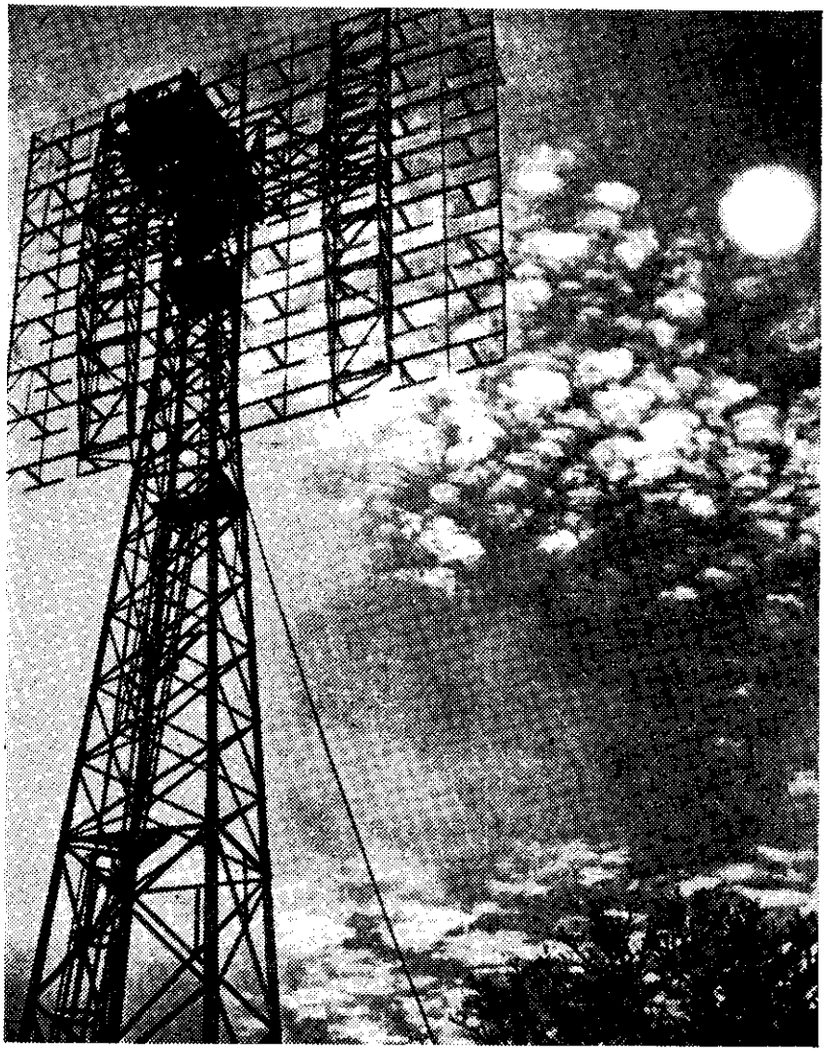
MOONSHINE AND RADAR

Written for "The Listener" by F.F.E.



DIRECTING radar energy at the moon: "This performance gives rise to amazing new possibilities in astronomical technique"

THE public interest has lately been aroused by a series of spectacular achievements in radiophysics. Unfortunately, the brief published accounts of these advances have often been so naively worded as to reduce their meaning to sheer fantasy. One is given to believe, for instance, that the moon has somewhere among its valleys and mountains a peal of bells whose tolling is perceptible to the trained scientific ear. The sun is similarly reputed to emit hissing noises, presumably rather like a bundle of snakes, or a locomotive letting off steam.

There is a very good reason for doubting that whatever sounds may be generated on either sun or moon could ever reach the Earth at all. The mode of travel of sound waves is a matter of the transmission of pressure variations through such material as surrounds the source of sound. In other words, sound is propagated by means of compressions and rarefactions imparted to and conveyed by the material along the path. Even with a medium as rare as air, large explosions have been audible at very great distances. But by what agency can we expect to hear the sun hissing across 93 million miles of empty space, or yet the moon clanging through a mere 238,000? Perhaps the modern physicist has justified the ancient philosopher in his belief in the eight celestial spheres, each occupied by a beautiful female who uttered a single note as the sphere revolved, the whole eight forming a perfect harmony. Or has the prophecy of Job now come true—"When the morning stars sang together, and all the sons of God shouted for joy?" Or Shakespeare's bold statement?

> There's not the smallest orb which thou behold'st
> But in his motion like an angel sings,
> Still quiring to the young-eyed cherubins:
> Such harmony is in immortal souls.

One suspects that the physicists come out of it rather better than they deserve.

A Simple Solution

But the solution is quite simple, and dispels any illusions as to the divinity of physicists. Take the BBC and Big Ben. Your radio is not merely an acoustic device for collecting sound waves from London. The BBC brings Big Ben to your drawing-room by broadcasting radio waves modulated so as to represent the chimes as far as your radio is concerned. The radio's function is to change these varying radiations into mechanical vibrations in your loudspeaker, which immediately travel through the air to your ear and give you the time in London. We are not endowed with the faculty to detect radio waves directly; the radio brings them to our cognisance by changing their variations into variations of a kind that can affect our sense organs.

Now we have no evidence of a BBC established on the sun. It has, however, been found that the sun transmits radio waves. There is of course nothing extraordinary about this discovery, since radio waves are of the same nature as both heat and light. But why have these radiations been described as noise? Because, having in the past used radio chiefly to transmit sound programmes, we find it convenient in studying the radio waves from the sun to turn them by the same technique into sound. The variations in these waves as we receive them are by no means systematic in form, such as might cause a loudspeaker to emit a single musical note. On the contrary, the variations are quite random, producing in the loudspeaker a rapidly fluctuating combination of notes, which to our ears simply represents noise.

But we can no more hear the radiations themselves than we can smell them. If, indeed, we choose to study the waves by visual means, on an oscilloscope, we find that the picture resembles a row of long grass! But this is no evidence of jungle for the snakes. And the moon, for its part, may or may not make sounds like the tolling of bells; in either case we could not detect them.

The recent experiments are more significant, if less picturesque, than has been reported. It is a remarkable achievement that radio receivers can now be constructed sufficiently sensitive to detect radiations from sources as remote as the sun and moon. Conversely, supposing the sun had happened to emit more powerful radiations, our present radars and radios would have been quite useless during the daytime because of solar interference. This supposition involves another, however, that the sun's temperature had been higher; so that conjectures as to the probable outcome of the Battle of Britain without radar would be quite nonsensical. For a slight variation either way in the sun's temperature would destroy not only radar but life as well.

An equally remarkable experiment lately announced is the reception of a radar echo from the moon. In this case the radiations received did not originate on the moon; they were entirely our own responsibility. A powerful transmitter, designed to send out radar energy in the form of a searchlight-beam, was directed at the moon. In spite of the fact that the energy must have been scattered from the moon in all directions, enough bounced back in our own direction to be received and recognised!

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