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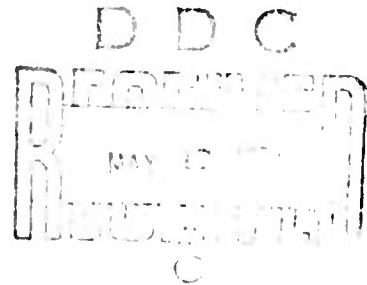
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Foreign Scientific Literature
Annual
~~TECHNICAL~~ TECHNICAL REPORT

January 1 - December 31, 1973

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ARPA Order No. 1622-4

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Summary

Under this contract Informatics Inc. has reported monthly all significant 1973 open-source publications on Soviet-bloc developments in the following fields: laser technology, effects of strong explosions, geosciences, particle beams, and material sciences. Optional topics, published irregularly, included the following: atmospheric physics, geomagnetic pulsations, energy conversion, biocybernetics, gravitational radiation, research vessels, and tunneling rockets. Reports in progress include climatology, satellite geodesy, laser fusion, and surface effect vehicles. Additional items of interest have been included under a miscellaneous interest category.

Routine laser reportage was concentrated on high-power beam interaction with matter. All laser material continues to be listed in the quarterly Bibliography of Soviet Laser Developments; the fourth quarter of 1973 corresponds to no. 14 in the bibliography series. A cumulative author index to all Bibliographies was completed in draft form.

We conclude that the present reporting format provides a timely review of recent Soviet developments in the selected fields, while retaining a quick-response capability to deal with any other desired topic.

Contract No. F44620-72-C-0053

Annual
~~1973~~ TECHNICAL REPORT

This report covers the contractual period from January 1 through December 31, 1973.

General Program Objectives

The stated purpose of this contract has been to provide document search and evaluation of Soviet-bloc publications dealing with a list of technical subjects of interest to ARPA. Following the identification and selection of pertinent material, it was then to be reported in forms ranging from bibliographic listing to extended subject studies, depending on topic importance and sponsor interest. Our coverage for 1973 has accordingly been as follows:

1. Laser Technology - During 1973 all articles found in the current Soviet-bloc scientific literature on the topic of laser research were recorded and published in the form of quarterly bibliographies, logically structured by subject. With publication of the fourth quarter issue for 1973, a total of 14 bibliographies will have been published, comprising a total on the order of 10,000 entries.

We have, in addition to specific laser subjects, included in the bibliographies all material judged to be of potential relevance to quantum electronics, such as optical propagation in various media, spectroscopy of laser materials, and nonlinear optics in general.

The sheer bulk of this retrieval has precluded a complete evaluation of all laser material in terms of the state-of-the-art. Instead, selected laser topics of known interest have been more closely monitored and any pertinent findings brought to the attention of the AFOSR monitors. Thus for purposes of the monthly reports, coverage was generally limited to high-power laser effects on solids and gas. In 1973 a total of 208 articles of this type were reported, of which 126 were abstracted in the monthly reports. These covered experimental and theoretical studies of laser damage to metals, dielectrics, and various other materials, as well as laser-plasma interaction.

A large number of papers are devoted to detailed theoretical studies of the exact nature of the beam-target interaction; the majority of such papers continue to deal with effects on dielectric materials.

Per DARPA request, a collection of abstracts on Soviet work in laser fusion was begun in late 1973, and is scheduled for publication in early 1974. A preliminary review shows that over 200 articles on Soviet laser fusion work have been published since 1969.

A cumulative author index to all Laser Bibliography entries through mid-1973 was completed in draft form and is in review. When complete this index will be machine stored and updated with subsequent issues of the Laser Bibliographies. It is hoped that the author index can be supplemented in future with subject and affiliation indexes.

2. Effects of Strong Explosions - The effort was continued in 1973 to report all Soviet material pertinent to strong explosive effects, either directly concerning nuclear detonations or on explosive effects which were judged relevant to nuclear effects. The topics covered were generally those of the 1972 effort, including shock wave effects; hypersonic flow around bodies; soil mechanics; exploding wires; equations of state; and miscellaneous explosion effects. Consistent with past practice, the only reference to nuclear explosions in this material is to non-Soviet tests.

In 1973 a total of 693 items were selected, of which 155 have appeared as abstracts.

3. Geosciences - The 1973 geosciences coverage reported on Soviet and East European seismology, instrumentation, deep seismic sounding, etc. During the year, 276 items were selected from original source material received by Informatics. Of these selections, 106 comprehensive abstracts were prepared. Two monographs were extensively abstracted, and a 25 page article on earthquake prediction was translated.

4. Particle Beams - Selections under this topic are concentrated on the generation and propagation of high-current pulsed electron beams. A substantial volume of Soviet reportage is appearing on this subject, particularly on techniques for high voltage or explosive field emission from needle-form cathodes, yielding nanosecond pulses on the order of kiloamperes. The coverage includes relevant aspects of linear induction accelerators, plasmotrons and related generating hardware. Treatment of this topic was broadened during 1973 to include all material relating to beam current propagation in various media, particularly on factors limiting beam stability.

Output on this topic appears to have tapered off in recent months; however articles by leaders in the field such as Fursey and Mesyats continue to appear.

In the contract year a total of 239 items were selected on particle beams and 142 of these have been abstracted.

5. Material Sciences - Items selected here are from advanced studies of material properties with emphasis on extremal conditions. Coverage has concentrated on high pressure, high temperature and superconductivity research. The growing volume of articles on superconductivity is noteworthy; in the last quarter of 1973 over 90 such articles appeared.

The overall selections for 1973 amounted to 995, of which 151 have been abstracted and published.

6. Optional Topics

A number of optional topics were covered and included either as a section of the monthly reports or published under separate cover. These were as follows:

a. Atmospheric Physics - This topic was treated five times, with collections of abstracts and bibliographies primarily dealing with optical propagation in the atmosphere and geomagnetic pulsations. Increased interest on the latter was indicated by ARPA, hence the most recent report comprised a retrosearch on all recent Soviet work in Pc-1 pulsations and relevant hydromagnetic studies. Also included in this effort was a 10-year bibliography of all work by two authors prominent in the field, V. A. Troitskaya and Ya. Likhter.

b. Energy Conversion - Two bibliographies on Soviet energy conversion studies were published. Coverage included solar energy, fuel cells, thermoelectric, thermionic, magnetohydrodynamics, storage batteries, and miscellaneous other types.

A comprehensive review of solar energy technology, covering the USSR and other non-U.S. sources, was nearly completed in 1973 and is scheduled for publication early in 1974.

c. Biocybernetics - Two bibliographies on recent work in biocybernetics and bionics were published, totalling 207 entries.

d. Gravitational Radiation - Per ARPA request, a review was made of Soviet work on gravitational radiation detection, covering the past ten years. The bulk of this report reviews the work of Braginskiy's team at Moscow State University, who lead in Soviet studies of this effect. An annotated bibliography of Braginskiy's and other Soviet papers is included, totalling 76 entries.

e. Research Vessels - A comprehensive list of all known Soviet R/V's was published, and a 2-part report on the description and activities of 8 specific R/V's was prepared at ARPA request.

f. Tunneling Rocket - A review article on Soviet experiments with a rapid tunneling rocket (plasma drill) was published.

g. Other - Reports on Soviet climatology, satellite geodesy and surface-effect vehicles were in progress at the end of 1973 and are planned for publication in the first half of 1974.

7. Miscellaneous Interest - Items not falling into any assigned headings but judged of possible interest have been presented under this topic. A wide range of subjects were encountered, including ball lightning studies, underwater arc discharge, radar signatures of land and sea surfaces, laser separation of isotopes, and numerous others.

In this year 300 such items were reported, 59 of which were abstracted.

8. Literature Acquisition - Under the acquisitions funding of this contract we have been able to purchase all relevant source material through European book dealers. Delivery has been arranged so that most periodicals are received by us approximately one month after publication; newspapers are generally not over 5 days old on arrival. Acquisition of some irregular publications, mainly conference proceedings, special collections of articles, institute proceedings and the like, is more difficult, mainly owing to the very small number of such issues printed in the USSR. We therefore have standing orders on certain vital topics placed with several dealers, and have in this way accumulated a substantial collection of pertinent irregular material. Under the 1973 contract we subscribed to a total of over 600 sources.

Through a recent arrangement with the State Department we now have access to items listed in their Russian Book List, which has provided some useful additions to our own book acquisitions.

Additional aid has come with the establishment of our Soviet-bloc holdings as a bona fide library. This has enabled a fruitful exchange with other libraries such as Battelle, MIT and NASA on wanted material.

9. Translations - The intent of this program is to limit translations only to items of vital interest. Accordingly the translation effort in 1973 was limited to a few articles which totaled well below the 100,000 word maximum specified by contract.

10. Conclusions - The 1973 effort under this contract has been provided by eight analysts, one research assistant, and associated clerical and administrative assistance. All of the literature accession, review and evaluation is done by this staff, as well as the bulk of the reporting; a small percentage of selected material has been abstracted by outside consultants.

We conclude that the present system is providing a rapid and complete exploitation of Soviet technical topics of stated ARPA interest. While the monthly reporting schedule is necessarily fragmented among the several topics, it does yield the most rapid dissemination of the latest information. In addition, the set of reports provides a data base from which a more extensive coverage of any desired topic may be made as desired.