

## Reviews

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Christopher G. Langton, ed., *Artificial Life* (The Proceedings of an Interdisciplinary Workshop on the Synthesis and Simulation of Living Systems Held September 1987 in Los Alamos, New Mexico) vol. VI, Santa Fe Institute Studies in the Sciences of Complexity, Addison Wesley:Reading, MA, 1989

The volume under review regroups essays that were originally presented at an Interdisciplinary Workshop. To review a book of this kind is a quite difficult task. Although all twenty four papers it contains are supposed to have a common theme, this theme is rather general, and its treatment by each author is far from being homogenous.

The editor of the volume, Chris Langton, recognized this in the preface:

Throughout the workshop, there was a growing sense of excitement, even profound relief, as previously isolated research efforts were opened up to one another for the first time. It quickly became apparent that despite the isolation we had all experienced a remarkably similar set of problems frustrations, successes, doubts, and visions. Even more exciting was that, as the workshop progressed one could sense an emerging consensus among the participants, a slowly dawning collective realization of the essence of Artificial Life.

Reading the book it was not easy to smell the consensus, but reading Langton's introductory paper, was a pleasure. According to him:

Artificial Life involves the realization of lifelike behavior on the part of man-made systems consisting of populations of semi-autonomous entities whose local interactions with one another are governed by a set of simple rules. Such systems contain no rules for the behavior of the population at the global level and the often complex, high level dynamics and structures observed are emergent properties.

The key word is emergence. Life is a result of the organization of matter. It is effects, not things, upon which life is based. Life is a kind of behavior, not a kind of stuff. And so on.

Visualizing life as a property of the organization of the matter, rather than a property of the matter which is so organized, artificial life means a synthetic approach to study the life-as-it-could-be.

The ideal tool for this synthetic approach to the study of life is the computer, which will support informational universes within which dynamic populations of informational molecules engage in informational biochemistry.

The key word is synthesis. Rather than starting with a behavior of interest and attempting to analyze it into its constituent parts, one starts with constituent parts and puts them together in the attempt to synthesize the behavior of interest.

Synthesis and emergence are the paradigms of connectionism. But instead of using this term, the authors play with the new one: artificial life.

What is in a name? A great deal. For instance a tendency to exaggerate. In suggesting that a machine with vast organizational capability is in the offing, and that life-as-it-could-be might quickly be attained, the advocates could make themselves hostage to critics who, aware of the limitations of certain of the theories being advanced, could insist on their inadequacies.

Yet the term *artificial life* is proved to have substantial uses, in assisting in the creation of a self-conscious community of researchers who are committed to a kind of intellectual inquiry never before attempted: life made by man rather than by nature.

The authors are aware that there is nothing in its charter that restricts biology to the study of carbon-based life. Without other examples, it is extremely difficult to distinguish essential properties of life – properties that must be shared by any living system in principle – from properties that are incidental to life, but which happen to be universal to life on Earth due solely to a combination of local historical accident, and common genetic descent . . .

The book concludes with a simple piece of wisdom: since it is quite unlikely that organisms based on different physical chemistries will present themselves to us for study in the foreseeable future, the only alternative is try to synthesize alternative life-forms ourselves. A dangerous but interesting enterprise, no doubt about that.

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Bernard Burnes, *New Technology in Context: The Selection, Introduction and Use of Computer Numerically Controlled Machine Tools*. Aldershot, England: Avebury/Gower Press, 183 pp, hard-back.

If you do not understand how CNC-Machines work, or how important their implementation is, you probably cannot understand the nature of contemporary automation, as when linked together they constitute the basic elements of Flexible Manufacturing Systems (FMS). It is precisely such technology which is intrinsic to the debate about 'Flexible Specialization' as an alternative to Fordist mass-production of standardized products for homogenous markets.

Whether such an analysis, as pursued by writers like Sabel and Piore, is plausible can be debated. Others use the term 'Flexible Taylorism' as more accurately describing modern production methods, especially in Japan. The issues raised in Burnes' book are therefore very important ones vis-a-vis the study of new technology and work-organizations.

Although the sub-title of this book denotes a highly specialized monograph on CNC tools, Bernard Burnes, who teaches at the Department of Management Science at the University of Manchester Institute of Science and Technology (UMIST), has tried to cover a wide range of issues related to the implementation of new technology, which is of great concern to all those interested in human systems management.

The first three chapters of the book review the literature on new technology, work organization

and job design and a critique of these two latter themes. What then follows is five chapters on the specific case-studies involving CNC machine adoption. Two further chapters round off the study with a comparison of the cases and a conceptual framework the author adduces from his research. For example, Burnes notes that: –

'As can be seen, a number of overlapping, but not necessarily interlinking, factors have been cited in the literature as being important in shaping the outcome of technological change. These include factors external to the organisation such as the nature of the host society, the economic system and prevailing economic environments, and the type of markets the organisation operates within. Other factors, relating specifically to the organisation, that have been cited as influencing the change process are company size, product, structure, existing technology, individual and organisational values, self-interest, and managerial control objectives.' (p 13)

Companies were visited in the mid-1980s to collect the qualitative data concerned. The cases are British-based only. Burnes follows a now well-established research tradition in looking at adoption of new technology at ground level and using interviewing-in-depth techniques. Such research may provide detailed insights which large-scale surveys do not necessarily yield.

Burnes' case-studies are well-described and analysed, although they may seem a little pedestrian to the social scientist interested in modern organization. The industrial sociologist will gain rather more than the economist, as there are too few references to economic considerations behind the adoption and use of new capital inputs. The author strongly emphasizes organizational politics: –

'The last, and to some the most important, factor is the power relations between the various groups and individuals involved in the decision-making process. Here, formal authority should be distinguished from actual power. It may be the case that managers and supervisors have the formal responsibility for making decisions, but the power that workers can exercise through collective or individual action may force them to accede to their demands. Also, in the process of deciding upon a particular course of action, the information supplied

to decision-makers is crucial, as this gives a great deal of latent power to those who are responsible for collecting and providing that information. These individuals have been called 'technical gatekeepers' because they control the flow of information and thus exert considerable influence on the premises upon which decisions are taken. Therefore, in the end, those who can exert most power, regardless of the quality of the arguments and their formal level of influence, will carry the day.' (p 159)

The study does, however, compare the nine case-studies quite fully, and relates it to the literature in the field in a workmanlike manner. There are all too few diagrams schematically setting out Burnes' approach and we wait until almost the end of the book for a figure incorporating the elements of his model. This schema is an open systems model incorporating internal and external factors, with an amended use of contingency and labour process theories.

Burnes concludes that Taylorism is the main obstacle to intelligent use of CNC machines specifically, and new technology in general:

'At the moment, for most organisations, the adoption of new technology is still in its infancy; therefore, the scope for choice is still there. This research has shown that economic and technical factors are not barriers to the creation of good jobs – rather the reverse. Only by creating jobs which embody skill, variety and autonomy, thus establishing a stable and well-motivated workforce, can organisations obtain the full technical and economic benefits of new technology.

Nevertheless, Scientific Management precepts are a major barrier to the creation of worthwhile

jobs and the realisation of these benefits. Only when this influence is removed will it be possible to say that the impact of new technology will lead to better rather than worse job design and work organisation.

Hopefully, by exposing what actually happens in organisations and the counter-productive nature of Taylorism, this book will contribute to that process.' (p 164)

Organizational choice will provide a better quality of job design and work organization and this reviewer cannot disagree with these thoughts. However, the approach used is less analytically sophisticated than this reviewer would have hoped for, and the theoretical implications drawn are perhaps disappointing. All in all, Burnes has made a modest contribution to our understanding of CNC technology. The conceptual chapters could have been extended considerably, for example.

Who will find this book helpful? It is probably of greatest interest to graduate students in management, industrial sociology and psychology as well as production engineers. I doubt if practising managers will persevere with its style of discussion and presentation. Even so, Burnes's work is an interesting addition to the growing number of monographs on CNC. It would be useful if he were to next go on to do a similar study of FMS operations and link the two together in terms of a more fully developed model.

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