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A Graded Bibliography on Macro Systems  
and Extensible Languages\*

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This bibliography attempts a rough characterization of a segment of the literature with respect to three attributes: aspect, degree of generality, and chronology. The categories for each attribute are described in the following sections.

The segment treated, by no means exhaustively, deals with the spectrum of user-specializable programming systems from macro systems to extensible languages. The coverage on the "garden variety" macro system is intentionally sparse and provides only a light sampling from vast amounts of highly similar material. At the other extreme, literature on the very general processor building and compiler compiler systems is omitted because of its lack of end user orientation.

The intent of this bibliography is to provide more assistance to the searcher or purposive browser than a listing of citations alone would provide. It is also a first attempt to roughly structure the diversity of publications on the topic. As such, the classification of items is highly subject to opinion and imperfectly informed judgement, so the expression of views contrary to those tabulated below will be welcomed, as will information on omitted citations.

ASPECT

The assignment into categories is based upon the aspect, purpose, or general thrust of each publication and uses the seven headings: Surveys, Foundations, Concepts, Techniques, Exposition, Applications and Manuals. A display for each aspect is presented below.

Works classified as Surveys are, of course, rather general and address a number of systems techniques or concepts within a single framework. Papers in the Foundations category address substantive theoretical issues. Those in the Concepts grouping are somewhat more diffuse, tending to have a thematic thread such as, "Here's a productive idea," or "Look at it this way". Those categorized as Techniques have "How To" issues as their main concern, often assuming without question the desirability of an extensible system or one based upon a generalization of the macro mechanism. Exposition, the most populous aspect, includes those publications oriented toward sharing the features and details of a particular language or system. Papers on Applications stress the use of extensible techniques or systems in a particular type of programming, and Manuals provide definitive descriptions of systems offered for use.

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## GENERALITY

Each bibliographic item is graded on a scale of 0 to 10 according to the generality of its viewpoint or subject matter. As mentioned, the ordinary macro system for assembler language programming is at the zero end and the full-scale extensible language system is at the ten end. Assigning generality category numbers to items falling between those extremes is an imprecise thing. The assignments to generality groups are the product of applying a fuzzy amalgamation of the loosely-defined generality indices described below. In many cases, however, it was impossible to tell enough about an item to feel confident about its generality descriptor.

One index of generality is the type of base language envisioned. Ordinary macro systems are intended only to process assembler language programs while more generalized systems can be applied to any statement-based language and others, still more general, can be applied to strings of text of any type. Related to this is the generality of the invocation mechanism. This ranges from the familiar macro name in the operation code field, through flagged invocations (i.e., prefixed by a special character) at syntactic levels possibly below that of <statement>, to mechanisms invoked by a large block of code and having their parameters interspersed throughout it. Other clues to generality are provided by the presence or absence of limitations on the nesting of invocations, and provisions for control of the process of detecting the invocations or protecting the generated (by an invocation) text from further scanning if desired.

Another group of indices arises from considering the generality of the means for specifying particular extensions. A macro definition language which provides only for parameters to be inserted into restricted environments (such as whole operands) is far less general than one which permits string operations on parameters, arithmetic, unconstrained concatenation, and the like. In this same vein is the idea of judging generality by gauging the extent to which the macro definition language or extension definition mechanism is regarded as a vehicle for specifying processing and text construction as opposed to one for declaring inserts. The existence of means for adroit conditioning, looping once for each member of a list parameter, or testing the context of an invocation correlates well with this form of generality. Facilities for remote (from the point of invocation) insertion of generated text and constructs like the many-to-many macro are also indicators of generality. A strong indicator is that of dynamism in the definitions of extensions such as the possibility of generating a new definition of a macro already in use.

Out near the extensible language end of the spectrum, indices of generality are rather sparse. Systems which offer only extensibility of data types and aggregates can be judged less general than those which allow extension in the syntactic and

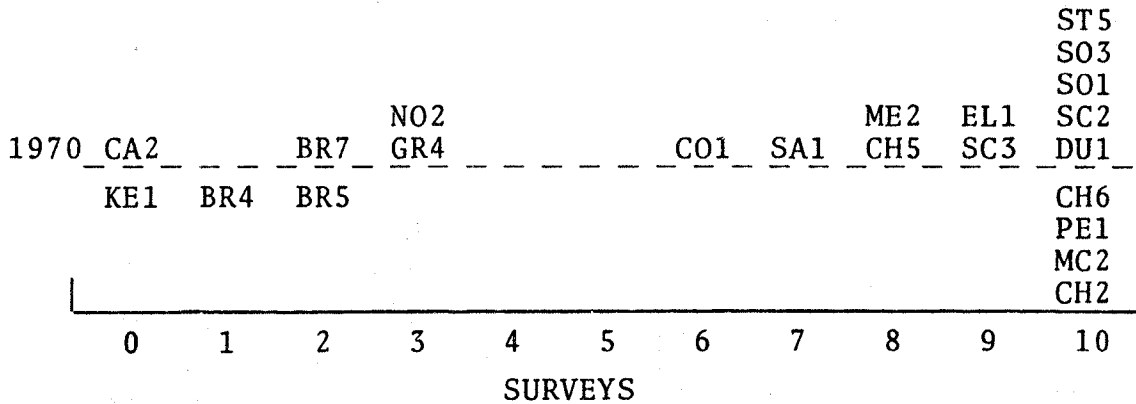
operator realms also. The degree of processor sub-detail that must be mastered in order to correctly specify extensions provides another clue, one that is applicable to macro systems as well. More general systems are more apt to consider their role as a tool for building custom facilities and thus provide a means for storing a copy of the system as currently augmented by extensions. The scarcity of indices at this end of the spectrum leads to the use of less resolution, extensible language items fall mostly into categories eight, nine and ten of the generality descriptor.

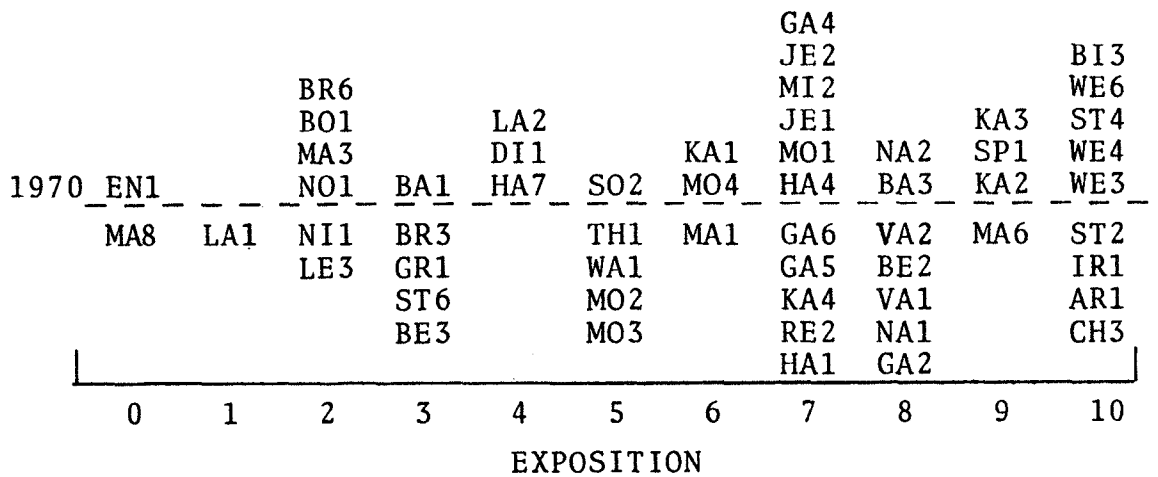
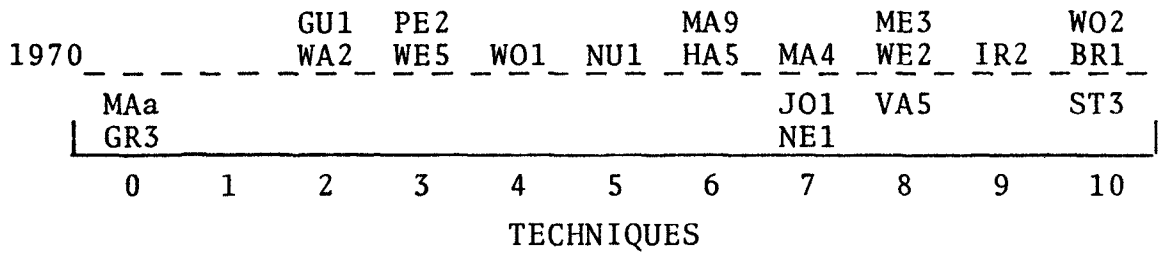
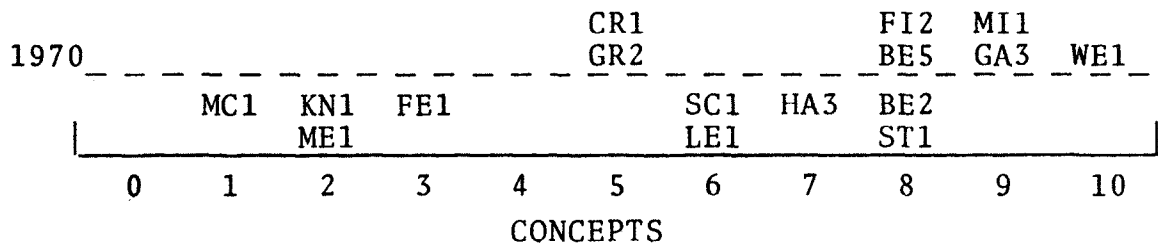
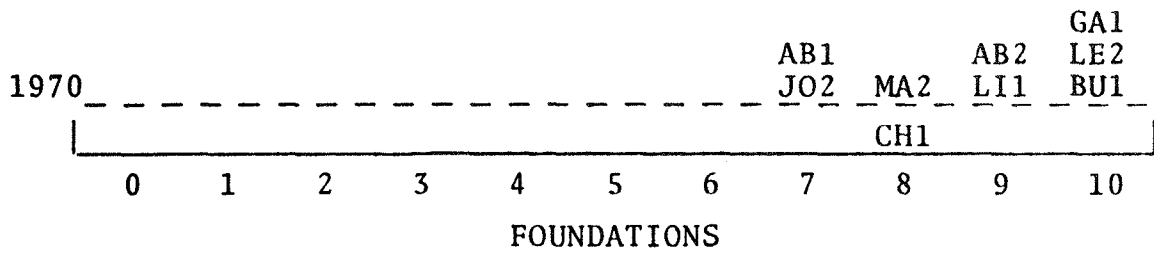
CHRONOLOGY

A simple chronological listing of items in each generality category of each aspect would contain little information. An elaborate date graph presentation would offer little insight. So, the displays below give chronological listings within categories which are aligned at January 1, 1970. No watershed works appeared at that time, it is merely a convenient date to use for distinguishing recent publications from earlier ones.

DISPLAYS

The displays of this section attempt to place each item in perspective with respect to topic, generality and recency. Each bibliographic entry of the following section has its exact publication date associated with it. Topic/generality codes composed of the first letter of the topic category suffixed by the numeric generality grading have been appended to the entries to form the graded bibliography.





1970		TE1 LA3	TA2 MA7	ZE1		CO2	SC4	CA1 AL1		BA2 CH4	
	DE1 MA5 BE4			LE4		PO1					
	0	1	2	3	4	5	6	7	8	9	10
	APPLICATIONS										

1970	VE1	WI1 PA1 VA3					CR1		VA4		BI2 WE7 BI1 TA1
	ZZ1		BR2					HA6 FI1 HA2 GA7 RE1			AR1
	0	1	2	3	4	5	6	7	8	9	10
	MANUALS										

MACRO SYSTEMS AND EXTENSIBLE LANGUAGES

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