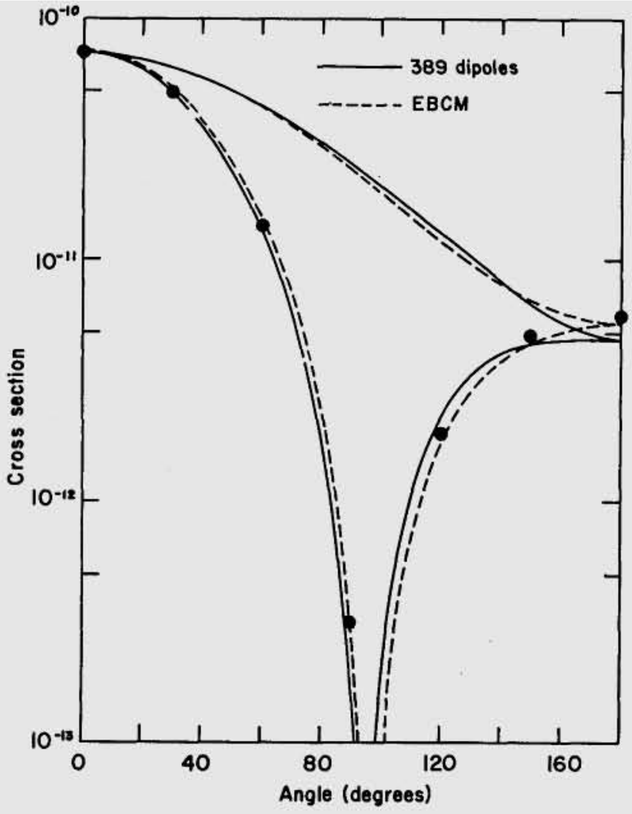

Fig. 2. Same as Fig. 1 with center or inner sphere displaced in the direction of the incident beam halfway toward the outer surface.

nent. The inner sphere has size parameter $\alpha_1 = 0.75$, $m_1 = 1.33$; the outer region has size parameter $\alpha_2 = 1.1$, $m_2 = 1.5$. The curves are normalized in the forward direction. EBCM and FA give nearly identical results. The PP calculation was carried out for both 297 dipoles and 389 dipoles. Although the agreement is not so good as for a homogeneous sphere, it is reasonably good considering the graininess of the model. The calculation with 389 dipoles is considerably closer to the EBCM calculation than that with 297 dipoles, so that increasing the number of dipoles would presumably continue to improve the accuracy.

In Fig. 2 the inner sphere is displaced in the direction of the incident beam with its center halfway toward the outer surface. As noted in earlier work,[2,3] this has little effect upon the forward scattering (indeed this is why normalization was effected at zero scattering angle), but there is about a 20% displacement of the differential backscattering signal. Here again EBCM and FA are in close agreement. PP differs somewhat, as expected from the graininess of the model. As already noted, the agreement should become better with a larger number of dipoles, but this would require considerably longer computing time.

We find generally in our calculations that the simple iterative method of solving Eq. (3) (used also by PP) tends to have poor convergence for size parameters greater than ~1.5. Furthermore, our results indicate that a far larger number of dipoles are needed to calculate accurately the scattering cross sections for structured spheres. Presumably, other numerical methods, such as the extremum principle of Yung,[6] might be employed to reduce the time required to solve Eq. (3) for these cases.

Despite these limitations, the method of PP provides a highly general calculation of scattering cross sections for particles of arbitrary shape and internal structure. Indeed, as noted in the original paper,[1] it is also applicable to particles made up of anisotropic media. The further extension of our algorithm to irregularly shaped particles or to dipoles with anisotropic polarizability appears to require only obvious minor changes in evaluating the coefficients in Eq. (3) without any changes in the method of solution. By taking the view that the polarizability per unit volume is an inherent point property of the material making up the particle, it is possible to argue that the polarizability to be assigned to the dipole at $\bar{r}_i$ is that computed using the Clausius-Mosotti relation for the dielectric constant at $\bar{r}_i$, as if, for each $\bar{r}_i$, the particle were regarded as uniform for purposes of calculating the corresponding α_i'. With α_i' values calculated in this way, it should be possible to extend the method to the general case of continuously inhomogeneous particles.

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Photometric properties of an unidentified bright object seen off the coast of New Zealand: comments

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Maccabee[1] has presented an analysis of a bright nocturnal light photographed from an aircraft off the coast of New Zealand. This analysis has significance only if, as the author claims, conventional sources of light are ruled out. We do not believe that this has been done. In particular, we do not accept the implication that the source was airborne at a height of ~1 km and consider that a very likely source of the light was one of a number of squid boats that could have been in the area.

The flight must be seen in context; it was the return leg of a flight between Wellington and Christchurch, during which the Wellington radar had recorded many anomalous echoes and the aircraft passengers had seen many unidentified lights. The passengers were a TV crew UFO-hunting following similar sightings on a previous night. The period of the sightings (on and after 20 December 1978) coincided with the arrival in New Zealand waters of a large squid-fishing fleet.

The light analyzed by Maccabee[1] was seen shortly after takeoff from Christchurch. Figure 1 in Ref. 1 is incomplete. Our interpretation of the available evidence is shown in our Fig. 1, where the data are drawn principally from a previous,

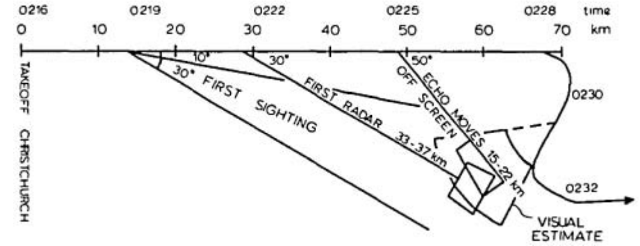

Fig. 1 Estimated flight path of the aircraft and position of the bright object on 31 December 1978. The object was in the enclosed areas at the times indicated.

detailed report by Maccabee.[2] The major difference is that ~3 min after the object disappeared off the right-hand side of the radar screen, the pilot made a right turn toward it. After flying southeastward for ~2 min, during which time the light moved relative to the aircraft to an estimated 30° below and to the right, the pilot resumed his course, finally seeing the object below and to the left. During the southeasterly course, the fact that the object was not seen by the radar, together with the known radar antenna pattern, means that the object was more than 15° below horizontal and hence <15 km away.

Figure 1 shows no evidence that the object moved significantly when bearing and distance errors are allowed for. The only suggestion that it was airborne comes from the first visual sighting at a range of ~50 km, when witnesses estimated the object to be apparently at the level of the cloud tops through which the aircraft had just emerged. Clouds over the sea were described by the air crew as low and scattered. Since it was very dark (new moon), and an object on the surface would have a depression to the horizontal of only 1°, the observations are not inconsistent with a near-stationary surface object. The first radar return was strong, which also suggests that the sighting line to the object was depressed.

Maccabee[1] estimated the source to be 12 m high × 18 m wide, with an intensity of 2.6×10^5 to 2.5×10^6 cd. These figures are in fact consistent with a squid boat, which typically carries a total of 200 kW of incandescent lights strung around the gunwales, producing an intensity of $3\text{–}4 \times 10^5$ cd. While the main fleet of thirty boats was fishing 250 km from the incident, records show that at least twenty boats were in transit between fishing grounds that night, and a few others were known to be fishing singly.[3] The routes taken by those in transit are not known, but they could have passed the site in question.

We conclude that the object may have been almost stationary, and the evidence that it was airborne is scant at best. Though the light was intense, it was quite compatible with potential shipborne sources known to be in the area. The claim of Maccabee that conventional sources have been ruled out and the implication that a UFO was photographed is therefore questioned.

References

1. B. S. Maccabee, Appl. Opt. 18, 2527 (1979).
2. B. S. Maccabee, "What Really Happened in New Zealand" (Bruce Maccabee, Silver Spring, Maryland).
3. New Zealand Ministry of Agriculture & Fisheries; personal communication.

Meetings Calendar

1979

December

10–11 Fiber Optics: Technology and Marketing seminar, Airport Marina Hotel, San Francisco *Communications & Information Inst., Information Gatekeepers, Inc., 167 Corey Rd., Brookline, Mass. 02146*

10–12 APS Div. of Electron and Atomic Physics, Houston *W. W. Havens, Jr., 335 E. 45th St., New York, N.Y. 10017*

10–14 Laser System Design course. U. of Wisc. *D. E. Baxa, Dept. of Eng., U. of Wisc. Ext., 432 N. Lake St., Madison, Wisc. 53706*

10–15 Infrared and Near Millimeter Waves, 4th internat. conf., Americana at Bal Harbour, Miami Beach, Fla. *K. J. Button, MIT, Natl. Magnet Lab., Cambridge, Mass. 02139*

12–13 Fiber Optics: Technology and Marketing seminar, Sheraton-San Diego Airport *Communications & Information Inst., Information Gatekeepers, Inc., 167 Corey Rd., Brookline, Mass. 02146*

17–18 Fiber Optics: Technology and Marketing seminar, Le Pavillon, New Orleans *Communications & Information Inst., Information Gatekeepers, Inc., 167 Corey Rd., Brookline, Mass. 02146*

17–21 Internat. Conf. of Lasers '79, Orlando, Fla. *V. J. Corcoran, Soc. for Optical and Quantum Electron., P.O. Box 245, McLean, Va. 22101*

28–30 History of Science Soc. ann. mtg., NYC *A. Donovan, 388 Birch St., W. Va. U., Morgantown, W. Va. 26506*

1980

January

2–6 6th Internat. Conf. on Vacuum Ultraviolet Radiation Physics. USA *R. P. Madden, NBS, Washington, D.C. 20234*

6–11 Internat. Winter Conf. 1980 on Developments in Atomic Plasma Spectrochemical Analyses, Inductively Coupled, Microwave, and D.C. Plasma Discharges, San Juan *ICP Information Newsletter, Chemistry—GRC Tower I, U. of Mass., Amherst, Mass. 01003*

7–11 Developments in Atomic Plasma Spectrochemical Analysis, San Juan *Internat. Winter Conf., LCP Information Newsletter, Chem., GRC Towers, U. of Mass., Amherst, Mass. 01003*

7–18 Optical Science and Engineering course, Doubletree Inn, Tucson *P. N. Slater, P.O. Box 18667, Tucson, Ariz. 85731*

13–16 American Astronomical Soc., San Francisco *P. Boyce, Suite 603, 1717 Mass. Ave. N.W., Washington, D.C. 20036*

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