There is no simple and comprehensive definition of “swarm intelligence,” and that is the way it should be. Generally speaking, in computational intelligence research a swarm comprises numerous entities, where knowledge, problem solving, or search is distributed across them and individuals persist over iterations. Though there have been attempts to eliminate randomness from some of the algorithms, most swarm implementations are stochastic to some degree. Swarms are unpredictable, with some kind of shaky truce negotiated between coordination and disorder. The field is often thought to be dichotomized between particle swarms and ant algorithms, but there are many extensions, adaptations, novelties, and innovations, and considerable overlap with evolutionary methods; there is little resistance to sharing techniques across research stovepipes, and the field of swarm intelligence itself can be visualized as a kind of metaswarm of researchers and methods.

On June 14th and 15th, 2011, the École Internationale des Sciences du Traitement de l’Information (EISTI), in Cergy, France, a few miles outside Paris, hosted the International Conference on Swarm Intelligence. The conference brought together researchers from around the world who study and use swarm intelligence algorithms. The lively discussions covered both theoretical advances and applications, and the
conference allowed for rich interactions among researchers representing many different disciplines and approaches.

Having seen the quality of the presentations, it seemed that a special journal issue would be appropriate, and submissions were solicited from attendees. After several rounds of review, the survivors can be found in this two-volume special issue of the *International Journal of Swarm Intelligence Research*.

A glance at the list of accepted papers reassures the reader that the young swarm intelligence paradigm is still expanding, or perhaps *exploding* is a better term; in the research community’s search of the space of theory and applications, the field is clearly in the exploratory, rather than exploitative, stage. Some authors here have proposed entirely new approaches to search and optimization, while others have hybridized existing forms or refined them. Some have found innovative and often exciting new uses for swarm intelligence, applying these computational intelligence methods to surprising subjects, with eye-opening results. Here we find social simulations, self-organization, constraint satisfaction problems, several insightful approaches to multiobjective optimization, and other computational challenges. Swarm intelligence is applied to such varied topics as creating art, finding protein structures, developing new kinds of robust peaches, aggregating robots, reducing the complexity of car-pooling. Researchers draw not only on ant and particle swarm algorithms, but hidden Markov chains, genetic algorithms, multiagent systems, L-systems, evolutionary game theory, the gravitational search algorithm, and other interesting methods for processing information. The domain of swarm intelligence, in other words, is exploding with new methods and new subjects for application of those methods.

Swarm methods are inspired by biological phenomena, especially the social behaviors of species that we consider to be much lower than ourselves in the hierarchy of intellectual sophistication or behavioral complexity. The obvious observation is that even insects, which show very little ability to learn as individuals, are able to accomplish marvelous feats of architecture, warfare, and efficiency in obtaining resources, by operating together as elements in a higher-level process. Gifted with a limited set of innate responses to stimuli, insects, birds, fish, and other social animals astound the human comprehension with the beauty, practicality, and magnificence of their achievements. Even if we don’t know why a flock of birds whirls and turns in the large-scale spontaneous choreography of its twilight flocking, even the most hardened individual must look up in awe at the perfection of their acrobatic display. As science looks into the behavioral algorithms that allow complexity to emerge from the aggregation of simple individuals, the question arises, what is the survival value of these emergent behaviors? And the answer inherent in swarm-intelligence results as reported in the current volume is that these observed social behaviors are in fact very powerful algorithms for solving otherwise-intractable problems offered by a complex and dynamic environment. There is intelligence in social behavior, in nature and in the computer.

Thanks to the editorial team, and especially Rachid Chelouah, for shepherding this outstanding crop of authors, holding them to deadlines, firmly but with infinite patience. There is a lot to learn from this crop of papers.

This special issue is divided into two parts. The first part is devoted to four papers while the second one contains five other papers.

*Rachid Chelouah*
*Maurice Clerc*
*James Kennedy*
*Patrick Siarry*
*Guest Editors*
*IJSIR*
Rachid Chelouah received his PhD in 2000, in computer science and operations research. He also received an engineer diploma in systems and networks engineering in 1988. Presently, he is head manager of Computer Science department in the EISTI engineering school in Cergy, near Paris (France). His primary research interests are decision support systems, operations research, swarm intelligence and their applications in complex and embedded systems, bioinformatic, and cloud and grid network. From 1988 to 1994 he worked as engineer, then as project manager in software engineering in companies like Net2s and Dassault.

Maurice Clerc was working with France Telecom R&D as Research engineer (optimisation of telecommunications networks). In 2005 he has been awarded with James Kennedy by IEEE Transactions on Evolutionary Computation for their 2002 paper on Particle Swarm Optimisation. He is now retired but still active in this field: a book in 2005 (translated into English in 2006), some papers, external examiner for PhD theses, reviewer for seminars and journals (IEEE TEC Best Reviewer Award 2007).

James Kennedy is a social psychologist who has been working with the particle swarm algorithm, which he originated with Russell C. Eberhart, since 1994. He received his PhD in 1992 from the University of North Carolina, and works for the U.S. Department of Labor in Washington, DC. He has published dozens of articles and chapters on particle swarms and related topics, in both computer-science and social-science journals and Proceedings. The Morgan Kaufmann volume, Swarm Intelligence, by Kennedy and Eberhart, is now in its third printing. In 2012, he was honored with the Pioneer Award by the IEEE Computational Intelligence Society.

Patrick Siarry was born in France in 1952. He received the Ph.D. degree from the University Paris 6, in 1986 and the Doctorate of Sciences (Habilitation) from the University Paris 11, in 1994. He was first involved in the development of analog and digital models of nuclear power plants at Electricité de France (E.D.F.). Since 1995 he is a professor in automatics and informatics. His main research interests are computer-aided design of electronic circuits, and the applications of new stochastic global optimization heuristics to various engineering fields. He is also interested in the fitting of process models to experimental data, the learning of fuzzy rule bases, and of neural networks.