Highlights of the Research Career

of

R. Malcolm Brown, Jr.

1962 -- 2008

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1. Airborne algae- This was his first major thrust as a graduate student. It basically opened up a new field of research for algae. One unexpected highlight is that many people were found to be allergic to algae, and they build up sensitivity by breathing dust with algal components in it.


2. Algal taxonomy using ultrastructure and immunological approaches- This was developed while a graduate student also. Because of limited morphology, the ultrastructural approach combined with an immunological approach turned out to be very helpful to identify a number of soil and airborne algae.


3. He pioneered in the first electron microscopic characterization of algal viruses. This work was accomplished in collaboration with Professor Kenneth Smith of Cambridge University, England who was a visiting scholar at UT-Austin at the time.


4. A discovery that cellulose can be made in the Golgi apparatus. This was important because before this, it was thought that it was impossible to have cellulose synthesized in this organelle.


5. Discovery of the cellulose synthesizing complex which led to the general understanding of how cellulose is assembled by all living organisms, including land plants.


6. Ultrastructural elucidation of a fossil leaf gave way to the modern "Jurassic Park" concept and some of the first PCR results from ancient fossils.


7. Experimental alteration of cellulose biosynthesis *in vivo* giving new information for the separation of the polymerization and crystallization events.


8. \textbf{The first purification of cellulose synthase and cellulose I and II synthesized \textit{in vitro}}


9. \textbf{The first cloning and sequencing of a cellulose synthase gene}


10. Proof that the cellulose II allomorph has a folded chain conformation


11. The first assembly of synthetic cellulose I


12. Multidomain architecture of β-glycosyl transferases provides crucial information leading to the discovery of cellulose synthase genes in vascular plants.


Saxena, I. M. and R. M. Brown, Jr. 1997. Identification of cellulose synthase(s) in higher plants: Sequence analysis of processive β-glycosyltransferases with the common motif “D, D, D35Q(R,Q)XRW.” *Cellulose* **4**:33-49

13. Proof for van der Waals forces organizing B-glucan chain sheets as the first stage of native cellulose crystallization.

Cousins, S. K. and R. M. Brown, Jr. 1997. X-ray diffraction and ultrastructural analyses of dye-altered celluloses support van der Waals forces as the initial step in cellulose crystallization. *Polymer. 38:*897-902


14. **In vitro separation of cellulose and callose**


15. **Proof that the rosette TC discovered in 1980 is the site for cellulose synthase**


16. **Identification of a B-1,3 glucan synthase gene**


17. **The first synthesis of carbon megatubes**


18. **Discovery of cellulose biosynthesis in the cyanobacteria and a suggested origin of vascular plant cellulose synthase**


19. **Proof for the localization of c-di-GMP activator of cellulose synthase in Acetobacter xylinum**


20. **Imaging of T-4 bacteriophage using light microscopy**


21. **Imaging of a new form of cellulose, “nematic ordered cellulose”**


22. **Invention and development of electronic paper as a revolutionary display for computer screens, books, magazines, newspapers, wall paper, and canvas**


Note: a company, **RealPaper Displays, Inc.** has been formed and the technology licensed. For information, visit the RealPaper website: [http://www.realpaperdisplays.com/](http://www.realpaperdisplays.com/)

23. **Development of techniques for atomic and molecular imaging of beam sensitive materials using the transmission electron microscope**

Visit the following URL sites:  
[http://www.botany.utexas.edu/facstaff/facpages/mbrown/ongres/jsharp.htm](http://www.botany.utexas.edu/facstaff/facpages/mbrown/ongres/jsharp.htm)  
[http://www.botany.utexas.edu/facstaff/facpages/mbrown/ongres/tspires/nano.htm](http://www.botany.utexas.edu/facstaff/facpages/mbrown/ongres/tspires/nano.htm)

24. **Invention and development of nano-scale fabrication using the transmission electron microscope**


US Patent **7,335,882** issued February 26, 2008. High resolution low dose transmission electron microscopy real-time imaging and manipulation of nano-scale objects in the electron beam
25. Contributions of microbial cellulose in the fields of medical products, wound healing, and emergency medicine


Note: a new company, Global Cellulose, Inc. has been formed to market various medical and cosmetics products designed and produced from microbial cellulose.

26. Development of a new global cellulose crop for biofuels using cyanobacteria (in collaboration with Dr. David R. Nobles, Jr.)


Patent Applications recently published by the United States Patent and Trademark Office:

20080113413 Expression of Foreign Cellulose Synthase Genes in Photosynthetic Prokaryotes (Cyanobacteria)

20080085536 Production of Cellulose in Halophilic Photosynthetic Prokaryotes (Cyanobacteria)

20080085520 Production and Secretion of Glucose in Photosynthetic Prokaryotes (Cyanobacteria)

20080124767 Production and Secretion of Sucrose in Photosynthetic Prokaryotes (Cyanobacteria)

Note: other provisional applications on this subject have been or are being filed by UT-Austin.

A new bioenergy company, Phykotek, Inc. has been formed (RM Brown Jr and David R. Nobles, Jr., founders) to commercialize the production of biofuels from cyanobacteria.


Note: As of May, 2008, Malcolm is still employed full time by The University of Texas at Austin and is very active in research as evidenced by the undergraduates, graduate students, and post-docs working in his laboratory. He does not plan to retire soon! His hobbies include gardening, photography, and music composition (www.novelmusic.com). He is married to Ann Callaway Brown (47 years) and has two children (now grown), David, and Julie. He has a grandchild, Christopher.
Most of the above publication citations can be found in pdf format and downloaded from the RMB website. Visit: http://www.botany.utexas.edu/mbrown/papers/default.htm