From these characteristics it is hoped that someone better qualified than the present authors will be motivated to devise an algorithm leading to a complete spatial-kinetic description of the molecule. This could well be a first step toward computer simulation of chemical reactions with all its attendant implications.

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A Cooperative Project in New Drug Reporting*

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The New Drug Information project (NDI) is an experiment among pharmaceutical companies in the exchange of information on new chemical compounds reported in the current literature to have biological properties. This project was designed to provide an alerting service for the scientists of each firm that would be more comprehensive than any one company could provide without greatly increased costs. Promptness of reporting and inclusion of the chemical structure of the compound were unique features of the plan.

The idea was discussed informally during the Gordon Conferences of 1961; its champions were Mr. Walter Southern of Abbott and Dr. Joe Clark of Lederle. It was originally planned to have a single format to which all would conform, but it might have taken months of conferences to hammer out such a format, and stringent entry requirements might have prevented the participation of some companies.

In the fall of 1961, Abbott and Lederle, joined by Schering, Mead Johnson, and Squibb, began to exchange information on new drug structures in whatever forms they provided this information internally. Warner-Lambert became a member of what has come to be called the "alerting ring" in December, 1961. Reflecting changes in personnel, Schering dropped out of the ring, and Wyeth joined. Late in 1962, Squibb which had been inactive for a time, resumed participation, and Searle became the seventh member.

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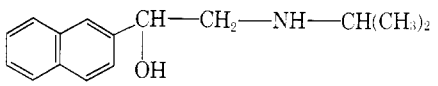
An NDI card is essentially a selective abstract of an original paper. Figure 1 is a reproduction of a 3 × 5-in. card prepared and distributed by Warner-Lambert. On the first line are the unique designations: the manufacturer's research number, the proposed generic name, and the trade name. The manufacturer and the empirical formula are stated in the upper right. The systematic chemical name is stated in the third line, under which is drawn the structure. The activity is stated in some detail, including the hosts in which the drug was tested. The reference includes the complete pagination and the month of the journal. When WL appears in the lower right hand corner it indicates that the card was originated by the Warner-Lambert library; the initials are followed by the date of distribution. Figure 2 reproduces a card prepared from information sent in by Lederle. We credit the abstract to them by placing their initials on our reproduction.

38174 (nethalide) (Alderlin) ICI
$C_{15}H_{19}NO$

α-(isopropylaminomethyl)naphthalenemethanol



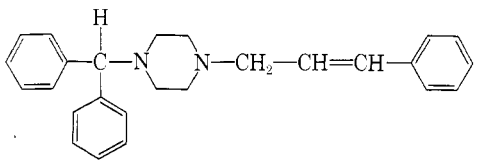
adreneric β-receptor blocker; antagonized induced tachycardia, produced a significant reduction in the resting heart rate in cats; prevented E.C.G. changes produced by catecholamines in dogs; hypotensive; vasodilator; effective in man.

Lancet 2:311–14, 314–16, 316–17, Aug. 18, 1962.
WL 9/62

Figure 1.

516 MD (Midronal) Delalande; Janssen
$N_2C_{26}H_{28}$

N-benzhydryl-*N'*-cinnamylpiperazine



antihistamine (clinical)

Presse Med. 70(43):1996, Oct. 13, 1962.
LD 11/62

Figure 2.

These cards are in format quite similar to that of Wyeth and Lederle. Abbott omits the empirical formula and chemical name. Meade Johnson draws structures on IBM cards and reproduces them on sheets. Squibb has adopted a 3 × 5-in. format which was originated by Paul deHaen's commercial service that dedicates numbered spaces to each item of information; Searle distributes sheets.

In our library we have long maintained a cross-indexed, alphanumeric file based on *Unlisted Drugs*. When we began to prepare structure cards we incorporated them in this file when possible. Cards for the *Unlisted Drugs* file were prepared singly, but spares of NDI cards were readily obtained, making other filing systems feasible. We now maintain additional files by activity, chemical class, empirical formula, and manufacturer. With these files we have been rather successful in retrieving information on compounds when only sketchy clues were available from the questioner. All members maintain alphanumeric files, and most maintain one or more additional files. Mead Johnson and Abbott code their information for machine retrieval.

The number of abstracts prepared varies widely among the members. The quantity of work produced is influenced by the amount of time a company chooses to devote to the project. It is also limited by criteria established for the inclusion of compounds. These criteria usually require that the compound shall be within the broad range of company interest, that the compound be of known structure, and that biological activity be reported for the first time. This latter requirement is interpreted by some to mean compounds not listed in standard references; by some to mean that there is no indication in the paper at hand of a previous report of biological testing. Warner-Lamber and one other company require that the compound shall not have been published in *Unlisted Drugs*, although we have recently modified that requirement to include compounds that have appeared in the two most recent issues of that journal.

We note in passing that the majority of single chemical entities appearing in *Unlisted Drugs* have been exchanged within the project. Indeed New Drug Information (NDI) furnishes entries directly to *Unlisted Drugs*. With no central clearing house and no delay for printing, NDI can be and is current. Ninety per cent of the abstracts in the project are mailed within six weeks of receipt of the journal.

In the first six months of NDI, many compounds were included that had been published in *Unlisted Drugs* months and even years before. This number declined considerably as the project progressed. New members often prepare abstracts on old compounds for a few months. This particular difficulty is self-limiting and can be expected to decrease further.

Error and duplication are not so readily eliminated. A not inconsiderable number of errors originate in the journal itself, where the structure or name is flatly inaccurate. Small errors of this type are often corrected in preparing the abstract, some go through unnoticed by the card originator, and some are presented with polite comments like "structure uncertain."

Many of the educated guesses of the originator in translating ambiguity into probability, later are shown to be correct, but it is valuable to throw ambiguous structures into the project's hopper, even if they are not correct. Some other member of the ring with a more intimate knowledge of a particular field may then elucidate the structure that has been called to his attention.

A discovered error on one's own cards is, of course, minor, while other members usually make major ones. Most members prepare corrected cards and note the section corrected; others feel it is sufficient to correct their master file.

At the very beginning duplication was of the "ships that pass in the night" variety. Originators in the several member companies, receiving the same journals at the same time, often choose the same papers to abstract for the project.

As the exchange gathered momentum a new kind of duplication became apparent. Members were reproducing the abstracts sent to them. This was, of course, what it was expected they would do. These reproduced abstracts, in decks of cards or on sheets, were distributed intra-company as an alerting service, but then the same sheets or decks were distributed to the ring. While many duplicates could be recognized on sight, most had to be checked to be sure. Had one processed JZ 1502 or was it the analog 1503? The use of initials to identify the company that prepared the abstract has eliminated much of this checking.

Of the "circle of seven," three members consider that duplication is not a problem, because duplicates can be discarded by checking an empirical formula index, but four members consider duplication a problem. Warner-Lambert is with the majority in this opinion. When there are several compounds in file with the same empirical formula, checking is time consuming, and becomes more time consuming as the file grows.

The assignment of journals is one of the obvious solutions to the duplication problem. The ring was about to try this when a commercial project for supplying the service became a close possibility. deHaen's *Drugs in Prospect* mailed their first cards to subscribers late in January, 1963. Pending evaluation of the commercial venture, journal assignment has been abandoned.

As a result of participation in the ring we were in a good position to analyze those journal titles usually available in the pharmaceutical library that give a high yield of papers on chemical compounds with reported biological activity. One might expect to find much new drug information in a publication such as *Journal of Pharmacology and Experimental Therapeutics*; however, this journal was the first reported reference for only 20 compounds, while the trade publication, *Drug Trade News*, was the first reporting source for 35 new drugs.

Of those journals responsible for more than 30 citations of new compounds it was found that three of these have been in existence 15 years or less (*Il Farmaco*, *Arzneimittel-Forschung*, and *Journal of Medicinal and Pharmaceutical Chemistry*). The latter, begun in 1959, and taken over by the American Chemical Society in 1962, would appear to be filing a real need in our subject area, since a total of 81 new compounds reported in the project to date were cited from it.

Abstracting and indexing periodicals yielded information from journal titles not held by any of the cooperating libraries. In some instances, the abstract in *Chemical Abstracts* was sufficient to produce a new entry for the project, but it would appear that many participants made the effort to obtain obscure publications to check apparently new drugs noted by title in such sources as *Current Contents* and *Index Medicus*.

In an alerting project such as this, the value of scientific society proceedings, symposia, and abstracts of papers is readily noted. Important examples are *Federation Proceedings* (cited 47 times), *Excerpta Medica's International Congress on Hormonal Steroids*, 1963 (cited 46 times), and the *Pharmacologist* (cited 33 times). See Table I.

The following statistics (Table II) present the New Drug Information project from the Warner-Lambert eye view, but they are roughly accurate for the project as a whole. From Dec. 1, 1961, to Dec. 1, 1962, nearly 3000 NDI cards were prepared by all participants. Of these, 19% were duplicates of the unavoidable type, 22% were reproduced abstracts, 10% were old, and 1% were unsuitable for various reasons. The remaining 48% were new drugs by our standards. This figure—116 significant compounds per month—is low because it includes the early months of NDI. In December, 1962, 212 new compounds were reported.

An alerting service is many things to many men. This service was designed primarily for the use of chemists, who think in terms of structure, but representatives of every scientific discipline in the member companies receive the service, as well as persons in administration,

Table I
Journals from which New Drug Information was Obtained

	No. citations
40 or more Citations	
J. Med. Pharm. Chem.	81
Arzneimittel-Forsch.	70
Arch. Intern. Pharmacodyn.	54
Nature	45
J. Am. Med. Assoc.	44
30–39 Citations	
Drug Trade News	35
Proc. Soc. Exptl. Biol. Med.	35
Farmaco (Pavia), *Ed. Sci.*	31
J. Pharm. Sci.	31
20–29 Citations	
Presse Med.	27
J. Pharm. Pharmacol.	26
Biochem. Pharmacol.	24
Chem. Pharm. Bull. (Tokyo)	24
Bull. Soc. Chim. France	22
Farmakol. i Toksikol.	20
J. Pharmacol. Exptl. Therap.	20
10–19 Citations	
Therapie	19
Brit. Med. J.	15
Chem. Ind. (London)	14
Experientia	14
J. Pharm. Soc. Japan	13
Lancet	13
Angew. Chem.	12
Brit. J. Pharmacol.	12
J. Org. Chem.	12
J. Sci. Ind. Res. (India)	12
Med. Exptl.	12
Antibiot. Chemotherapy	11
Minerva Med.	11

	No. citations
Chem. Eng. News	10
Compt. Rend.	10
1–9 Citations	
Compt. Rend. Soc. Biol.	9
J. Am. Chem. Soc.	9
Can. J. Biochem. Physiol.	8
Cancer Res.	8
Helv. Physiol. Pharmacol. Acta	8
Acta Pharmacol. Toxicol.	7
Ann. Pharm. Franc.	7
Arch. Pharm.	7
Cancer Chemotherapy Rept.	7
Chemotherapia	7
Endocrinology	7
Toxicol. Appl. Pharmacol.	7
Acta Biol. Med. Ger.	5
Acta Chem. Scand.	5
Acta Endocrinol.	5
Am. J. Clin. Nutr.	5
Ann. N. Y. Acad. Sci.	5
Bull. Exptl. Biol. Med. (USSR)	5
Bull. World Health Organ.	5
Chem. Week	5
Current Therap. Res.	5
Hautarzt	5
Nouveaute Med.	5
Pharm. J.	5
Prod. Pharm.	5
Am. J. Med. Sci.	4
Clin. Res.	4
J. Clin. Endocrinol. Metab.	4
Life Sci.	4
Med. Klin. (Munich)	4
Metab. Clin. Exptl.	4
Naturwissenschaften	4
Praxis (Bern)	4
Psychopharmacologia	4
Science	4
Am. J. Psychiat.	3
Ann. Biochem. Exptl. Med. (Calcutta)	3
Arch. Biochem. Biophys.	3
Boll. Soc. Ital. Biol. Sper.	3
Cancer	3
Chemist Druggist	3
Helv. Chim. Acta.	3
J. Antibiotics (Tokyo) *Ser. A.*	3
J. Endocrinol.	3
Klin. Wochschr.	3
Pharmazie	3
S. African Med. J.	3
Studienamnden, Suppl. to Svensk Farm. Tidskr.	3
Z. Physiol. Chem.	3
Acta Biol. Acad. Sci. Hung.	2
Acta Physiol. Pharmacol. Neerl.	2
Am. Druggist	2
Am. J. Cardiol.	2
Am. J. Trop. Med. Hyg.	2
Ann. Medico-Psychol. (Paris)	2
Ann. Surg.	2
Arch. Exptl. Pathol. Pharmakol.	2
Arch. Internal Med.	2
Biochim. Biophys. Acta.	2
Biochem. Biophys. Res. Commun.	2
Boll. Chim. Farm.	2
Bull. Acad. Polon. Sci.	2
Deut. Med. Wochschr.	2
Diseases Nervous System	2
Drugs. Res. Rept.	2
Endokrinologie	2
FDC Rept.	2
Hospital (Rio de Janeiro)	2
Intern. J. Fertility	2
Japan Circulation J.	2
J. Chem. Soc.	2
J. Clin. Exptl. Psychopathol.	2
J. Gen. Microbiol.	2
J. Immunol.	2
J. Indiana State Med. Assoc.	2
J. Lab. Clin. Med.	2
J. Nervous Mental Disease	2
J. Nutr.	2
J. Parasitol.	2
Med. J. Australia	2
Oncologia	2
Roczniki Chem.	2
Therap. Umschau	2
Vopr. Virusol.	2
Wien. Med. Wochschr.	2
Acta Physiol. Acad. Sci. Hung.	1
Acta. Physiol. Latinoam.	1
Agressologie	1
Am. J. Gastroenterol.	1
Am. J. Ophthalmol.	1
Am. J. Physiol	1
Am. J. Vet. Res.	1
Am. Rev. Respirat. Diseases	1
Anaesthetist	1
Ann. Allergy	1
Ann. Inst. Pasteur	1
Antibiotiki	1
Arch. Dermatol.	1
Arch. Immunol. Terapii Doswiadczalne	1
Arch. Ital. Sci. Farmacol.	1
Arch. Ital. Sci. Med. Trop. Parassitol.	1
Arch. Pathol.	1
Australian Vet. J.	1
Biochemistry	1
Brit. J. Anaesthesia	1
Brit. J. Cancer	1
Brit. J. Exptl. Pathol.	1
Bull. Chem. Soc. Japan	1
Bull. Drug Addiction	1
Calif. Med.	1
Can. J. Chem.	1
Can. Med. Assoc. J.	1
Circulation	1
Circulation Res.	1
Clin. All-round (Osaka)	1
Clin. Pharmacol. Therap.	1
Collection Czech. Chem. Commun.	1
Dia. Med.	1
Diabetes	1
Dokl. Akad. Nauk SSSR	1
Electroencephalog. Clin. Neurophysiol.	1
Exptl. Neurol.	1
Fertility Sterility	1
Fukuoka Acta Med.	1
Gazz Med. Ital.	1
Ger. Med. Monthly	1
Hippokrates	1
Intern. Rec. Med.	1
Japan J. Pharmacol.	1
J. Am. Geriat. Soc.	1
J. Appl. Chem. (London)	1

	No. citations		No. citations
J. Appl. Physiol.	1	*Obstet. Gynecol.*	1
J. Bacteriol.	1	*Ochanomizu Med. J.*	1
J. Chiba Med. Soc.	1	*Penn. Med. J.*	1
J. Lipid Res.	1	*Pharm. Ind.*	1
J. Mol. Biol.	1	*Pharm. Index*	1
J. Neuropsychiat.	1	*Practitioner*	1
J. New Drugs	1	*Proc. Roy. Soc. Med.*	1
J. Nucl. Med.	1	*Progr. Med. Chem.*	1
J. Physiol. (London)	1	*Radiobiologiya*	1
J. Reprod. Fertility	1	*Radiobiol. Radiother.*	1
J. Trop. Med. Hyg.	1	*Radiol. Med. Torino*	1
J. Urol.	1	*Rec. Trav. Chim.*	1
Lab. Invest.	1	*Russ. Chem. Rev.* (English Transl.)	1
Lille Med.	1	*Schweiz. Apotheker-Zg.*	1
Mfg. Chemist	1	*Schweiz. Med. Wochschr.*	1
Med. Ann. District Columbia	1	*Sci. Sinica* (Peking)	1
Med. Welt	1	*Scot. Med. J.*	1
Mod. Drugs	1	*Tetrahedron Letters*	1
Mod. Med. (Tokyo)	1	*Texas Rept. Biol. Med.*	1
N. Y. State J. Med.	1	*Trans. N. Y. Acad. Sci.*	1
Nord. Med.	1	*Ugeskrift Laeger*	1
Nard. Veterinarmed	1	*Vet. Med.*	1
Northwest. Med.	1	*Vet. Record*	1

Citations from monographs, symposia, abstracts of scientific meetings, indexing and abstracting publications

	No. ref.		No. ref.
Federation Proc.	47	Anglo-German Med. Res.	2
Intern. Congr. on Hormonal Steroids, Milan, 1962	46	Antimicrobiol. Agents & Chemotherapy (Annual)	2
The Pharmacologist	33	Laurentian Hormone Conference, 1963	2
Unlisted Drugs	14	Progr. Drug. Res.	2
Chem. Abstr.	11	Psychopharmacol. Abstr.	2
Chemother. Res. Bull.	11	Abstr. Am. Pharm. Assoc., Sci. Sect.	1
Biol. Abstr.	8	Brevaria	1
Proc. Am. Assoc. Cancer Research	8	Cancer Chermotherapy Abstr.	1
ACS Abstr. Papers of the Meetings	8	Dig. Neurol. Psychiat.	1
Abstr. Japan. Med.	6	Interscience Conf. Antimicrobial Agents and Chemotherapy (Annual)	1
Patents	6	Pharm. Praxis, Beilage Pharmazie	1
Current Contents	5	Proc. Intern. Congr. Biochem. 5th	1
U. S. Vet. Admin.: Medical Research in the Veterans Admin. (Annual)	5	Proc. Tenth Congr. Int. League Rheum.	1
CINP III Congress, Munich	4	Surgical Forum (Book)	1
I.C.R.S. Med. Rept.	3	Trop. Diseases Bull.	1

marketing, international, and overseas affiliates. Companies report that they use the abstracts to search for new drugs, to generate ideas, to compare reported agents with compounds in the process of development, and to check new agents of specific foreign firms to see if closely related drugs are available, and thus to check if a foreign firm may license one agent to them and another closely related one to a competitor.

Six of the seven members of the alerting ring have subscribed to deHaen's *Drugs in Prospect*. Now NDI enters a new phase. We plan to continue our service for a few months to check the new service for speed, accuracy, and coverage. Because of our many months of experience we are in a unique position to do this. The goals and difficulties are familiar to us.

If the commercial service succeeds, we will certainly cheer it on. It was made possible by NDI, an extraordinary exchange project that is the product of the work and cooperation of so many information specialists.

Table II

Statistics	Dec. 1, 1961–Dec. 1, 1962
565	True duplicates
665	Reproduced abstracts
316	Previously published in *Unlisted Drugs*
28	Unsuitable for various reasons
1419	Significant new compounds
2993	Total abstract prepared