Foreword

The Evolution Artificielle cycle of conferences was originally initiated as a forum for the French-speaking evolutionary computation community. Previous EA meetings were held in Toulouse (EA'94), Brest (EA'95, LNCS 1063), Nîmes (EA'97, LNCS 1363), Dunkerque (EA'99, LNCS 1829), and finally, EA 2001 was hosted by the Université de Bourgogne in the small town of Le Creusot, in an area of France renowned for its excellent wines.

However, the EA conferences have been receiving more and more papers from the international community: this conference can be considered fully international, with 39 submissions from non-francophonic countries on all five continents, out of a total of 68.

Out of these 68 papers, only 28 were presented orally (41%) due to the formula of the conference (single session with presentations of 30 minutes) that all participants seem to appreciate a lot.

The Organizing Committee wishes to thank the members of the International Program Committee for their hard work (mainly due to the large number of submissions) and for the service they rendered to the community by ensuring the high scientific content of the papers presented.

Actually, the overall quality of the papers presented was very high and all 28 presentations are included in this volume, grouped in 8 sections which more or less reflect the organization of the oral session:

1. **Invited Paper:** P. Bentley gave a great talk on his classification of interdisciplinary collaborations, and showed us some of his work with musicians and biologists.
2. **Theoretical Issues:** Current theoretical issues concern measurement, adaptation, and control of diversity, even though connections with other disciplines are still very fruitful. Morrison and De Jong introduce a unified measurement of population diversity with some interesting issues on the computation complexity of diversity measures. Sidaner *et al.* also propose a diversity measurement, which they use to analyse the way Walksat explores its search space. Bienvenue *et al.* investigate the adaptation of EA niching strategies to Monte Carlo Filtering Algorithms. Cerruti *et al.* show how an EA can be usefully exploited to tackle a hard mathematical problem related to the measure of randomness of a binary measure. Berny investigates the extension of a PBIL-like algorithm (more exactly a selection learning algorithm) for d-ary strings. Brown *et al.* present a very original Markov Random Field modeling of GAs, where they build an explicit probabilistic model of any fitness function. This work also seems to have some interesting connections with epistasis analysis approaches.
3. **Algorithmic Issues:** Devising new algorithmic issues and understanding the behavior of genetic operators and mechanisms is an important research topic in evolutionary computation. Johnson and Shapiro explain the importance of selection mechanism in the case of distribution estimation

algorithms. In order to accelerate the convergence of EAs, Abboud and Schoenauer propose building and evaluating a surrogate model and introduce a surrogate mutation. To avoid stagnation in evolutionary search, La Tendresse *et al.* propose re-initializing parts of the population at given time intervals. Dealing with noisy functions is an important topic in evolutionary computation, Leblanc *et al.* propose exploiting historical information to devise new search strategies.

4. **Applications:** This section demonstrates the successful applicability of EAs to a broad range of problems. Oudeyer presents an evolutionary model of the origins of syllable systems. Optimizing portfolio is a challenging task. Korczak *et al.* use artificial trading experts discovered by GA to optimize portfolio. Hamiez and Hao propose a scatter search approach to solve the graph coloring problem. By introducing an appropriate indirect representation, Bousonville allows the application of evolutionary methods for solving the two stage continuous parallel flow shop problem. Bélaidouni and Hao present an analysis of the search space of the famous SAT problem based on a measure called "density of states", and Roudenko *et al.* use a multi-objective evolutionary algorithm to find optimal structures for car front end design.
5. **Implementation Issues:** Until very recently, researchers in evolutionary computing used to design their own programs. This section concerns the use of tools to alleviate researchers of the task of programming. Lutton *et al.* present the EASEA (EAsy Specification of Evolutionary Algorithms) language and extensive tests on some famous functions. Keijzer *et al.* present the EO (evolving objects) library, an object-oriented framework aimed at building evolutionary applications.
6. **Genetic Programming:** Genetic Programming emerged in the 1990s as a very promising paradigm for automatic generation of programs. Robilliard and Fonlupt propose a way to overcome overfitting in a remote sensing application. Ratle and Sebag introduce a grammar-based GP approach, which uses an approach *a la* PBIL during evolution, and a technique called boosting is presented by Paris *et al.* to improve genetic programming.
7. **Constraints Handling:** This section collects studies reflecting ways to handle constraints in evolutionary computation. Le Riche and Guyon provide a new insight on function penalization for constraints handling, and Smith proposes to deal with constraints using the augmented Lagrangian penalty functions.
8. **Coevolution and Agent Systems:** Alternative evolutionary paradigms are introduced in this section. Casillas *et al.* use the coevolutionary paradigm for the learning of fuzzy-rule based systems. Srivastava and Kaldate present a multi-agent simulation modeling two competing groups in the sphere of social and ecological resources while Edmonds simulates a foraging agent in environments with varying ecological structures. Delepoulle *et al.* give some insights on the ability of learning. Seredyński and Zomaya report results on developing parallel algorithms for multiprocessor scheduling with use of cellular automata.

At this point, we would like to thank all sponsoring institutions who generously helped the Evolution Artificielle conference: the Conseil Régional de Bourgogne, the Université de Bourgogne, the Centre Universitaire Condorcet, the Communauté Urbaine Le Creusot – Montceau, the DGA (Délégation Générale pour l'Armement), the INRIA (Institut National de Recherche en Informatique et Automatique), the AFIA (Association Française pour l'Intelligence Artificielle, and the CMAPX (Centre de Mathématiques Appliquées de l'Ecole Polytechnique).

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January 2002

Pierre Collet
Evelyne Lutton
Marc Schoenauer
Cyril Fonlupt
and Jin-Kao Hao

Evolution Artificielle 2001 – EA 2001

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Université de Bourgogne, Le Creusot, France

5th International Conference on Artificial Evolution

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Invited Talk

Why Biologists and Computer Scientists Should Work Together
P. Bentley (University College London)

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