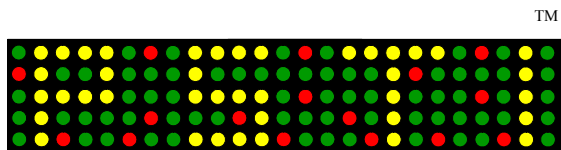
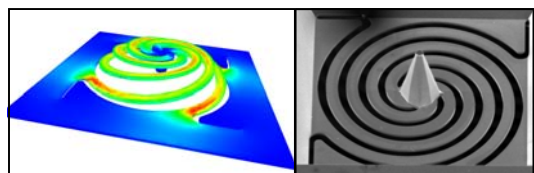


# Printing Microtiter Plates

Individually Compliant, Micromachined  
Silicon Hollow Bore Nozzle Arrays



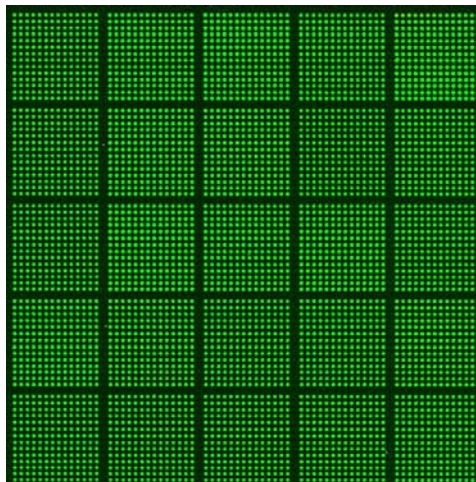
The printing microtiter plates consist of an array of wells each of which possesses its own hollow bore nozzle tip that is rendered individually compliant by connection to the body of the microtiter plate by four thin (~30 $\mu$  thick by 40 $\mu$  wide) spiral silicon tethers. The closely spaced silicon tethers, which provide the necessary force for successful printing, also form the bottom of each well. To print hundreds of spots simultaneously, each well is filled with an automated liquid dispenser and the printhead touched to the substrate. This printhead is capable of printing millions of spots per hour.



**Parallel Synthesis Technologies, Inc.**

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## Microarrays Printed with the Printing Microtiter Plate



Microarrays of Cy3 labeled 9-mers in 3x SSC printed using the printing microtiter plate with tips spaced on 2.25mm centers. The spots are ~80 $\mu$ m in diameter and are spaced on 150 $\mu$ m centers.

## Printhead Specifications

- Approximately 5,000 200pL spots per 1 $\mu$ L of printing fluid using 60 $\mu$ m tips
- Maximum number of print tips on a 25mm x 75mm printhead: 1200 (6144 SBS format) or 300 (1536 SBS format)
- Spot diameter variance (%CV): ~2% for single tips and ~5% for 100 tips
- Print tip sizes from 35-500  $\mu$ m
- Nozzle bores from 15-50  $\mu$ m
- Reservoir volume variable from 0.1–10  $\mu$ L
- Deposited spot volumes as low as 100pL
- Custom well volumes and spacings available

For more information and custom designing please contact us at (408) 749-8318 or [info@parallel-synthesis.com](mailto:info@parallel-synthesis.com)

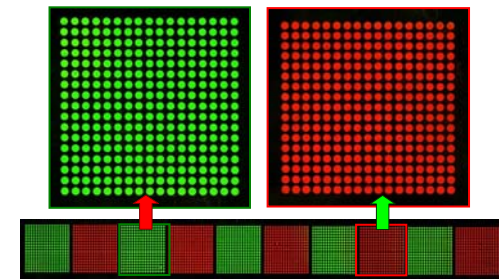
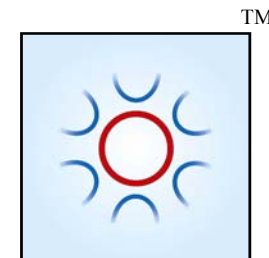


Image of two oligonucleotides printed from every other well in a printing microtiter plate and hybridized against Cy3 and Cy5 labeled complements. The spots are ~75 $\mu$ m in diameter and are printed on 125 $\mu$ m centers. Note precise circular and uniform spot morphology.

Cost as Low as  
**\$10**  
per Print Tip

For more information please contact us at  
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OEM enquiries welcome



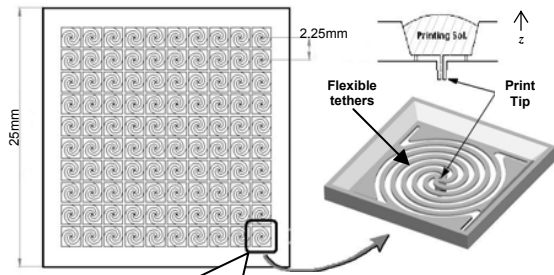
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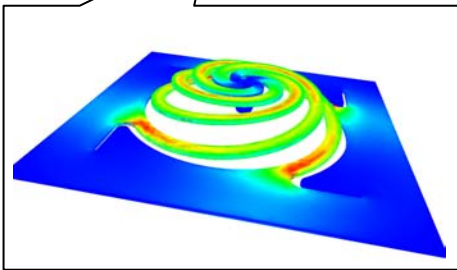
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# MICROMACHINED PRINTING MICROTITER PLATES

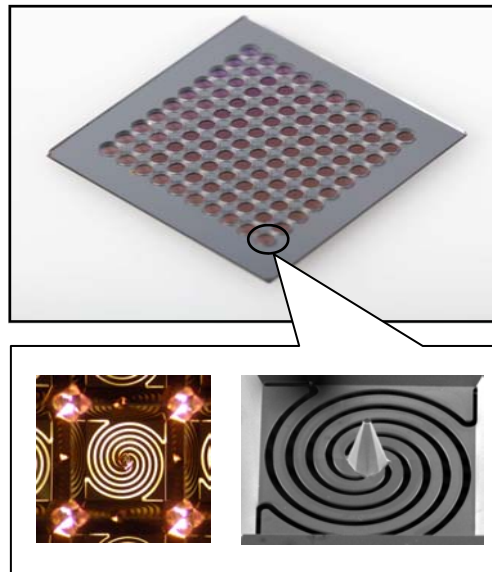
Schematic of a 1"x1" printhead with 10 x 10 array of print tips on 2.25mm centers supported by flexible tethers.



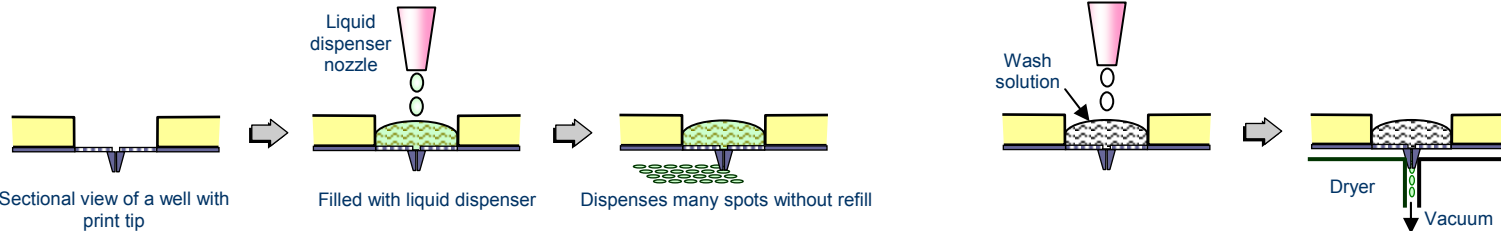
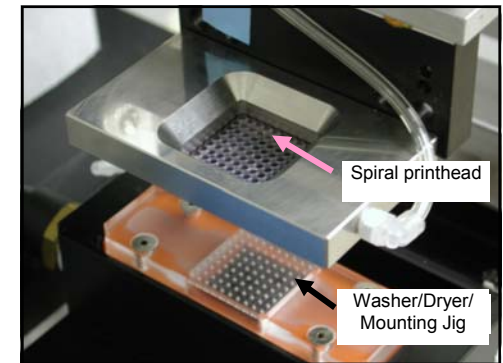
Finite element analysis simulation of the strain induced upon a  $200\mu$  deflection of the print tip nozzle perpendicular to the substrate.



Photographs and electron micrographs of a printing microtiter plate with 100 print tips on 1536 SBS format (2.25mm center to center distance).



Multiple printheads, pre-filled with appropriate oligo solutions, can be selected from a cassette and picked up by the arrayer's printing arm by vacuum. A 10 x 10 nozzle array attached to the arrayer is shown positioned over a dryer assembly.



Schematic illustration of the filling of the printing microtiter plate wells with an automated liquid dispenser. Approximately 5,000 spots of  $\sim 200\text{pL}$  volume each are obtained for each microliter of printing solution or one million spots per 100 element array per  $2\mu\text{L}$  per well.

Application of vacuum to the hollow bore nozzle tip removes all liquid from the well, springs and nozzle bore.