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ASCA (AUTOMATIC SUBJECT CITATION ALERT)

A New Personalized Current Awareness Service for Scientists

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Citation indexing serves as the basis for a large-scale personalized reference system offered on a subscription basis by the Institute for Scientific Information in Philadelphia, Pennsylvania. Dr. Eugene Garfield is President of ISI and Irving Sher is Vice-President in charge of Research and Development.

■ For the past two years, the Institute for Scientific Information, Philadelphia, has been testing and operating the first commercially available large-scale computerized selective dissemination system for scientists.[1] During this time, researchers in every discipline have been testing and utilizing the ASCA system for their own particular information needs. More than 500 scientists have been involved in tests which involve a data file that indexes approximately 300,000 current articles each year with almost 10 million indexing terms.

ASCA has substantial coverage of journals in the natural sciences and has much to offer to behavioral scientists who want to "keep up" with the literature. At least 100 of the approximately 1,600 journals covered by ASCA deal predominantly with the behavioral sciences, including the *American Behavioral Scientist, Current Anthropology, Econometrica, Behavioral Science, Journal of Personality and Social Psychology, Ethnology,* and *Journal of Educational Research* – among others.[2]

Area coverage extends into such areas of science as astronomy, psychology, chemistry, biology, physics, statistics, clinical medicine, ecology, oceanography, education, etc. Each journal covered is completely indexed since it is ISI's policy to cover journals comprehensively. Selective segmentation of journals or parts of journals into a priori categories, as is done in most conventional discipline-oriented systems, usually results in loss of information for the user. One of the significant advantages of the ASCA multidisciplinary approach is that it integrates the literature of seemingly diverse disciplines. Rapid technological advances in many cases involve mixtures of disciplines, and ASCA enables the scientist to take advantage of this cross-fertilization.

However, lest any reader be given the wrong impression, the coverage of ASCA, while significant in a field like psychology, is far from complete for all the behavioral sciences. Within the next few years, ISI hopes to add more than 300 key journals in such fields as sociology, political science, anthropology, history, and other areas of the behavioral sciences.

In spite of the imperfect source coverage of the behavioral science journals per se, ASCA can often do an excellent job of retrieving pertinent information for the behavioral scientist. In today's highly multidisciplinary research, it is difficult to predict when a journal in the natural or physical sciences will provide essential information to the behavioral scientist. In this respect, ASCA is absolutely unique.

ASCA was developed after ten years of research on a retrieval system called "citation indexing."[3] The citation indexing method of retrieval of subject matter is based on the fundamental idea that when a scientist cites an earlier work in his research paper, he specifies a conceptual, that is, subject relationship between the two papers. Later, when the user of a citation index or ASCA expresses his subject interest in citations (cited references) rather than words, the semantic problems usually associated with changing nomenclatures or complex descriptors are completely avoided.

In all personalized current awareness of SDI systems (Selective Dissemination of Information), it obviously is necessary

for the user to express his desires for information in prescribed ways. Each scientist must construct a "profile" of his interests. He must "tell" the system exactly what he is interested in, and the computer, in turn, will "tell" him what current articles have appeared that are of interest based on comparisons between the interest profile the user has supplied and the attribute profiles of the individual source documents.

In the ASCA system, the user has several advantages not found in traditional current awareness systems. He can construct his profile in many different ways. He can use, among other techniques, citation profiles as well as word profiles in building his interest profile.

Questions to the ASCA system can include requests for articles which:

1. contain in their titles any specific words, initial parts of words, or phrases, either alone or in any conceivable combinations
2. are written by a given author
3. describe work done at a given organization
4. are published in a given journal
5. conform with any combinations of the above
6. cite any given paper, book, symposium, report, etc.
7. cite a given author

When a scientist submits his interest profile to the computer system, his profile "questions" act as codes which identify his current area of interest.

Each week the newly published literature of science and technology is screened by ASCA and matched against each individual profile submitted by each scientist. Every question in the profile is, in the course of a year, screened against almost 10 million index entries provided by the ASCA system. To give you an idea of the magnitude and complexity of the ASCA system, consider that in an average week, the computer examines well over 5,000 newly published items characterized in detail by some 180,000 indexing terms – including, among others, 60,000 cited references, 65,000 cited and publishing authors, and 36,000 words.

An important factor in the success of any SDI system is that it must give the user the ability to communicate with the system readily. This is true of ASCA. Users can add questions to their profile, delete questions from their profile, or reshape their profile on a weekly basis. This interaction between man and machine gives the ASCA system an ability to serve users in an efficient, convenient manner.

Another factor in the success of an SDI system is the ease with which the user has access to the documents that are retrieved. ASCA provides this access by enabling the user to receive with his ASCA reports full tear sheets of all articles retrieved through his profile (ASCAmatic). Alternately, the user may order any article reported by using ISI's OATS (Original Article Tear Sheet) service, whereupon the specified tear sheets will be mailed within 24 hours. Tear sheets of all but the longest articles can thus be obtained for $2.00 per article, and they are superior in quality to photocopies. ISI's unique library consists of multiple copies of all journals indexed from which articles are literally torn – hence, the name "tear sheets."

ASCA computer reports are mailed each week. In this way, the scientist is informed promptly of those current articles, communications, reviews, etc., that are related to questions specified in his profile. Even if the literature does not provide any "hits" in a particular week, the ASCA subscriber still receives a report informing him that the computer file was searched but that no pertinent items were found that satisfied any of the questions in his profile.

The frequency of ASCA reports makes it possible for any subscriber to read his report in a matter of minutes – an important factor to the busy scientist. The number of "hits" will naturally vary from week to week and from interest to interest. Each ASCA report is quite individualized. Even two people working on similar projects generally have specific interests which differ considerably.

While words are inherently ambiguous in any system, including controlled thesauri systems, citations provide a means for defining subject interests relatively free of ambiguity. A topic which illustrates the advantages of citation indexing over word indexing is the topic "Origin of Life." In this instance, there are practically no existing terms which will adequately permit the scientist to construct a word profile, though "prebiotic" is beginning to come into use. Nevertheless, an average of half a dozen papers are picked up each week through the use of key cited references and authors.

There are other subjects, however, for which the user's requirements can be satisfied better through a word approach. This becomes apparent in fields where the terminology is unambiguous, free of inadvertent homographs, and where this terminology is used in titles to identify the main theme of the article. Words also can be used to advantage either in fields where there are poor bibliographic practices by custom or where there is a tendency to have small bibliographies or a very diffuse bibliographic heritage. The word "laser" is an example of relatively "clean" terminology. The field of engineering illustrates an area where references are not used as much as they might. "Communication systems" illustrates a topic which might be difficult to specify in a list of cited references.

In my own experience, one of the most interesting aspects of using terms such as "communication," "reading," or "creativity" is the serendipitous fallout which is, in fact, a function of "noise." One of the most exciting aspects of the information dissemination problem is that users frequently find those things "interesting" which indexers would have ruled out as being not "relevant." In practice, it is all but impossible for an indexer to determine on an a priori basis which articles will or will not prove truly relevant to the highly specific requirements of a particular user at a later time. This holds true when the indexer is an intermediary applying restricted or unrestricted vocabulary to an article. It also holds for the original author when he "indexes" his paper by the title he chooses and by the references he cites.

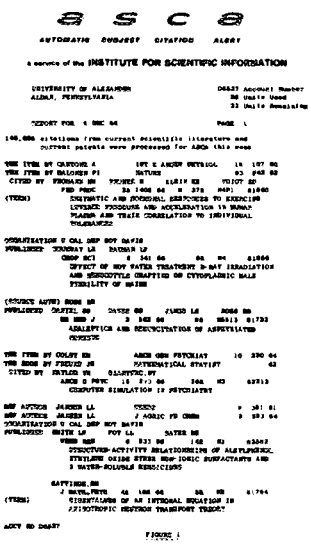
In the sense that the natural language expressions of authors form the basis of the word selection procedure in ASCA, it is a natural language system. In contrast, systems such as MEDLARS are based on artificial "unnatural" language, that is, subject heading authority lists or thesauri created by indexers. Each of these approaches has advantages and disadvantages, but it should be stressed that in the ASCA system, word profiles are used to augment and not replace the highly specific and unambiguous means of access through citation indexing.

In Figure 1, a composite ASCA report illustrating the use of various types of questions is shown. However, to illustrate the ASCA service by concrete example, in Figure 2, the ASCA profile for a hospital house staff member is shown. He is writing a paper on "Attitudes of Dying Patients toward Death." The profile contains key papers and books on this topic as well as the terms "death" and "dying." Figure 3 is a composite list of selected items to which he was alerted during the past year. The items selected illustrate "hits" based on cited references and/or the terms "death" and "dying." The usual ASCA format is followed, but a few journal abbreviations have been expanded since the reader may not have ISI's list of journal abbreviations available.

Consider Munnichs' paper from the *Bibliotheca Vita Humana* (Figure 3). Five of the 204 cited references in this "review article" appear in the profile (Figure 2). The article appeared in a journal that is not ordinarily read by psychiatrists or psychologists – no less a practicing physician. In addition, the title of the paper does not contain either of the key words "death" or "dying," and yet it is quite pertinent to this subject.

There are occasions when the Cited Reference Questions in the profile may not produce a "hit" for a pertinent item which is, however, detected by the occurrence of an appropriate word term in the title – e.g., the editorial from the *British Medical Journal* on the "Moment of Death." Though it contains five references, none of these is in this particular profile, but the word "death" is sufficient to cause a hit. The same is true of the *JAMA* editorial, "When Death Occurs."

However, the benefits of indexing terms like "death" and "dying" are somewhat diluted by the variety of circumstances in which it may occur. Consider the paper by Suinn in the *Psychoanalytic Review* on "Guilt and Depth of Reaction to Death of a President" (Figure 3). While the subscriber felt this did not really concern the main theme of his research, it was, nonetheless, of considerable interest to him for other reasons. This frequently happens and illustrates why it is difficult to establish a priori criteria of "relevance" in measuring user reactions. Still, it is easy to understand why this same ASCA client does not consider relevant the paper on "Microbial Death during Freezing in a Soft-Serve Ice Cream Freezer." Fortunately, as it turns out, the weekly frequency and format of the ASCA reports make it quite simple to skip such items – after all, the term "death" only occurs about six times per week.



a s c a

AUTOMATIC SUBJECT CITATION ALERT

a service of the INSTITUTE FOR SCIENTIFIC INFORMATION

UNIVERSITY OF ALEXANDER
ALEXA, PENNSYLVANIA

DA827 Account Number
86 Units Used
33 Units Remaining

REPORT FOR 4 DEC 66 PAGE 1

140,686 citations from current scientific literature and current patents were processed for ASCA this week

THE ITEM BY CARTOON A 197 E AMINO ORTHOCL 16 197 86
THE ITEM BY BALDWIN PI NATURE 85 943 82
CITED BY FRANKLIN SM TENNIS S SIBIR KH VICOT SC
FED PROC 26 1406 66 H 378 (4P) 81466
(TERM) SYNTHETIC AND HORMONAL RESPONSES TO EXERCISE
LEVINGE PROCEDURE AND ACCELERATION IN HUMAN
PLASMA AND THEIR CORRELATION TO INDIVIDUAL
TOLERANCES

ORGANIZATION U CAL DEP BOT DAVIS
PUBLISHED JOURNAL LE DATABASE LF
CROP SCI 6 241 66 BA BM 81866
EFFECT OF HOT WATER TREATMENT & GAT IRRADIATION
AND SERICOTTLE GRAFTING ON CYTOPLASMIC MALE
STERILITY OF MAIZE

(SOURCE AUTH) SOURCE AB
PUBLISHED CHAPTEL AB DATES 66 JUNCO LE BC66 BB
BB BBB J 3 562 66 BA 86613 81782
ABSLEPTICE AND RESUSCITATION OF ASPHYXIATED
PERSONS

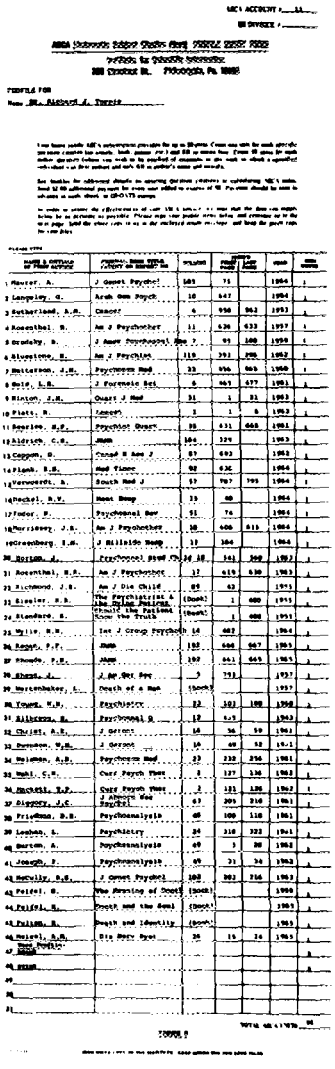
THE ITEM BY COLBY EB AMER GERM PSYCHIAT 10 290 66
THE BOOK BY FREUD JE MATHEMATICAL STATIST 63
CITED BY BATLES VH CALSTATEC BY
AMER J PSYC 16 F:) 66 BOA HJ 62713
COMPUTER SIMULATION IN PSYCHIATRY

BBF AUTHOR JARMEN LA CCEC2 P 38: 81
BBF AUTHOR JARMEN LA J AGRIC FD CHEM 3 893 66
PUBLICATION U CAL DEP BOT DAVIS
PUBLISHED SMITH LF FOY LA DATES BE
WEED BBF 6 833 BB 168 HJ 65863
STRUCTURE-ACTIVITY RELATIONSHIPS OF ALKYLPHENOL
ETHYLENE OXIDE ETHER NON-IONIC SURFACTANTS AND
3 WATER-SOLUBLE REPRESCIDES

GAFFIHOR BB
J MATH.PHYS 46 184 66 BA HB 81784
(TERM) DIRENTIALBRS OF AN INTEGRAL EQUATION IN
ANISOTROPIC NEUTRON TRANSPORT THEORY

ADCY BD D6827

FIGURE 1



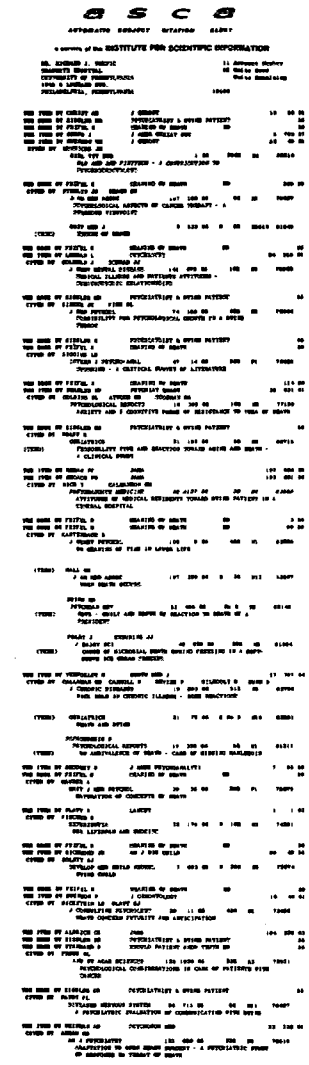
SEC'S ACCOUNT #
BB INVOICE #

PROFILE FOR
Name Dr. Richard J. Turner

NAME & INITIALS OF FIRST AUTHOR	PUBLICATION NAME, VOLUME, PAGE, DATE OR REPORT NO.	VOLUME	CITATIONS FROM	CITED YEAR	YEAR	ITEM NUMBER
1 Mayer, A.	J Genet Psychol	101	71		1964	1
2 Langsley, G.	Arch Gen Psych	10	147		1964	1
3 Sutherland, A.M.	Cancer	4	958	962	1951	1
4 Rosenthal, D.	Am J Psychother	11	626	633	1957	1
5 Brodsky, B.	J Amer Psychoanal Ass 7		95	108	1959	1
6 Rivetzone, E.	Am J Psychia	119	391	398	1962	1
7 Batterson, J.H.	Psychosom Med	23	956	965	1960	1
8 Bole, L.E.	J Forensic Sci	6	461	477	1961	1
9 Hinton, J.M.	Quart J Med	31	1	21	1962	1
10 Platt, B.	Cancer	3	1	6	1962	1
11 Beerlee, W.F.	Psychiat Quart	35	631	666	1961	1
12 Aldrich, C.K.	Hum	164	329		1963	1
13 Cappon, D.	Canad M Ass J	87	693		1962	1
14 Plank, E.N.	Med Times	92	636		1964	1
15 Verwoerdt, A.	South Med J	57	787	795	1964	1
16 Pechel, D.V.	Nerv Ment	73	60		1964	1
17 Fodor, P.	Psychosom Ser	51	76		1965	1
18 Morrissey, J.R.	Am J Psychother	18	606	615	1964	1
19 Greenberg, I.M.	J Nervous Ment	13	364		1964	1
20 Norton, J.	Psychosom Stud Soc	24 18	161	202	1963	1
21 Rosenthal, D.E.	Am J Psychother	17	619	630	1963	1
22 Richmond, J.B.	Am J Dis Child	85	62		1953	1
23 Siegler, R.D.	The Psychiatrist & the Dying Patient	(Book)	1	488	1955	1
24 Blandford, S.	Shall the Patient Know the Truth	(Book)	1	488	1955	1
25 Wylie, H.W.	Int J Group Psychoth	14	487		1964	1
26 Kogan, F.F.	Hum	152	646	667	1963	1
27 Rhoads, F.E.	Hum	152	661	665	1963	1
28 Ehrat, J.	J Am Ger Soc	7	791		1957	1
29 Warrenbaker, L.	Death of a Man	(Book)			1957	1
30 Tower, W.H.	Psychiatry	22	303	308	1958	1
31 Silberman, H.	Psychosom Q	17	6:5		1963	1
32 Christ, A.E.	J Geront	16	56	59	1961	1
33 Dunsdon, W.H.	J Geront	16	69	72	19-1	1
34 Weisman, A.D.	Psychosom Med	23	232	256	1961	1
35 Wahl, C.W.	Curr Psych Ther	2	127	136	1962	1
36 Maxwell, R.F.	Curr Psych Ther	2	121	126	1962	1
37 Diggory, J.C.	J Abnorm Soc Psychol	63	205	210	1961	1
38 Friedman, S.B.	Psychoanalysis	48	100	110	1961	1
39 Lenhan, L.	Psychiatry	24	318	322	1961	1
40 Berezn, A.	Psychoanalysis	48	3	20	1963	1
41 Joseph, E.	Psychoanalysis	48	31	34	1963	1
42 McCully, R.S.	J Genet Psychol	102	302	316	1963	1
43 Feifel, H.	The Meaning of Death	(Book)			1959	1
44 Feifel, H.	Death and the Soul	(Book)			1963	1
45 Feifel, H.	Death and Identity	(Book)			1965	1
46 Meisel, A.H.	Dis Nerv Syst	25	15	24	1963	1
47 [illegible]						1
48 [illegible]						1
49						
50						
51						

TOTAL

FIGURE 2



In other cases, one can reduce the number of hits by using appropriate *combinations* of words or word stems, particularly if one term occurs so frequently that even a weekly list of all "hits" to that one term would be intolerable. While there are people who want to see all papers on such popular topics as "DNA" or "Memory," perhaps a more selective behavioral scientist might prefer to use a combination of these terms, thereby reducing considerably the number of hits each week.

There are information retrieval system designers who would have us believe that searching systems free of ambiguity are possible. While citation indexing, in my opinion, approaches the upper limit of specificity presently achievable in economic information systems, it is well to consider that the prepared research mind thrives on ambiguity or the unexpected – serendipity – a kind of subtle browsing. Indeed, citation indexing was once called "systematic serendipity."[4] In practical terms, ASCA locates all the papers a scholar *must* read and keeps to a manageable limit the number of items of probable interest.

While the ASCA system was primarily designed to serve users in the natural sciences, physical sciences, medicine, and technology, it is now able to serve many facets of the behavioral sciences. A number of reasons have prevented us from expanding coverage in this field as fast as we would like. Two major reasons are archaic editorial practices and consumer lethargy.

Many journals in the behavioral science field retain poor citation practices and archaic notations which, however erudite, hamper every user of the journal. Great effort on ISI's part to edit these journals would be required. The benefits of indexing *any given journal must always be compared to the benefits* derived from indexing two or more other journals for a comparable effort. This must also be weighed against user demand.

Heretofore, behavioral scientists usually either have been unwilling or unable to support documentation activities. While ISI must do everything reasonable to anticipate the changing needs of all the sciences, we cannot be so far ahead of our audience as to invite economic disaster. The situation, however, is rapidly changing. Journal citation and abbreviation practices are improving. The behavioral sciences are beginning to receive significant monies from governmental and other sources for research. Increased interest in information and documentation facilities has been a logical consequence of this support.

ISI stands ready at any time to augment its coverage of any aspect of the behavioral sciences with the cooperation of individuals, professional societies, libraries, and others having an interest in this matter. Our experiences have convinced us that the methods we originally developed for the physical sciences can be well applied to the behavioral sciences.

NOTES

1. E. Garfield, ISI Eases Scientists' Information Problems — Provides Convenient Orderly Access to Literature, *Karger Gazette No. 13, (March 5, 1966) p. 2 (Reprinted in Science* 154, [1966] 762–763)
2. A complete list of the journals included in the system and additional information about ISI services can be obtained by writing the Institute for Scientific Information, 325 Chestnut Street, Philadelphia, Pennsylvania 19106.
3. E. Garfield, Citation Indexing: A Natural Science Literature Retrieval System for the Social Sciences, *American Behavioral Scientist* 7(10), (1964) 58–61, and E. Garfield, *Science Citation Index* — A New Dimension in Indexing, *Science* 144, (1964), 649–654.
4. J. F. Smith, Systematic Serendipity, *Chemical and Engineering News* 42 (35), (1964), 55–56.