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FINAL REPORT

Contract NR 105-411

November 1, 1968 - February 14, 1970

"Light and Temperature Dependence of Photosynthesis"

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February 24, 1970

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Research Conducted Under This Contract (NR 105-411)

In our year and one fourth of support from ONR our research has taken several turns, both experimental and theoretical and we now feel the problem is much better in hand.

The early model of the wind tunnel-growth chamber, described in our status report of April 30, 1969 was found to be useful but not completely satisfactory, probably because of the large internal volume (several cubic feet or about 100-200 l.). In May, 1969, our group felt very fortunate to be joined by Professor Conrad S. Yocum, on sabbatical leave from the University of Michigan. His ideas and enthusiasm for the project helped immeasurably, both from the experimental and theoretical aspects.

In June and July our theoretical model advanced to the point where we could add the leaf energy budget to the photosynthesis model which combined both diffusion and biochemical aspects. This model was presented at the International Symposium on Productivity of Photosynthetic Systems in Moscow, U. S. S. R., September, 1969, in a paper "Geophysical Factors Affecting Plant Productivity." A copy of this paper is included in this final report as a technical report.

Since September we have improved our photosynthesis model and are in the rough draft stage of submitting it to the journal Science. This new model unlike the old one, incorporates plant respiration in the light and hence is much more widely applicable.

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Our experimental apparatus has been altered considerably and now has an internal volume of about 75 ml. We have just acquired some calibrated gases and are ready to give our model a thorough testing.

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List of Publications

Gates, D. M., H. B. Johnson, C. S. Yocum and P. W. Lommen.

Geophysical Factors Affecting Plant Productivity.

Proc. International Symposium "Productivity of  
Photosynthetic Systems." Part II: Theoretical  
foundations of optimization of the photosynthetic  
productivity. Moscow, U. S. S. R. September 1969.

(In Press).

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13. ABSTRACT  A theoretical model for photosynthesis has been developed. It combines the resistance network used in transpiration studies with a simplified biochemical approach describing the uptake of CO <sub>2</sub> at the chloroplasts. This model was combined with the energy budget approach to leaf energy balance and presented at the International Symposium "Productivity of Photosynthetic Systems" in Moscow, U. S. S. R., September, 1969. The photosynthesis model has been refined to include photorespiration, thereby making it more widely applicable, and is presently being prepared for publication.  Experimentally, we have constructed a small volume (75 ml) chamber into which a plant leaf section can be placed and are beginning to give our theoretical model a thorough testing.			

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