expedite a resolution of this problem. We have received no answer to my wife's application or to my letter. Two years ago international support helped us in our struggle for the emigration of our son's fiancee who had become a hostage for my public activity. Now I am asking your support in the even more difficult and tragic struggle to permit my wife to travel abroad, a struggle that is vitally important on both the personal and public planes. I earnestly ask those who are concerned with my fate, who want to help me, to concentrate all their attention on this problem. I ask the heads of foreign delegations, I ask all participants in the Conference to support my appeal to Andropov through official, diplomatic channels as well as through private conversations which the Conference may make possible.

It is particularly important that Sakharov's scientific colleagues worldwide respond to his desperate plea for help. We urge them to write to the Soviet authorities, as well as to Soviet colleagues whom they know personally or by reputation, to appeal for intervention on behalf of the Sakharovs.

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Probing Titan's Surface

Recent reports (*1*) concerning the state of the surface of Titan indicate the need for new experiments and also provide an interesting example of the continual interplay between theoretical and experimental research. Theoretical considerations had led to suggestions that methane oceans cover Saturn's giant moon. In the Voyager project, detailed analysis of the radio measurements of the atmospheric temperature structure showed no effects of condensation, indicating that ubiquitous methane oceans could be ruled out. Theoretical arguments have now been presented favoring oceans, not of methane, but of ethane. Because of ethane's lower vapor pressure, such oceans would not have been detected by Voyager. Thus the stage is set for further experiments.

Radar would be an appropriate "next generation" remote probing tool. Radar signals would penetrate Titan's cloud cover, but would interact strongly with the surface, whether it were solid or liquid. Maps based on measurements of reflectivity, scattering from small-scale surface structure, topographic elevations, the unique signatures of ocean waves, and the electromagnetic polarizing properties of surface material could be obtained. In preliminary considerations of new missions, plans have centered on a spacecraft monostatic radar system (where the radio transmitter and receiver are both on the spacecraft), such as the one carried to Venus by the Pioneer orbiter. Study by Earth-based monostatic radars may also become feasible if system improvements are made. There are other possibilities, however, based on transmissions from Earth with reception on the spacecraft (or vice-versa) in the so-called bistatic radar mode.

Such bistatic methods (which include the radio occultation technique used for the Titan atmospheric study in the Voyager project) have been in use for two decades. They have led to a number of discoveries and have provided fundamental information about planetary atmospheres, surfaces, and rings. A feature of essentially all these experiments that may not be generally appreciated is how little transmitter power has been used, at most a few tens of watts from spacecraft telecommunications transmitters (their maximum capability) to ground-based receivers, over distances of up to 1.5 billion kilometers. In principle, the experiments could have been based on the much greater capabilities of the existing ground-based transmitters that are located at the NASA/Jet Propulsion Laboratory deep space tracking stations. They have been commanding spacecraft for many years at power levels of up to several hundreds of thousands of watts. Most of this power increase could be realized for experimental improvements if dedicated spacecraft receiving systems were provided. This increase in sensitivity is just what would be needed for studies of the surface of Titan in the bistatic radar mode, with measurement abilities competitive with what might alternatively be done with a spacecraft monostatic system. A bistatic receiver on a Saturn orbiter that repeatedly encounters Titan could be used also for greatly improved occultation studies of the atmospheres of Titan and Saturn, and even of the densest parts of Saturn's rings.

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