METEORITE SEARCH IN VICTORIA LAND, ANTARCTICA IN 1977–1978 AUSTRAL SUMMER

Keizo YANAI

National Institute of Polar Research, Kaga 1-chome, Itabashi-ku, Tokyo 173

Abstract: A U.S.-Japan meteorite search team found 9 specimens around the Allan Hills in South Victoria Land in 1976–1977 summer. The area was revisited in 1977–1978 and 311 meteorite specimens were recovered. This collection was named officially as Allan Hills-77 meteorites and the specimens were designated initially as Allan Hills-77001 to Allan Hills-77311 in order of discovery. These meteorites were collected very carefully by means of the predetermined collection procedure in the field, in order to minimize contamination and to maximize the preservation of scientific data in each specimen. These specimens were kept frozen during field storage, shipment, preservation and initial processing at the Johnson Space Center, NASA, Houston, Texas. Preliminary classification in the field revealed that these specimens are 6 irons, 4 achondrites, 2 carbonaceous chondrites, and 295 chondrites of various types and metamorphic grades including 4 dubious specimens which may be meteorites but probably terrestrial rocks.

1. Introduction

Nine meteorites including one iron, one achondrite and a variety of chondrites were found during four hours' visit to the bare ice area near the Allan Hills by the U.S.-Japan joint party on January 18 and 20, 1977 (CASSIDY *et al.*, 1977; YANAI, 1978b). This discovery suggested a finding of many more specimens there, and so a new joint party revisited the same site during the summer of 1977–1978. The U.S. participants in the second season were William A. CASSIDY (Principal investigator on the U.S. side) of Department of Earth and Planetary Sciences, University of Pittsburgh and Billy P. GLASS of Geological Department, University of Delaware. Japanese participants were the present author and Minoru FUNAKI, both from the National Institute of Polar Research.

Four scientists mentioned above visited the area around the Allan Hills and Carapace Nunatak in South Victoria Land 230 km north of the U.S. McMurdo Station. The team conducted detailed search on foot for meteorites on the bare ice around the camp sites located close to the Allan Hills and Carapace Nunatak. The reconnaissance by helicopter was made more extensively than the previous season (1976–1977). The team worked for 21 days from December 26, 1977 to January 25, 1978.

A total of 311 individual specimens were newly collected from the bare ice

and firn areas near the Allan Hills and were officially named Allan Hills-77 meteorites. These specimens consist of 6 irons, 4 achondrites, 2 carbonaceous chondrites and 295 chondrites of various petrological types and metamorphic grades including 4 dubious specimens.

On January 23, 1978, an iron meteorite, later named Victoria Valley meteorite,

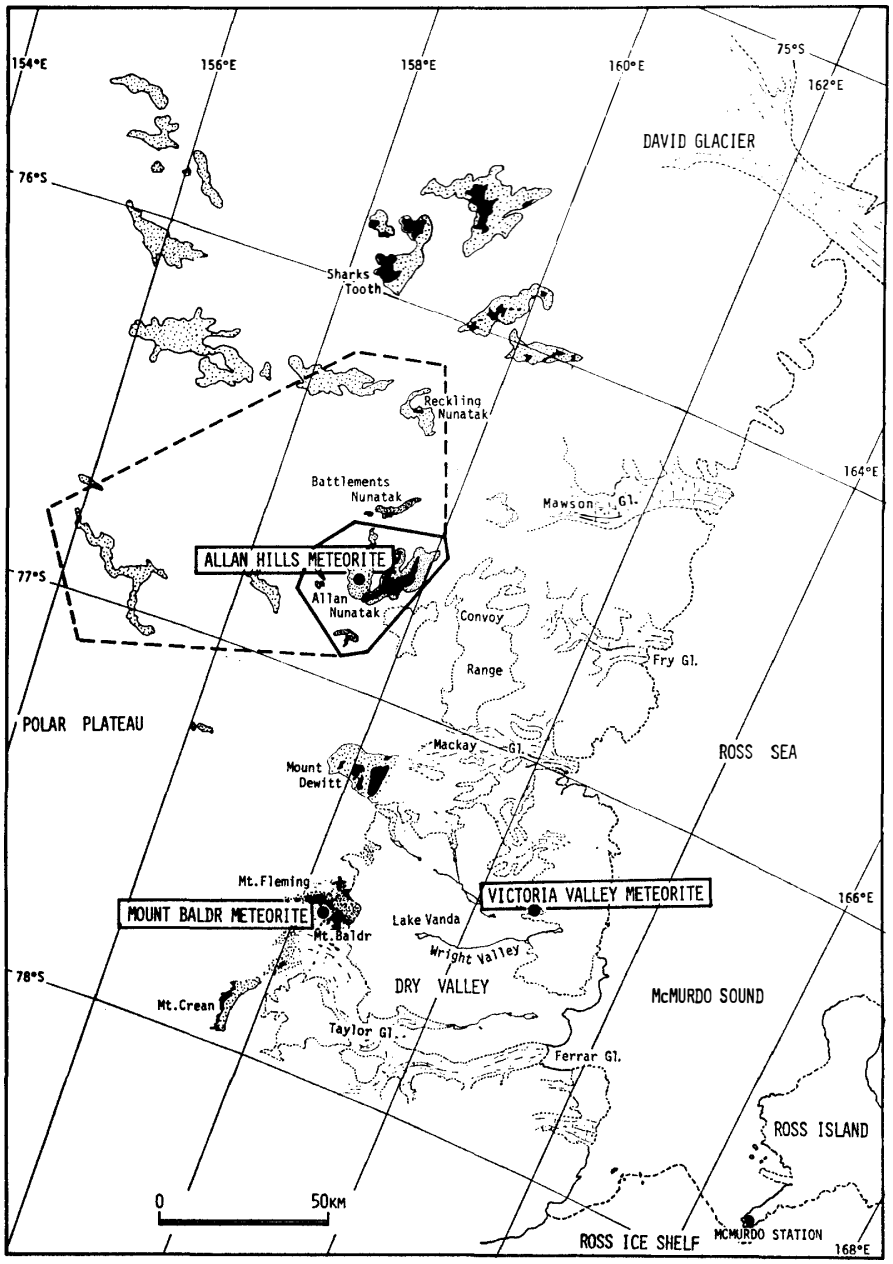

Fig. 1. The location of meteorites collected in Antarctica (modified from YANAI, 1978b).

was found by Harold BORNS and Steven KITE, University of Maine, in morainal deposits at the end of the Lower Victoria Glacier, Dry Valley. This iron meteorite was present by BORNS to the U.S.-Japan joint party as a scientific material.

Fig. 1 shows detailed locations of meteorites found in the Victoria Land. The locations of all Antarctic meteorites ever found until 1978 are shown in Fig. 2.

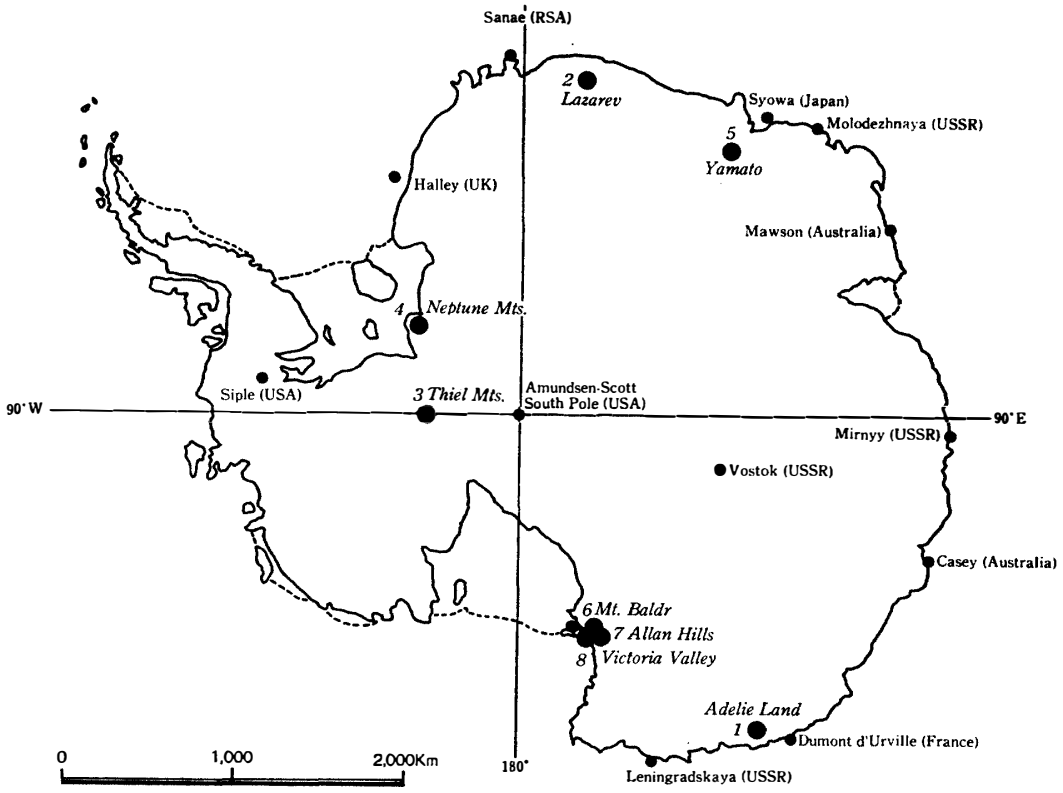

Fig. 2. The locations of meteorites collected in 1976–1978 in South Victoria Land: closely searched area is shown by solid line and reconnaissance area by dotted line.

2. Recovery of Meteorites

During the field season of December 1977 to January 1978 the U.S.-Japan joint party revisited the bare ice area of the Allan Hills where the team had previously found 9 meteorites in January 1977. The area searched, in the central part of the large bare ice field near the Allan Hills, is shown in Fig. 3.

It seems probable that Antarctic meteorites have been protected from chemical and biological contamination, because they have been kept under very cold condition in the contamination-free environment. Therefore, utmost care was required in collecting the specimens for scientific research. In the 1977–1978 field season

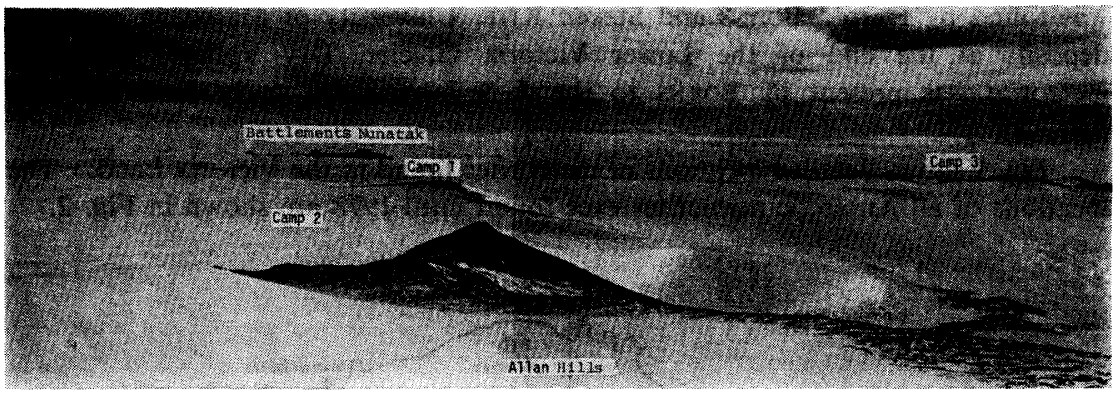

Fig. 3. Searched area of the bare ice field near the Allan Hills viewed from the south.

all meteorites from the Allan Hills were collected in a very careful way, using chemically and biologically clean materials for handling the specimens. In picking them up in the field, teflon-covered gloves were used. The specimens were put in a teflon bag with a number tag, sealed up with the teflon tape, and stored in the large steel container with the bubble wrap. Some rare meteorites such as carbonaceous chondrites were picked up with teflon-covered gloves, wrapped in an aluminum foil, put in the sealed can of stainless steel with a number tag, and stored in the steel container. Meteorites collected were preserved in a cold and clean condition, at least until the initial examination was made.

Materials for collection and shipping were supplied by the Johnson Space Center, Houston, Texas. All meteorites recovered went through the initial processing (examination and classification) and subdivision using a clean cabinet filled with nitrogen gas of the lunar sample curatorial facilities in the Johnson Space

Table 1. Preliminary tabulation of specimens recovered from the Allan Hills area during the 1977-1978 field season.

Type	Number of individuals	(1976-1977 season)
Iron	6+1*	1
Chondrite of a variety of types and metamorphic grades (except carbonaceous chondrite)	295	7+2**
Carbonaceous chondrite	2	0
Achondrite	4	0
Dubious	4	0
Total	311+1*	9+2**

* Collected by Harold BORNS and Steven KITE, University of Maine, in the morainal deposits in the Lower Victoria Valley on January 23, 1978.

** Mt. Baldr meteorites.

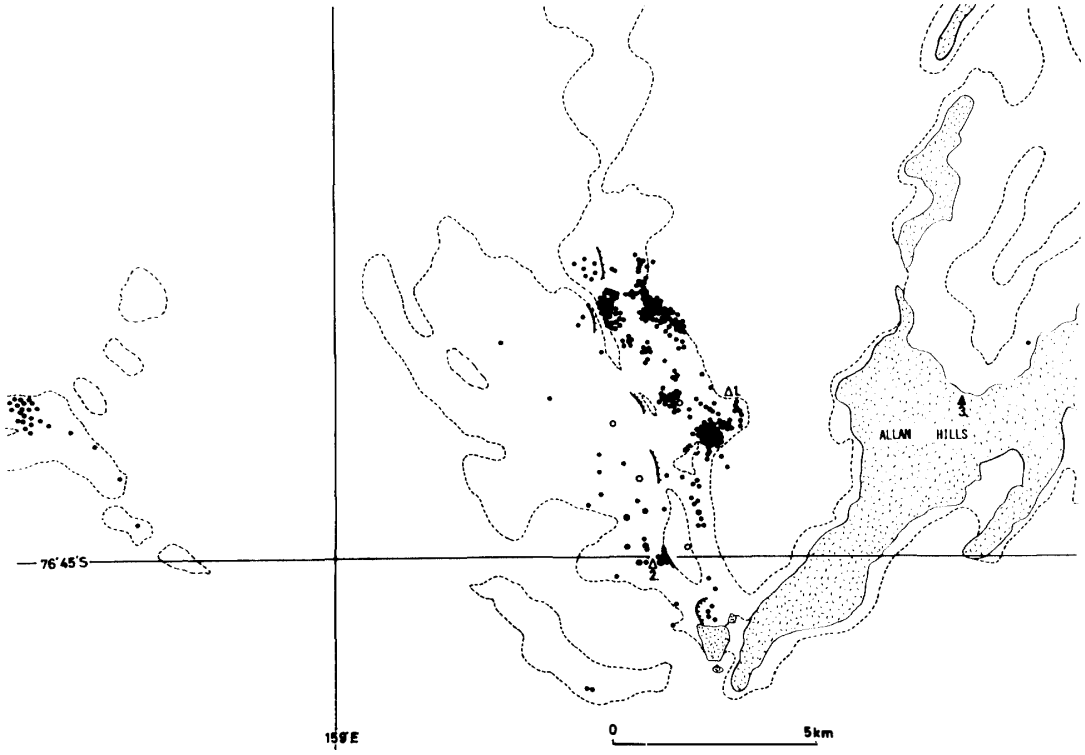

Fig. 4. Distribution map of the Allan Hills-77 meteorites in Allan Hills, South Victoria Land. Allan Hills-76 meteorites are also shown with the same symbols after correction of sampling sites. Numbers 1, 2 and 3 are the camp sites. Solid circle: chondrite. Open circle: achondrite. Dot in open circle: iron. Half solid circle: carbonaceous chondrite.

Center. There are many rocks in the bare ice area near the Allan Hills, and it was not easy to distinguish meteorites from rocks, especially from black basalt. Nevertheless in the 1977–1978 season, 311 meteorite samples were recovered at three different places around the Allan Hills. As shown in Table 1, preliminary classification *in situ* and initial examination after the field work revealed different kinds of meteorites. The locations of the Allan Hills meteorites including the 1976–1977 collection are shown in Fig. 4. The photographs of rare meteorites taken *in situ* are presented in Figs. 5a–5f.

3. Allan Hills-77 Meteorites

Three different types of occurrence in the field were recognized during the collection of the Allan Hills-77 meteorites. The most common type is that meteorites lie on the surface of bare ice after ablation of ice sheet. This occurrence is similar to the Yamato meteorites in most cases (YANAI, 1978a). A few were found on the surface of several centimeters thick firn on the bare ice. There is only one

Fig. 5a. Allan Hills-77135, achondrite, 482.5 grams.

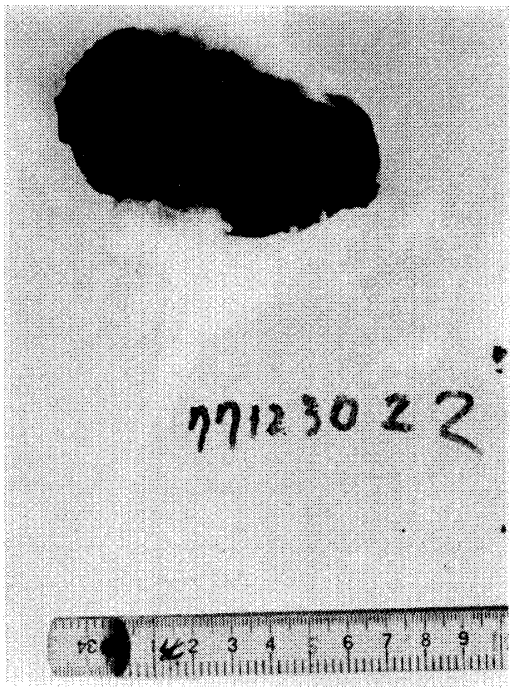

Fig. 5b. Allan Hills-77179, eucrite (achondrite), 235.5 grams.

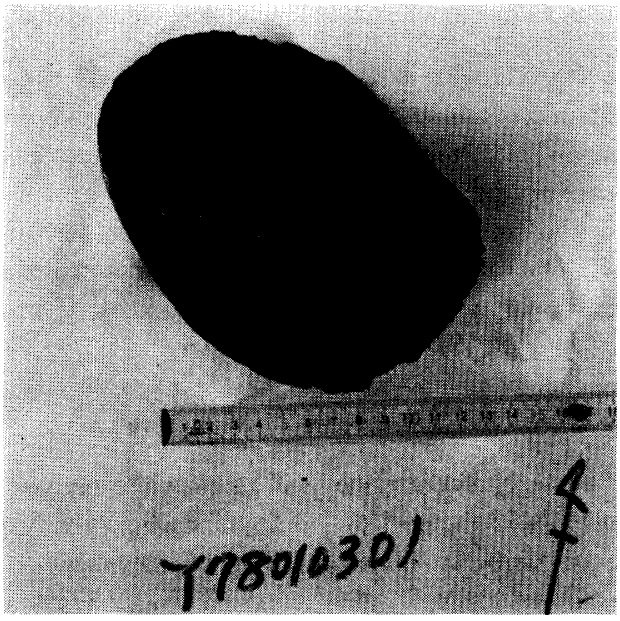

Fig. 5c. Allan Hills-77265, ureilite (achondrite), 1995.7 grams.

Fig. 5d. Allan Hills-77274, diogenite (achondrite), 676.2 grams.

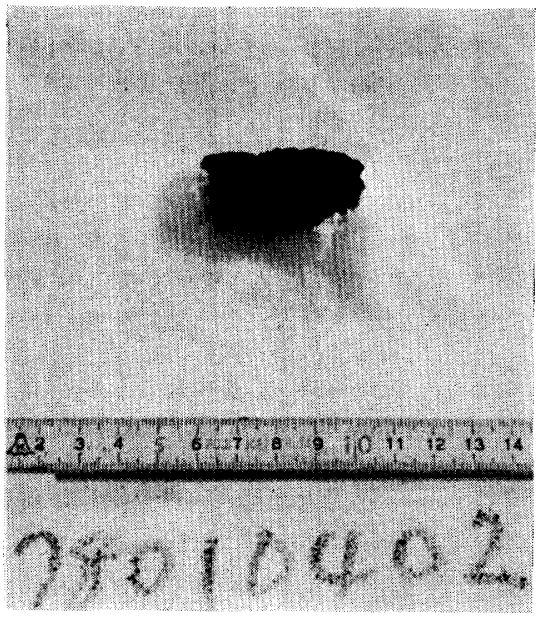

Fig. 5e. Allan Hills-77284, carbonaceous chondrite (C2), 19.91 grams.

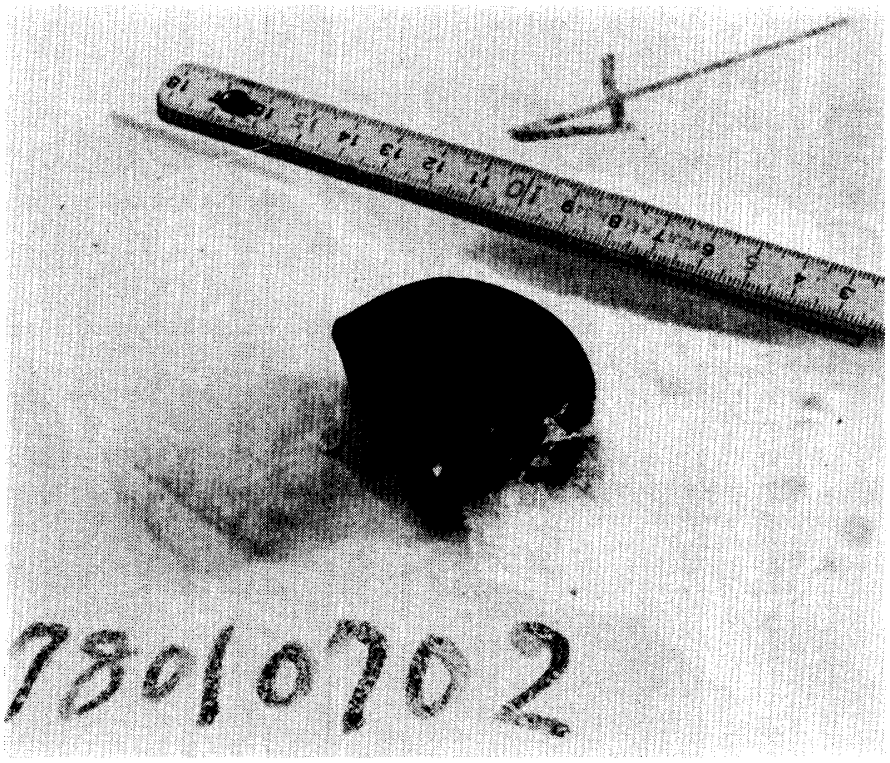

Fig. 5f. Allan Hills-77303, carbonaceous chondrite.

case that one meteorite was found buried its greater part in the bare ice. This occurrence may be interpreted that the meteorite was coming up from below to the bare ice surface of the ice sheet. This is also a rare case in the Yamato meteorites (YANAI, 1978a).

Most of the Allan Hills-77 meteorites are almost entirely covered with fusion crust and some broken meteorites are also partially covered with fusion crust. Generally, crust of the stony meteorites was abraded partially by weathering, so that sometimes chondrules are observed on the broken surface. Iron meteorites were characterized by a spherical shape with fused surface and thumbprints.

Most of the small specimens are fragmentary and deeply oxidized showing a brown color. It is not sure whether the fragmentation occurred when the parent body dashed into the earth's atmosphere or by impact on the earth's surface or by mechanical breaking on the bare ice after the fall. Some meteorites are considered to have landed softly onto the deep and soft snow in interior Antarctica, because they are covered almost entirely with fusion crust.

In both the Yamato Mountains and the Allan Hills, it is a common feature that many meteorites were found on the bare ice surface, but there is some difference between the Yamato Mountains and the Allan Hills in their distribution (concentration). All the Yamato meteorites collected were not found in the moraine consisting of much rocks, whereas in the Allan Hills, many meteorites were found in the moraine with basalt, tillite, coal, sandstone, etc.

Acknowledgments

The author is very grateful to the United States Antarctic Research Program, National Science Foundation, at McMurdo Station for their cordial assistance.

References

CASSIDY, W. A., OLSEN, E. and YANAI, K. (1977): Antarctica: Deep-freeze storehouse for meteorite. Science, **198**, 727–731.

YANAI, K. (1978a): Yamato-74 meteorites collection, Antarctica from November to December 1974. Mem. Natl Inst. Polar Res., Spec. Issue, **8**, 1–37.

YANAI, K. (1978b): First meteorites found in Victoria Land, Antarctica, December 1976 and January 1977—Report of the U.S.-Japan joint program titled "Antarctic Search for Meteorites" 1976–1977—. Mem. Natl Inst. Polar Res., Spec. Issue, **8**, 51–69.

(*Received June 20, 1978*)