THE TWENTY-TWO MOST FREQUENTLY CITED APL PUBLICATIONS — AFTERTHOUGHTS

The reflections by John C. Murphy bring to a close the series on “The Twenty-Two Most Frequently Cited APL Publications.” The articles were a collection of great diversity and high merit. They generally dealt with new ideas in active areas of research and development, presented to the scientific and engineering community for the first time. But as was pointed out by Garfield, who developed the citation assessment methodology used by us to identify “influential” publications, citation frequency alone does not provide a wholly satisfactory perspective of the impact of any specific publication, whether in advancing a scientific field or in furthering the technical program of the establishment where it originated. For various reasons, some articles may have had an influence well beyond their citation-frequency score. I will provide a few examples to illustrate that point.

SATELLITES AND SPACE PHYSICS

A key publication that opened the door for all subsequent APL efforts in space research, satellite engineering, and systems development was published nearly 30 years ago by Guier and Weiffenbach. While of pivotal importance to APL, it received only scant attention in the technical literature. The authors pointed out that “...in the absence of serious refractive effects one can reasonably expect to obtain accurate orbits through an analysis of the Doppler shift of the radio signal of an Earth satellite as a function of time.” It had been shown a few months earlier in an internal memorandum by McClure, who was familiar with the Guier-Weiffenbach work, that accurately known satellite orbits could, in turn, be used to pinpoint the position of an observer on the surface of the earth or ocean. An important use of satellites was established, but much careful work had to be done to determine and account for refraction effects. Several years later, greatly refined orbits and atmospheric corrections were combined in order to design an altimeter instrument with unsurpassed precision and usefulness.

Having established a firm foothold in an important satellite development program (Transit), APL carried out a distinguished program in space research that led to the publication of several hundred articles in planetary physics, satellite oceanography, and satellite design. Several were included in the “most frequently cited” collection in Vol. 7, No. 4 of the *Johns Hopkins APL Technical Digest*.

HIGH-SPEED PROPULSION AND COMBUSTION

In the field of high-speed propulsion, which concentrated largely on air-breathing ramjets as the engine best suited to propel payloads to supersonic speeds beyond the operating range of turbojets, the citation-frequency record did not provide a good indication of the impact of APL publications on technical progress. At the inception of the engine development in the late 1940s, a basic input to the analysis of ramjet operations was made by Rudnick. He developed the thermodynamic principles of heated gases flowing through variable area inlets, ducts, and nozzles that provided analytical tools for determining the performance of different engine designs and fuels.

Interest in higher and higher speeds with ramjets that have been recently pushed to the limit of escape velocity required the formulation of novel and ingenious design principles. In an important article by Billig and Dugger, a way was shown to achieve high-propulsion efficiency at hypersonic speeds. Although its citation frequency was low, the article received the Silver Medal Award from The Combustion Institute.

In support of the development of ramjets, an article by Avery and Hart analyzed fundamental limits in combustion devices set by the finite rates of chemical reactions that heat the gases flowing through the engine. Quite apart from its usefulness for measuring the reactivity of various fuel-oxidizer combinations, the concept of a “highly stirred reactor,” by separating chemical parameters from physical processes (such as droplet evaporation and mixing), was widely adopted in the analysis of chemical engineering operations. The paper, however, has been cited rarely in the literature.

In a series of influential publications, Hart and McClure laid the foundation for understanding the intricate couplings between sound waves and solid propellant combustion in rockets. Acoustic resonances can be highly destructive and may lead to catastrophic structural failures of propellant grains or overheating of vital structural parts. For this and a series of subsequent publications, McClure was awarded the Hillebrand Award of the American Chemical Society. The citation frequency was only moderate.

OTHER TOPICS

A substantial number of other articles could be mentioned that did not figure prominently in the citation-
frequency analysis but that, nevertheless, influenced the fields they addressed. For example, a mathematical problem in a topology of long standing, “The Paving of the Plane” formulated by Hilbert nearly 100 years ago, was solved. Monitoring ocean waves from space with synthetic aperture radar promises to provide a global, real-time picture of sea states everywhere on the ocean.  

CONCLUSION

Citation-frequency analysis works well in fields where perceptive and active groups of research workers make collective judgments about the significance of individual publications. This is especially true in rapidly developing areas where new insights stimulate a large body of researchers to use them promptly. In our experience, articles of unusual pertinence and interest were identified by this method. But to bring the APL publication achievements into full perspective, particularly in engineering and technology, articles that are selected on a more qualitative basis need to be added.

Since 1985, with the participation of a knowledgeable committee, such a subjective selection process has been used at APL to identify articles that are judged to be of unusual significance. It remains to be seen if the citation assessment that requires several years of data accumulation will agree with those selections.

REFERENCES


READING LIST

Arranged in six broad categories, the reading list highlights much of the unclassified research at APL during the past 40 years. It provides, in the main, survey articles of long-range individual and group efforts—some terminated, others ongoing.

Together with “The Twenty-Two Most Frequently Cited APL Publications,” the list delineates areas of interest to the APL research staff. With more than 3000 publications to survey, it cannot be an exhaustive list, but it is intended to be a guide to a rich lode of accomplishments in many areas of science and engineering.

Physics/Chemistry

In the Beginning

Free Radicals Confined

Unstable Chemical Fragments

Organ Pipes in the Sky

Fast Reactions of Molecular Fragments

Chemical Switches

Unsteady Planetary Rotations

Space/Satellite Systems
First Steps into Space

Johns Hopkins APL Technical Digest, Volume 8, Number 2 (1987)
Currents in Space I


Currents in Space II


Planetary Magnetic Fields


Satellite Altimetry


Oceanography

Waves Everywhere


Waves Across the Seas


Engineering

Limits to Attacks

W. H. Goss, “Guided Missiles,” Transcript of address delivered to the joint meeting of the Engineers Club of Philadelphia and the Philadelphia Section, American Society of Mechanical Engineers (Feb 21, 1950).

Limits to Growth


From Mach 5 to Orbital Velocity


Unseen Hazards


Inexhaustible Energy from the Sun


Electromagnetic Propagation Anomalies


Unsnarling Traffic


Biomedicine

The Urban Fire Problem


Pain


Paraplegic Aids


Flows in Biological Pipes


Information Networking in Hospitals


Outer Space to Inner Space


A Cancer Cure


Eye Damage


Miscellaneous

The R&D Business


The Struggle for World Leadership


Ancient Astronomical Measurements