multiple CAS numbers were found are being resolved separately.

Although the on-line system has not been implemented as yet, TDB data gathering activities are being used to assist in the preparation of dossiers for the National Cancer Institute (NCI) on substances suspected of being potential carcinogens. These dossiers are prepared by an NCI contractor using TDB records as one source of data. In cases where no record exists, the chemical is assigned for immediate data extraction.

While the primary goal of the program is to develop a data bank that will be responsive to national needs and interests, its worldwide importance also is recognized. A number of other nations and international organizations are either at various stages of developing data banks similar to or complementary to the TDB, or are interested in seeing that one is developed.

An experiment is underway to collect data on selected chemicals through an international collaborative effort. It is being carried out under the auspices of the Organisation for Economic Co-Operation and Development (OECD) in Paris, with the OECD and some of its member nations taking part. Each participating group is selecting approximately 50 chemicals with emphasis placed upon those which are produced in large amounts.

The participants are suggesting data sources, with final selection and assignments coordinated centrally to avoid duplication. Assignment of data elements for extraction is being done on the basis of data sources and specialized interests. All data will be encoded in English and sent to NLM for conversion to machine-readable form, if necessary, and building the chemical records.

One major objective of this project is to determine whether the cooperative establishment of such data bases is more advantageous than separate action at national levels. Moreover, it is hoped that the resulting data will provide some specific results and advantages. For example, the collection could present an international means for dealing with industrial health and safety problems. Of special importance is the fact that it would be of service to all countries rather than select portions being available on a national basis only.

Semiconductor Journals

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Using an on-line literature searching system, the number of papers in many journals dealing with semiconductors was determined. The journals are ranked by the percentage of their contents devoted to semiconductors, and by the total number of semiconductor papers they published. Only four journals devote over half of their contents to semiconductor papers. Approximately half of the 19,646 papers (which were found in 91 journals) appeared in eight journals.

From its beginnings in the late 1940's, semiconductor research and development has grown rapidly; it is now a multimillion dollar effort. Coincident with this growth, semiconductor literature has also burgeoned and diversified. This study represents an attempt to characterize the literature on semiconductors by determining the leading publications in the field. Such information is useful to technical librarians who are faced with rising journal subscription costs and increasingly straitened budgets, as well as to those working in the field who desire to keep abreast of new developments. A list of leading publications is helpful in providing efficient access to much of the new technology. It is also of interest to those who follow the history of science and its network of communication.

The Lockheed Corporation's DIALOG™ system[1] was used to gather the data for this study. Briefly, the DIALOG™ system is an on-line interactive literature searching and information retrieval system which is accessed remotely using a computer terminal and standard telephone line. Currently DIALOG™ supports 16 major data bases. The searcher forms "sets" by entering terms of interest, using a simple command language. Each set formed is given a reference number, and the number of items it contains is reported to the user. The sets can be combined by the Boolean logic operators AND, OR, and NOT. The contents of any set can be displayed immediately at the terminal in a variety of formats, or they can be printed off-line on a high-speed printer. Searchable fields include the title, author(s), keywords, and source for each reference.

For this study, the *Science Abstracts A* (SAA) and *Science Abstracts B* (SAB) data bases were the first choices as indexes to the semiconductor literature. SAA covers the physics and materials science aspects of semiconductor materials, while SAB covers the electrical engineering and device aspects. Together, they would be expected to provide thorough coverage of the world's literature on semiconductors. At the time of this study, the data for 1970 through April 1975 were available on the DIALOG™ system.

By the time this study had been completed, a total of 91 physics or materials science journals publishing acticles on semiconductors had been identified. Many of these were chosen from previous journal network or journal hierarchy studies.[2-4] Some were selected after consultation with experts in the field, and a few became evident as this study proceeded. The list of journals arranged by broad subject coverage, which appears in the yearly guide to the *Science Citation Index*, was also checked.[5] Attempts were made to ensure that no major journals were omitted from this survey, by scanning several printed issues of SAA and SAB.

The search procedure with the DIALOG™ system was as follows. A set was formed containing items with terms of the form SEMICOND... in either the SAA or SAB title or keyword (the DIALOG™ system's descriptor and identifier) fields. Sets were then formed containing all papers published by each of the 91 journals. A special attempt was made to include all of the many variations of journal title abbreviations, etc. (The ASTM CODEN was used where possible, but it has been included in SAA and SAB only since 1973.) Titles for Russian journals which are translated cover to cover were included in both the original and translated forms. (All representations of a title were ORed together into one set, eliminating duplicates.)

Each journal title was then combined in turn in a Boolean

Table I. Journals Ranked by Percentage of Semiconductor Papers Published

Journal	No. of papers Total	Semicond	Percent semicond
Sov. Phys. Semicond.	2941	2617	89
Solid-State Electron.	628	537	86
J Non-Cryst. Solids	613	364	59
J Electron. Mater.	75	44	59
Solid-State Technol.	340	141	41
IEEE Trans. Electron Devices	1063	414	39
Microelectronics	64	24	38
J. Electrochem. Soc.	1956	705	36
IBM J. Res. Dev.	257	92	36
Litov. Fiz. Sb.	571	180	32
IEEE J Solid-State Circuits	457	142	31
Jpn. J. Appl. Phys.	2170	659	30
RCA Rev.	188	54	29
Appl. Phys. Lett.	2592	723	28
Phys. Status Solidi	7019	1925	27
Inorg. Mater.	1010	276	27
Elektronika	388	105	27
Thin Solid Films	953	243	25
Elektrotech. Cas.	237	57	24
J. Lumin.	275	62	23
Sov. Phys. Solid State	4572	1010	22
Solid State Commun.	3537	758	21
Philips Res. Rep.	165	34	21
IBM Tech. Disclosure Bull.	1601	325	20
Microelectron. Reliab.	139	27	19
J. Appl. Phys.	6365	1219	19
Int. J. Electron.	928	172	19
J. Phys. Chem. Solids	1579	273	17
Ukr. Phys. J.	2125	331	16
Phys. Rev. B	5663	911	16
J. Cryst. Growth	1377	224	16
Mater. Res. Bull.	667	100	15
J. Phys. C	2330	339	15
Surface Sci.	1549	220	14
Infrared Phys.	163	23	14
Electron. Lett.	2330	36	14
Comments Solid State Phys.	98	14	14
Rep. Prog. Phys.	73	9	12
JETP Lett.	2217	273	12
J. Vacuum Sci. Technol.	1394	171	12
Proc. IEEE	2227	249	11
J. Phys. D (Brit. J. Appl. Phys.)	1642	183	11
J. Solid State Chem.	445	39	8.8
J. Phys. Soc. Jpn.	3767	328	8.7
Helv. Phys. Acta	840	69	8.2
Rev. Mod. Phys.	110	9	8.1
Czech. J. Phys.	941	76	8.1
Ferroelectrics	291	23	7.9
Phys. Kondens Mater.	211	16	7.6
J. Mater. Sci.	959	70	7.3
Electron. Power	241	17	7.1
Sov. Phys. JETP	2731	188	6.9
Radio Eng. Electron. Phys.	2473	168	6.7
Z. Angew. Phys.	413	26	6.3
Physica	1513	31	6.0
Phys. Rev. Lett.	5622	315	5.6
Phil. Mag.	1346	75	5.6
J. Phys. Chem.	1369	73	5.3
Izv. Akad. Nauk SSR, Ser. Fiz.	2455	129	5.3
J. Phys. (Paris)	916	48	5.2
Sov. Phys. Usp.	275	14	5.1
Sov. Phys. Dokl.	1971	94	4.8
Bell Syst. Tech. J.	639	30	4.7
Can. J. Phys.	1538	70	4.6
Energy Convers.	132	6	4.5
Phys. Lett.	9464	383	4.0
Acta. Phys. Polon.	1363	53	3.9
C. R. Acad. Sci.	4304	164	3.8
Phys. Today	115	4	3.5
Rev. Sci. Instrum.	2642	88	3.3
J. Phys. E	1491	49	3.3
Phys. Rev. and *Phys. Rev. A*	5946	139	2.3
J. Chim. Phys.	577	12	2.1
Sov. Phys.-Tech. Phys.	2336	39	1.7
Z. Angew. Math. Phys.	492	8	1.6
IEEE Trans. Magn.	986	15	1.5
Nuovo Cimento	2835	37	1.3
Z. Phys.	2038	23	1.1
Inzh.-Fiz. Zh.	772	8	1.0
Proc. Roy. Soc. London	827	8	0.97
Am. J. Phys.	1768	15	0.85
Science	985	7	0.71
Opt. Spectrosc.	885	6	0.68
J. Opt. Soc. Am.	1787	11	0.62
Lett. Nuovo Cimento	2970	18	0.61
Aust. J. Phys.	356	2	0.56
J. Chem. Phys.	10416	41	0.39
Nature (London)	3786	14	0.37
J. Inorg. Nucl. Chem.	550	2	0.36
Chem. Phys. Lett.	4253	15	0.35
Prog. Theor. Phys.	2174	6	0.28

AND operation with the set of papers having SEMICOND... descriptors, and the number of papers in the resulting set was recorded for analysis. (Note that examination of, or counting, the individual items is completely unnecessary, and is one of the virtues of using an on-line system to do a study such as this. Indeed, this study would have been excessively laborious and time-consuming, if not impossible, in the days before on-line searching systems were available.)

A total of 26,824 items in SAA and 22,188 in SAB had the term SEMICOND... associated with them. The union of these two sets yielded 34,410 items, revealing an overlap of approximately 30% in the coverage of the semiconductor literature by SAA and SAB.

For each journal, the total number and the number of semiconductor papers published by it were recorded. The journals were ranked by percentage of papers dealing with semiconductors. Table I lists these data. The journals were also ranked by absolute number of semiconductor papers in each, and a cumulative percent of total was calculated for each. Figure 1 is a plot of cumulative percentage against number of journals.

A total of 19,646 semiconductor papers was published by the 91 journals. This is 57% of the total of 34,410 unique papers found in the search. The remaining 43% appeared in

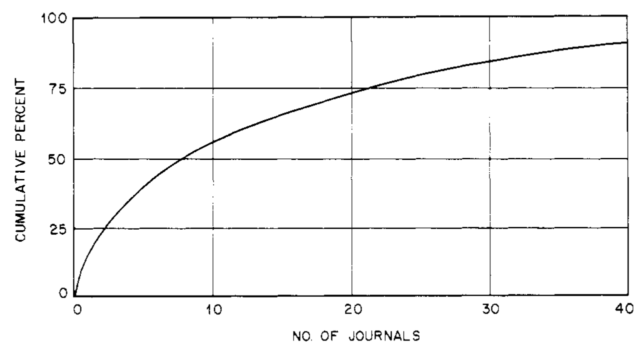

Figure 1. Distribution of semiconductor papers. Cumulative percentage as a function of number of journals.

such diverse media as conference proceedings, government reports, theses, and patents.

Table I shows that four journals (*Soviet Physics-Semiconductors*, *Solid-State Electronics*, *Journal of Non-Crystalline Solids*, and *Journal of Electronic Materials*) devote more than half of their contents to semiconductors. Twelve journals have 30% or more of their papers on semiconductors. Of the remaining journals, the last 37 have 10% or less of their contents on semiconductors, and the last 12 have less than 1%. The field is clearly concentrated in a core of about a dozen major journals and highly fragmented among many others. This clustering is a well-known characteristic of scientific publication, documented by Garfield[6] and others.[2-4]

Although the "core" semiconductor literature is concentrated in a small number of journals, they are quite diversified in their subject coverage. Of the 12 journals with 30% or more of their contents devoted to semiconductors, six are applications- or device-oriented, while the other six are more oriented toward basic research. Of the six research-oriented journals, three are primarily concerned with physics, two with materials science, and one with chemistry. Semiconductor research and development is apparently advancing on two fronts: one devoted to studying new materials and their properties, and the other devoted to developing new applications and devices based on these materials.

Turning to the absolute number of semiconductor papers published, Figure 1 shows that 8 journals published half of the 19,646 journal papers, and 22 journals published 75%. Again, a small number of journals accounts for the majority of papers. The top eight journals in terms of number of semiconductor papers published are: *Soviet Physics-Semiconductors*, *Physica Status Solidi*, *Journal of Applied Physics*, *Soviet Physics-Solid State*, *Physical Review B*, *Solid State Communications*, *Applied Physics Letters*, and *Journal of the Electrochemical Society*. Only two, *Soviet Physics-Semiconductors* and *Journal of the Electrochemical Society*, are among the top 12 journals in terms of percentage of semiconductor papers. It is not surprising that the same journal, *Soviet Physics-Semiconductors*, is first on both lists. This translation of a journal almost exclusively devoted to semiconductors would be expected to head the lists. One might inquire why *Soviet Physics-Semiconductors* has 89% of its papers on semiconductors, rather than 100%, since it is ostensibly devoted entirely to the subject. A check of a few of the citations to these papers revealed that, although some did concern semiconductor materials, they did not have the term SEMICOND... in a keyword field. This is probably due to errors or inconsistent indexing policies in SAA or SAB.

As noted previously, many (43%) of the found semiconductor papers appeared in nonjournal media. Conference proceedings appear to be a major source. Unfortunately, the DIALOG™ system does not permit searching on class of publication (such as journal, report, conference, etc.) so that no quantitative measure of the distribution of papers in nonjournal media could be made. However, based on the number of conference papers observed in the manual scan of SAA and SAB, plus the number of papers in several known major conferences on semiconductors,[7] it was estimated that as many as 20% of the 34,410 papers might appear in this form. Government reports, theses, and patents, although not covered in detail by SAA and SAB, also contribute a significant fraction of papers.

As a check on some of the results of this survey, *Chemical Abstracts* (CA) was also searched for semiconductor papers. Data for the period 1972 to April 1975 were available on the DIALOG™ system. The semiconductor coverage of CA appears, on the surface, to be much less than that of SAA and SAB; about 9000 papers in CA had keywords of the form SEMICOND.... This may be due to differences in indexing policy, but it is also due to different areas of emphasis; e.g., CA does not attempt to cover electrical engineering. CA is indexed thoroughly on a specific materials basis, so that, for example, a paper on gallium arsenide may not have the term SEMICOND... in its title or descriptor field. Such a paper would not be included in the set of all semiconductor papers, even though it concerns a very important semiconducting substance. On the other hand, SAA and SAB tend to include broad descriptive terms such as SEMICOND... in their indexing, and hence the strategy used in this survey would be expected to retrieve most of the papers on semiconductors.

The top ten journals from the SAA and SAB list were matched against the 9000 CA papers; as with SAA and SAB, they accounted for about half of the total. About 2000 papers (half of the remainder) were found to be Russian language publications, including many conferences. This is not surprising; CA covers the nonperiodical Soviet literature extensively and includes many Russian conference proceedings. Approximately 20% of the 9000 items in CA were found to be patents. Therefore, approximately 8300 items of the 9000 were accounted for as being in either the top ten journals, Russian-language publications, or patents. The remaining 700 items are widely scattered over many journals. These results from CA support the findings for SAA.

Finally, the country of publication of those journals which devote 30% or more of their papers to semiconductors was determined. Among these 12 journals, 7 were published in the U.S., 2 in the U.S.S.R., and 1 each in the Netherlands, Japan, and Great Britain. Of course, the country of publication does not necessarily indicate the geographical origin of its contents, but it seems clear that a preponderance of the semiconductor literature issues from the U.S.

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