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# Laser System for Biological Tissues Final Report CRADA No. TSB-1549-98

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February 9, 2018

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## Laser System for Biological Tissues

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Final Report  
CRADA No. TSB-1549-98

Date: September 24, 1999

Revision: 1

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### A. Parties

The Parties to this CRADA are The Regents of the University of California as operators of the Lawrence Livermore National Laboratory (LLNL) and Paul Weber, M.D., Professional Association.

University of California  
Lawrence Livermore National Laboratory  
7000 East Avenue, L-795  
Livermore, CA 94550  
Luiz B. Da Silva  
(925) 423-9867

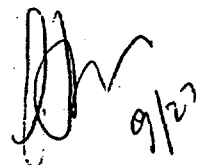
Paul J. Weber, M.D., Professional Association  
5353 North Federal Highway, Suite 400  
Fort Lauderdale, FL 33308  
Paul J. Weber  
(954) 489-9800

### B. Project Scope

The goal of this project was to demonstrate a laser-based system which can shape and resurface the epidermal plate as well as generate images on acrylic. The prototype system used a pulsed diode pumped laser to ablate and shape the surface using a high absorption pigment. A CCD camera will image the epidermal plate and computer software will analyze the image to guide laser ablation.

The deliverable was for LLNL to generate a final report upon completion of the project, which summarized the results of the project and the schematics for the prototype device.

This project consisted of six (6) main tasks, all of which would be performed at LLNL over a seven (7) month period. Due to lack of manpower availability which caused delays in the project work, and minor redesigns which delayed manufacturing, the project was extended for an additional five months.

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### C. Technical Accomplishments

The specific tasks were:

1. Design system which incorporates laser, steering mirror control and imaging system to identify area to irradiate and then control laser firing.
2. Select and order laser, control and optical components.
3. Machine packaging and control hardware.
4. Assemble system and determine optimum laser parameters to maximize writing speed and quality of image and surface.
5. Write computer software to collect image of the epidermal plate, identify epidermal plate area, and then control laser firing.
6. Test complete system for performance and reliability. Also evaluate the possibility of sputtering metal layers on the epidermal plate surface.

All tests were performed on artificial epidermal plates and phantoms. LLNL was responsible for performing all these tasks. The partner visited LLNL to contribute to initial prototype design and evaluate performance of the simplified system.

We demonstrated that the concept that the Partner was interested in worked; however, the cost of the technology makes prototypes not practical at this time.

### D. Expected Economic Impact

Ultimately when laser costs are reduced, we expect that this concept will produce a marketable product. The timeline for this could be as long as 3-5 years and the annual market could be in the \$10 - \$20 Million range.

### E. Partner Contribution

Dr. Paul Weber worked to identify suitable phantoms for the laser trials and worked on the evaluation of test results. In addition, Dr. Weber worked with LLNL to develop initial designs for the system.



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**F. Documents/Reference List**

a) Reports

No reports were generated for this project. All results were recorded in laboratory handbooks.

b) Patent/Copyright Activity

No patents have resulted from this project.

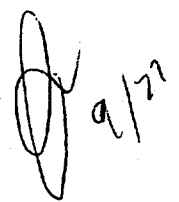
c) Subject Inventions

No Subject Inventions have resulted from this project.

d) Background Intellectual Property (BIP)

The following LLNL BIP was used in this project. There are no present plans for licensing this technology to our CRADA partner.

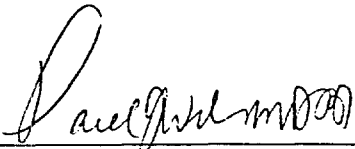
IL-10183 - *Method for Marking or Etching of Images into a Metal Surface Using a Laser*;  
Matthew J. Everett, Luiz B. Da Silva, Dennis L. Matthews, Peter M. Celliers


A handwritten signature, possibly 'D. J. Everett', followed by the date '9/27'.

## G. Acknowledgement

Participant's signature of the final report indicates the following:

- 1) The Participant has reviewed the final report and concurs with the statements made therein.
- 2) The Participant agrees that any modifications or changes from the initial proposal were discussed and agreed to during the term of the project.
- 3) The Participant certifies that all reports either completed or in process are listed and all subject inventions and the associated intellectual property protection measures generated by his/her respective company and attributable to the project have been disclosed or are included on a list attached to this report.
- 4) The Participant certifies that if real property was exchanged during the agreement, all has either been returned to the initial custodian or transferred permanently.
- 5) The Participant certifies that proprietary information has been returned or destroyed by LLNL.

 9/27/99  
Paul J. Weber, M.D. Date  
Paul J. Weber, M.D., Professional Association

 9/24/99  
Luiz DaSilva, Ph.D. Date  
Lawrence Livermore National Laboratory

Attachment I – Final Abstract

TSB-1549-98

**PAUL J. WEBER, M. D.,  
PROFESSIONAL ASSOCIATION  
Final Abstract**

Paul J. Weber, M.D., Professional Association, of Fort Lauderdale, FL is a small business that is dedicated to providing cosmetic surgery and clinical applications of lasers.

**Title of Project** Laser System for Biological Tissues

**Purpose** To provide a proof of concept for a LLNL invention and to develop a prototype of the product. The goal was to demonstrate a laser-based system which can shape and resurface the epidermal plate as well as generate images on acrylic.

**Benefit to Industry** The risk of infectious disease has caused considerable concern in medical and cosmetic procedures. This risk is also present in the routine treatment of hands when using existing techniques. Lasers can reduce the risks of infectious disease by eliminating patient contact, and offer the industry a variety of new marketable techniques.

**Benefit to DOE/LLNL** This work is directly related to the DOE center of excellence for laser applications in medicine programs in which LLNL is a participating national laboratory. This work is also relevant to DOE/DP programs in the use of lasers for weapons machining and cutting. The temperature measurements obtained in this work will be useful to determine if a similar system can be used in weapons applications.

**Time Period** Twelve months, starting August 13, 1998

**LLNL Contact** Luiz Da Silva, (925) 423-9867

**Brief Description**

Lawrence Livermore National Laboratory formed a partnership with Paul J. Weber, M.D., Professional Association to evaluate the potential use of lasers to shape and resurface the epidermal plate. LLNL designed and built a test system which incorporated a high repetition rate laser and scanning system to raster the laser beam over a phantom. Software was written and used to control laser firing and scanning. The tests showed that good results could be obtained using this type of system. However, the high laser cost makes this approach currently impractical for the medical market. Based on these results, LLNL and Paul J. Weber PA decided to not proceed with final prototype design and development.

In summary, this project successfully demonstrated the technique and supplied Paul J. Weber PA with the required information to make a decision on the market potential for this technique.