

30th August 1963

Dear Hap:

Before I setup here to observe at 2100kc there were no preconceived theories to test. I merely thought it a good idea to make observations which had never been made before and see what might result. I knew that my apparatus would be very sensitive to ionized hydrogen, which would appear as absorbing clouds. Vast quantities have been turned up in our own galaxy, particularly toward the center. Much more important, good evidence is now available for the existence of intergalactic ionized hydrogen. In retrospect, this is not surprising as the ratio (distance between stars)/(diameter of stars) is about 10^6 times the ratio (distance between galaxies)/(diameter of galaxies).

Over thirty years ago Hubble suggested that some other more satisfactory explanation than relative velocity could be found to explain the shift of spectral lines in light from distant galaxies. Many people have tried but all have failed because intergalactic space was deemed absolutely empty. In the mean time cosmologists have had a field day of irresponsible speculation.

When I was at Green Bank, a substantial effort was in progress to find hypothetical neutral hydrogen between the galaxies. I suggested that any such gas would probably be ionized. They agreed. However, they pointed out that their equipment could not detect ionized hydrogen; only neutral hydrogen. As expected, this ill-conceived search ended in failure. At the time, I was informed that my methods were unintelligent science because I do not test theories. Conversely theirs was intelligent science!

Ionized hydrogen is effectively an electron gas. The refractive index drops below unity and the electromagnetic wave lengthens. Collisions extract energy from the wave and fix it since $h\nu$ is less and h is constant. The process is cumulative with distance. I suspect the above closes the lid on the coffin of the expanding universe.

The sky is large and data taking is slow. Even by end of next year, the possibilities of present antenna will not be exhausted. Consequently, I have dropped any plans to expand the installation. The situation will be reviewed in October 1964. By making observations at a still lower frequency, I may be able to put the above discussion into some quantitative form. Consequently the budget for next year comprises only items relating to alterations required for 1100kc observation, operation and maintenance.

Labor	£1300	
anchors and Stays	800	
Antenna & Electronic revisions	1200	
Maintenance and Operation	300	
Transport	200	
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Total	£3800	= \$8550

Exchange: One pound equals 2.25 dollars

Grote Reber
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