The contributions in this volume were all presented as invited papers at the Sixth International Conference on Mathematical Methods in Reliability: Theory, Methods, Applications (MMR 2009), which was held at Gubkin Russian State University of Oil and Gas (Gubkin University, Moscow, Russia) during June 22–26, 2009. The International Organizing Committee of this conference included organizers of the previous conferences, namely, Professors Nikolaos Limnios (France), Mikhail Nikulin (France, Russia), Bo Lindqvist (Norway), Sally McNulty (USA), Tim Bedford (UK), and Vladimir Rykov (Russia). In addition to Gubkin University, the Peoples Friendship University of Russia (PFUR), and the University of Bordeaux-2 (France) participated in the meeting’s organization.

Reliability theory is a multidisciplinary science aiming to provide complex technical, computer, and informational systems and processes that are resistant to failure. Catastrophic events of the recent past, such as the explosion of the 4th block of Chernobyl’s nuclear power station in April 1986, the failure of the blocking system that switched out 21 United States electrical stations in August 2003, and the 2009 breakdown of a turbine in the Sayano-Shushenskaya electrical station, show the necessity for the scientific community to pay more serious attention to reliability problems. Although human error played an important role in most of these events, mathematical modeling and careful investigation into causes of failure are nevertheless very important.

During the early stages of research on reliability theory, the primary focus was on developing mathematical terminology and formalism. These rudiments were established in works such as B. V. Gnedenko, Yu. K. Belyaev, A. D. Solov’ev’s *Mathematical Methods in Reliability Theory* and R. E. Barlow F. Proschan’s *Mathematical Theory of Reliability*. More modern developments and practical problems began to receive attention at the end of the last century, when the First International Conference on Mathematical Methods in Reliability Theory (MMR 1997) was organized in Bucharest in 1997. Since then, six more conferences have been undertaken as part of the MMR series:

- the second, in Bordeaux (France, 2000);
- the third, in Trondheim (Norway, 2002);
- the fourth, in Stanta Fe (New Mexico, USA, 2004);
- the fifth, in Glasgow (Scotland, UK, 2007);
the sixth, in Moscow (Russia, 2009, based on which this volume is being prepared); and
the seventh, in Beijing (China, planned for 2011).

More than 200 people from 35 countries participated in the sixth conference and presented a total of 167 talks. Ten plenary talks (1 hour) were also presented; most appear in this volume. All the talks given at the conference were broadly classified according to the following topics: “Mathematical models and methods in reliability theory” (22 sessions), “Statistical methods in reliability theory” (10 sessions), “Computer tools and support of reliability problems solution” (3 sessions), “Applications of reliability theory in industry, medicine, power stations, transport and other spheres” (9 sessions). Accordingly, these topics are well represented in the present collection.

It is worth noting that the conference also included a “round table discussion” devoted to the memory of one of the field’s greatest pioneers, B. V. Gnedenko. Professors V. Korolyuk, Yu. Belyaev, I. Ushakov, I. Kovalenko, and D. B. Gnedenko (B.V.’s son) all discussed their memories and experiences with this remarkable scientist and man. Further information on this and other conference events can be found at http://mmr.gubkin.ru.

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