some sense all artificial languages are created and used for the needs of humans. Not one of the known artificial languages has a component that did not exist in a natural language. However, because retrieval in the IR system is performed using a computer, it is not hard to note that in the appropriate machine operations of such retrieval, the phonetic component of the IRL is not used. Subsequently, a need for its creation does not exist. The remaining components seem to be necessary. Within the framework of the existing perceptions of retrieval, any language must have vocabulary and some type (even the simplest kind) of grammar, both of which are auxiliary means for giving meaning to a communication with the help of the semantic component of a given language. The giving of meaning (the use of the semantic component) in different languages often has different goals. In some languages, these meanings are used for human communication, in others for directing (for example, the language of stoplights regulating traffic), still in others for retrieval. That is why, in addition to the rules for selection and output of the objects must be formulated on the basis of the semantic component of the IRL, despite the fact that the object to be retrieved in the IR system is a meaning required by the user. These rules (as opposed to the rules for the expression of meaning in a communication using a natural language) may be formulated strictly and, subsequently, they may be implemented with the help of a computer (in other words, they are implemented within the IR system). Thus, we will once again note that *the main property of an artificial IRL is that its semantic component allows one to formalize the rules of selection and the output of information*. Actually, some formal rules of selection could be based on the semantic component of a natural language. However, if these rules are used during the search process, then the search is performed not in a natural language but in artificial language. Now we can consider a number of general ideas which form the foundation for the creation of the IRL and begin our consideration of the lexical component of the IRL.

It seems there are few requirements for the lexical component of the IRL. It may be asserted that through the help of words, the IRL must provide the representation of that information, which is being searched for by the users; that is, the meanings of available words must allow the retrieval of information needed by the users. It also appears important for the IRL vocabulary to cover the area that is represented by the document of the collection. In creating the vocabulary of a specific language (in creating the alphabet and forming the words of the IRL), it is possible to indicate a number of features that seem quite desirable (but not absolutely necessary). Some examples are as follows:

1. The selection of an alphabet is determined mainly by considerations of practical convenience. It would be desirable for it to consist of a minimum necessary number of standard symbols used by a computer.

2. It is desirable for the lexical component of the IRL to be convenient for use by a computer. For example, for the purpose of organizing the

storage and retrieval of information in a computer, it is convenient to use words of equal length.

In speaking about the grammatical component (syntax) of the IRL, we emphasize that all grammatical rules must be strictly formulated (formalized). This is necessary for the retrieval with a computer. A number of other considerations are possibly not as crucial. To some degree, all of them are dictated by two factors: (1) the requirements of automatic retrieval (by a computer) and (2) the quality of retrieval performed by a computer. For example, the use of a more developed grammar leads to an increase in the complexity of software for the IR system. Programs become more complex and bulky, they take up more memory, and the length of the retrieval time increases. However, if this increase in complexity greatly improves the results of the search, that is, noticeably improves the quality of information services from the viewpoint of the users, for example, then within the framework of a specific IR system such increase in complexity may be considered useful.

All of the components we have reviewed were created (and exist) so that a language could fulfill its intended purpose. Because in our case the intended purpose of the IRL is the retrieval of information, its semantical component should allow us to formulate the rules of selection and output of information. It is apparent that these must be formal rules and that they must ensure the acceptable quality of retrieval.

In the development of a specific IRL, one should take into account that with the passage of time, languages in general and IRLs in particular change. This primarily applies to the vocabulary of a language. Hence, the IRL being created must possess the ability to be modified as the language of documents and requests changes.

We have provided some of the most important requirements for the IRL. However, all these requirements have significance only within the framework of the general approach to the organization of retrieval without the participation of humans. They acquire a constructive quality only within the framework of a specific idea of performing such retrieval. Therefore, we will subsequently spend some time on the idea of the automatic retrieval of meaning-based information (through the help of a computer); that is, we will attempt to answer the question, "How can *this* be done without the participation of humans?"

The idea of automatic retrieval is based on the work of American mathematicians Mooers (1948) and especially Taube, Gull, and Waschel (1952). We will begin with our review with the work of Taube et al. By 1952 Taube et al. developed the system Unitern, which utilized formal rules for the retrieval of documents. In creating the system, Taube assumed that the *meaning of the request, just like the meaning of the document, may, with accuracy sufficient for purposes of retrieval, be transmitted by a set of certain words encountered in its text*. In other words, he believed that for purposes of retrieval, the contents of documents and requests will be transmitted to a sufficient extent by their vocabulary, that is, *only*