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PANEL:
A Springboard for Information Processing in the 21st Century

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In general terms, the question to be addressed by the panel is simply whether the Fifth Generation technologies, developed at ICOT and other centres throughout the world, will lead the development of information processing in the next century.

Considered in isolation, the most characteristic of these technologies are:

- knowledge information processing applications,
- concurrent and constraint logic programming languages, and
- parallel computer architectures.

But it is the integration of these technologies, using logic programming to implement applications, and using multiple instruction, multiple data (MIMD) parallelism to implement logic programming, which is the most distinguishing characteristic of the Fifth Generation Project.

To assess the future prospects of the Fifth Generation technologies, we need to consider the alternatives. Might multi-media, communications, or data processing, for example, be more characteristic than artificial intelligence of the applications of the future? Might object-orientation be more characteristic of the languages; and sequential, SIMD, MISD, or massively parallel connectionist computers be more typical of the computer architectures?

Certainly many of these technologies have been flourishing during the last few years. Old applications still seem to dominate computing, at the expense of new Artificial Intelligence applications. Object-orientation has emerged as an alternative language paradigm, apparently better suited than logic programming for upgrading existing imperative software. Both conventional and radically new connectionist architectures have made rapid progress, while effective MIMD architectures are only now beginning to appear.

But it may be wrong to think of these alternatives as competitors to the Fifth Generation technologies. Advanced database and data processing systems increasingly use Artificial Intelligence techniques for knowledge representation and reasoning. Increasingly many database and programming language systems have begun to combine features of object-orientation and logic programming. At the level of computer architectures too, there seems to be a growing consensus that connectionism complements symbolic processing, in the same way that sub-symbolic human perception complements higher-level human reasoning.

But, because it provides the crucial link between applications and computer architectures, it is with the future of computer languages that we must be most concerned.

The history of computer languages can be viewed as a slow, but steady evolution away from languages that reflect the structure and behaviour of machines to languages that more directly support human modes of communication. It is relevant to the prospects of logic programming in computing, therefore, that logic programming has begun to have a great influence, in recent years, on models of human languages and human reasoning outside computing. This influence includes contributions to the development of logic itself, to the development of "logic grammars" in computational linguistics, to the modelling of common sense and non-monotonic reasoning in cognitive science, and to the formalisation of legal language and legal reasoning. Thus, if computer languages in the future continue to become more like human languages, as they have in the past, then the future of logic programming in computing, and the future impact of the Fifth Generation technologies in general, must be assured.