicago, Nobel laureate in physics in 1983, was of Indian extraction but indirectly connected with Smoluchowski. In 1973 Chandrasekhar, during a visit to

Poland at the time of the Copernicus 500th anniversary, was awarded the Marian Smoluchowski Medal of the Polish Physical Society in appreciation of his contributions to stochastic methods in physics and astrophysics and, especially, his pioneer article published in *Reviews of Modern Physics* in 1943 which covered Smoluchowski's contributions to this field.

Chandrasekhar received his medal from Professor Wojciech Rubinowicz, the then president of the Polish Physical Society, and initiator of this series and of this volume on which he worked until his death in 1974. In a speech at the award ceremony, Chandrasekhar noted that the Nobel prizes in chemistry awarded to R. Zsigmondy in 1925 and to T. Svedberg in 1926 were for experimental confirmation of Smoluchowski's theoretical predictions on colloidal and disperse systems and that if Smoluchowski had been alive he would certainly have been a Nobel laureate.

The original papers by Smoluchowski published in this volume were selected to provide references to the essays; the French paper for Kac's essay and the German for Chandrasekhar's. [...] The papers [...] appear in English translations which have no literary ambitions; the first was translated by Roman Smoluchowski and the second by Jerzy Kociński and Jan Maćkowiak".

The materials described above are complemented by an essay on Marian Smoluchowski's life and scientific work titled "Marian Smoluchowski and the Theory of Probabilities in Physics". This paper was written by Stanisław Ulam and published in *American Journal of Physics* in 1957.

Stanisław Ulam (1909–1984) was a Polish-American mathematician, a representative of the Lvov School of Mathematics. He is commonly known as a co-father of the American thermonuclear weapon. His paper is important for two reasons. The first one is Lvov, as this city connected the two scholars. Marian Smoluchowski brought the Lvov center to the world-class level as regards mathematical and physical sciences. Later, the famous Lvov School of Mathematics maintained these traditions. The second reason is the fact that Stanisław Ulam linked Smoluchowski's works with mathematical foundations of statistical mechanics. It is worth mentioning that Ulam was one of the pioneers in the application of statistical methods for computer calculations (Monte Carlo method).

In addition, the volume contains translations into English, prepared specially for this publication, of Marian Smoluchowski's three other extremely important papers. The first one concerns electrokinetic phenomena theory. Marian Smoluchowski received a remarkable result there. He showed that under the thin double layer assumption, the fluid flow in such phenomena is independent of boundary shape. The paper was published in 1903 in Polish and French. As it plays an important role in the contemporary physical chemistry, its translation into English should

be regarded as very desirable. The translation, conducted by Maria Spsychalska, was based on the Polish language version.

Moreover, there is Marian Smoluchowski's article about Brownian motion. The paper played a very important role in convincing scientists as to the validity of the kinetic theory of matter. The article complements Albert Einstein's earlier paper, in which Einstein linked Brownian motion with a macroscopic phenomenon, i.e. diffusion of suspended particles, and on this basis he drew conclusions on the proper description of this motion. Einstein did not investigate the problems at the microscopic level. He did not explain, for example, the problem of the thermal velocity of the Brownian particle and did not undertake to resolve Naegeli's arguments. Smoluchowski did it in his paper of 1906, in which he moved on from the world of atoms to the description of Brownian motion. This paper was translated from the German original into English by Rudolf Schmitz from RWTH Aachen and Robert Jones from Queen Mary College University of London.

The same two physicists translated Marian Smoluchowski's paper on critical opalescence published in German in 1908 (the French and Polish versions appeared in 1907). Explaining this mysterious phenomenon, discovered at the end of the 19th century, was a great challenge for the then scientists. Marian Smoluchowski was the one who presented the correct explanation, linking the intensity of light scattering with fluctuations of molecule concentration. Next, he showed that these fluctuations increase with the increase of gas compressibility, which grows sharply at the critical point.

The final part of the volume contains a bibliography of Marian Smoluchowski's scientific works, compiled by Alojzy Burnicki.

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