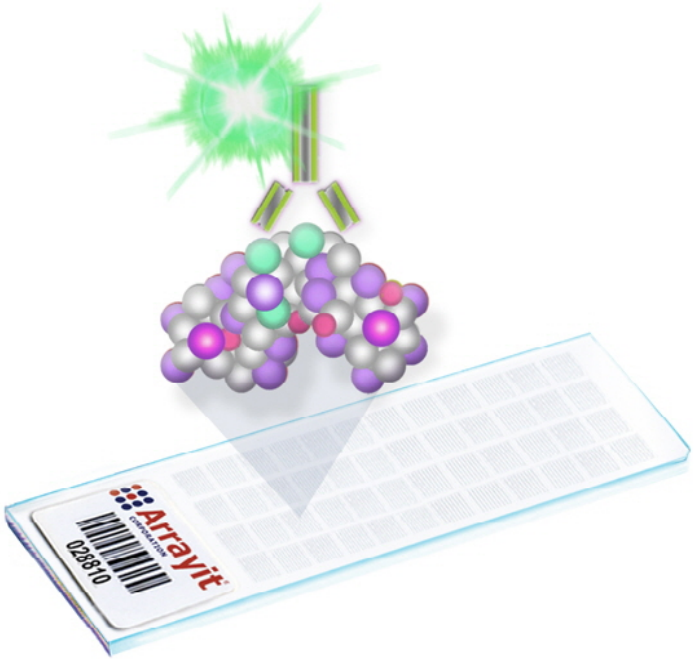
UniversitätsSpital Zürich

Protein Microarrays

Journal Club

Arnaud Monnard



August 26th 2014

Aguzzi lab

Outline

Manufacturing of microarrays

- **Contact Printing**
  - Pin Printing
  - Microstamping
  - Flow Printing
- **Lithography**
  - Photolithography
  - Electron Beam
  - Dip Pen Nanolithography
- **Non Contact Printing**
  - Thermal
  - Piezo
  - Valve
- **Cell Free**
  - PISA
  - NAPPA
  - In Situ Puromycin Capture

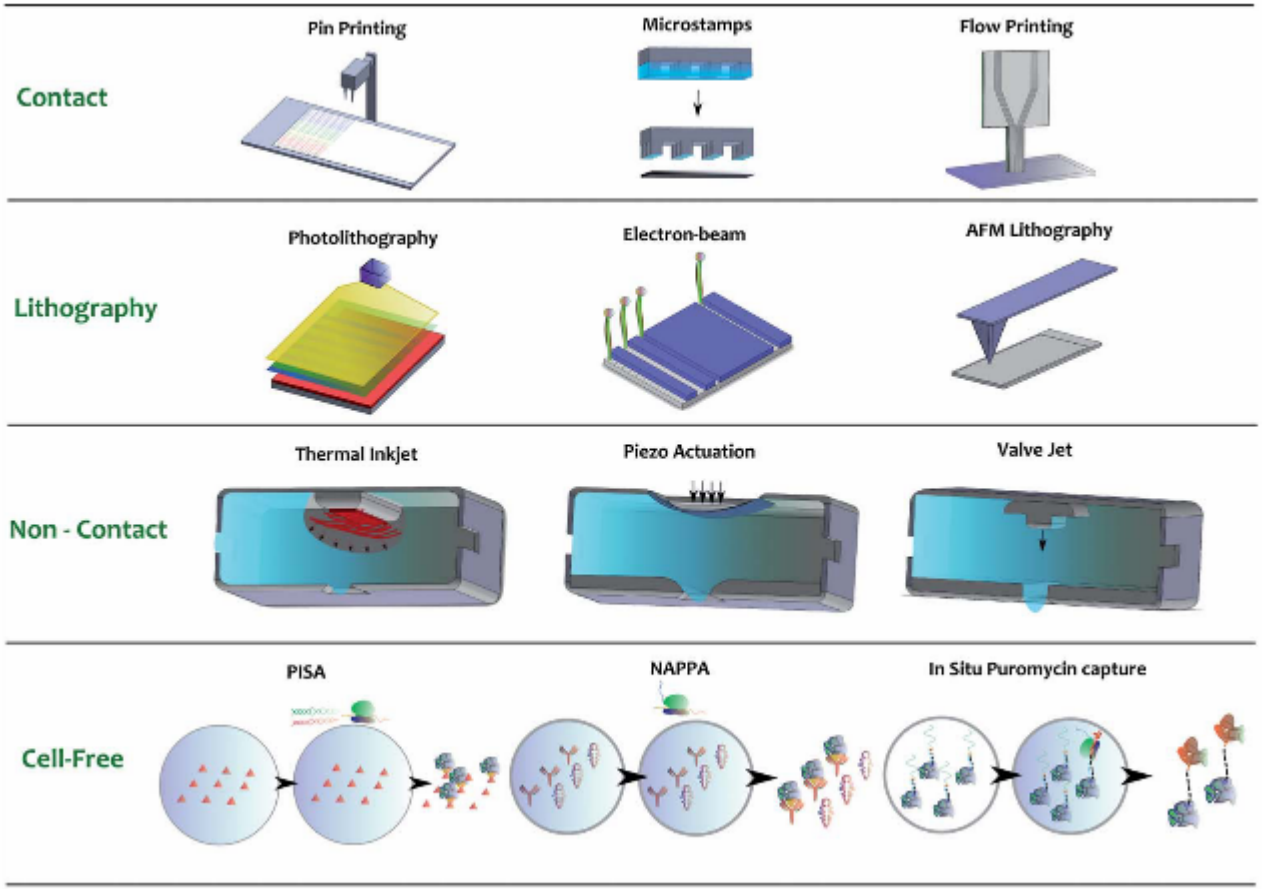
Publications

- **Proof of Concepts**
  - MacBeath et al. Science 2000
  - Chen et al. BioTechniques 2006
- **Applications**
  - Jones et al. Nature 2006
  - Mok et al. Nature Protocols 2009
  - Gagni et al. Biosensors and Bioelectronics 2013

Introduction

- First antibody array in 1983 followed by developement in the late 90’s
- Use principles and technologies of DNA microarrays
  - Minimal sample consumption
  - High throughput
- Bypasses the limitation of DNA microarrays

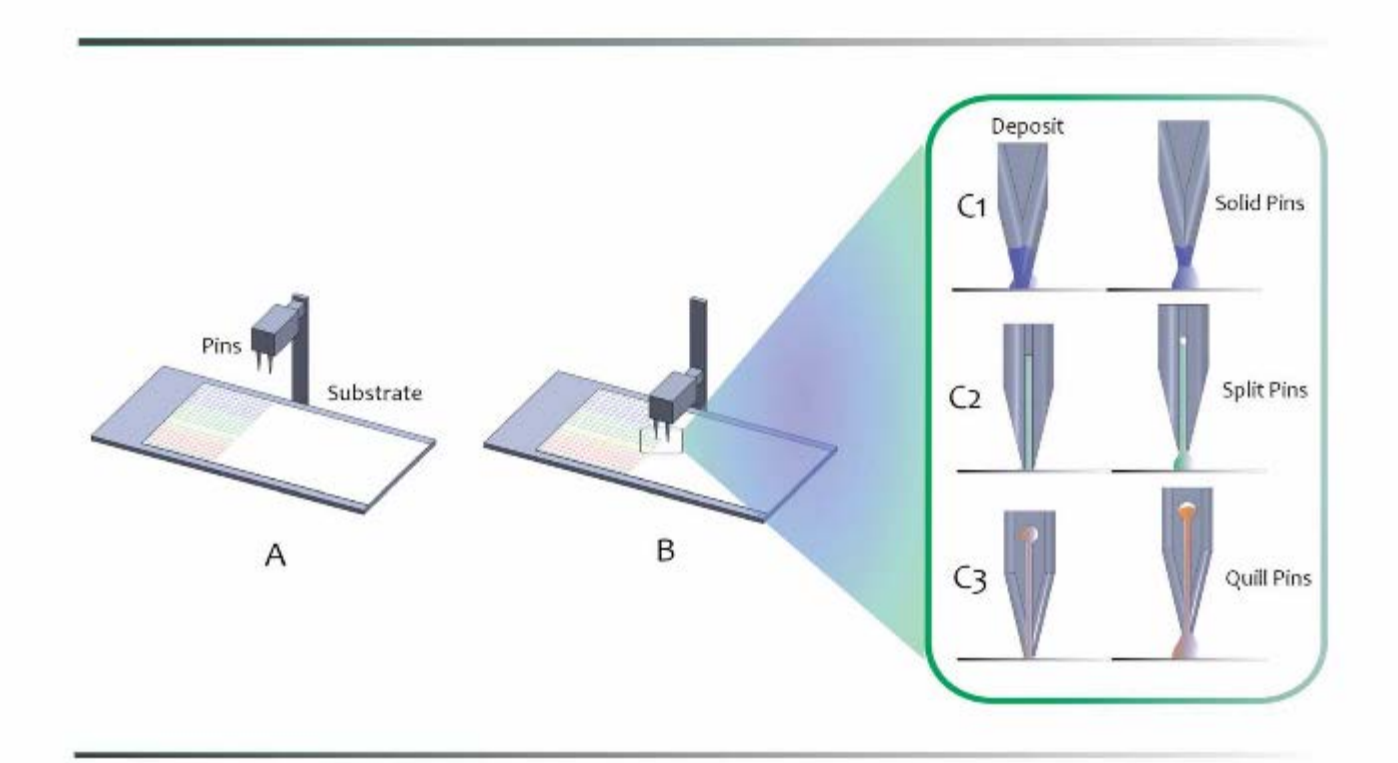
Protein Microarray Manufacturing Technologies



Analyst, 2014, **139**, 1303–1326

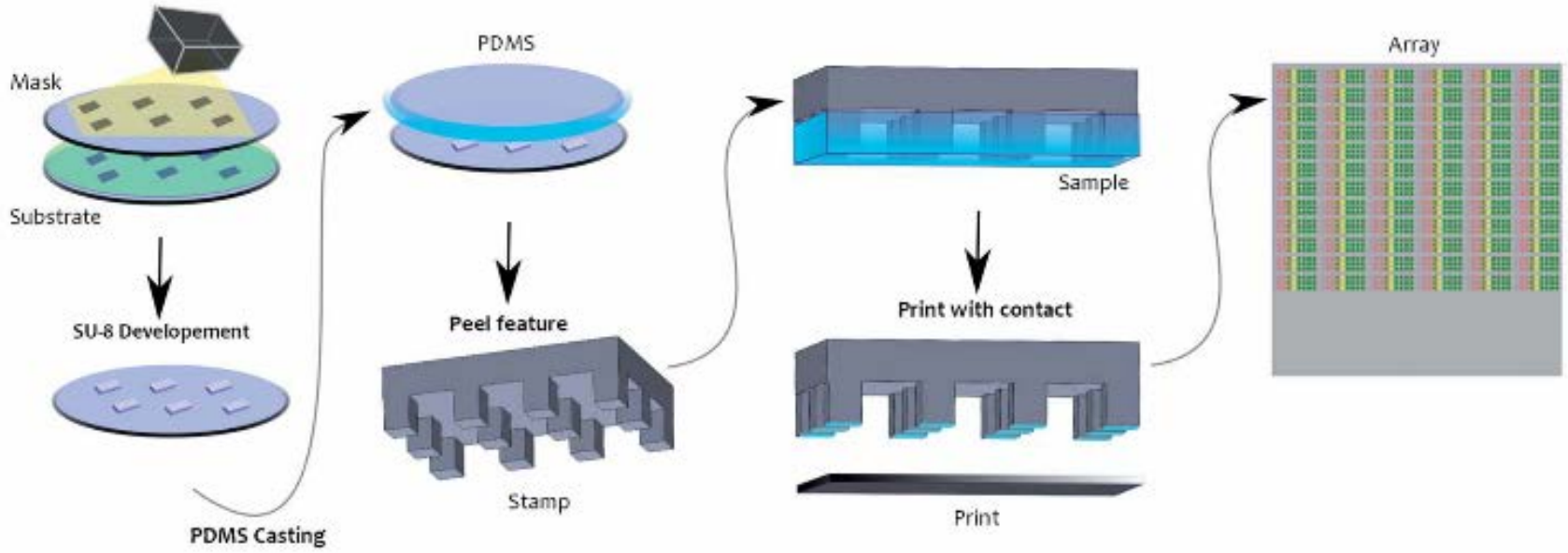
Contact Printing

Pin Printing



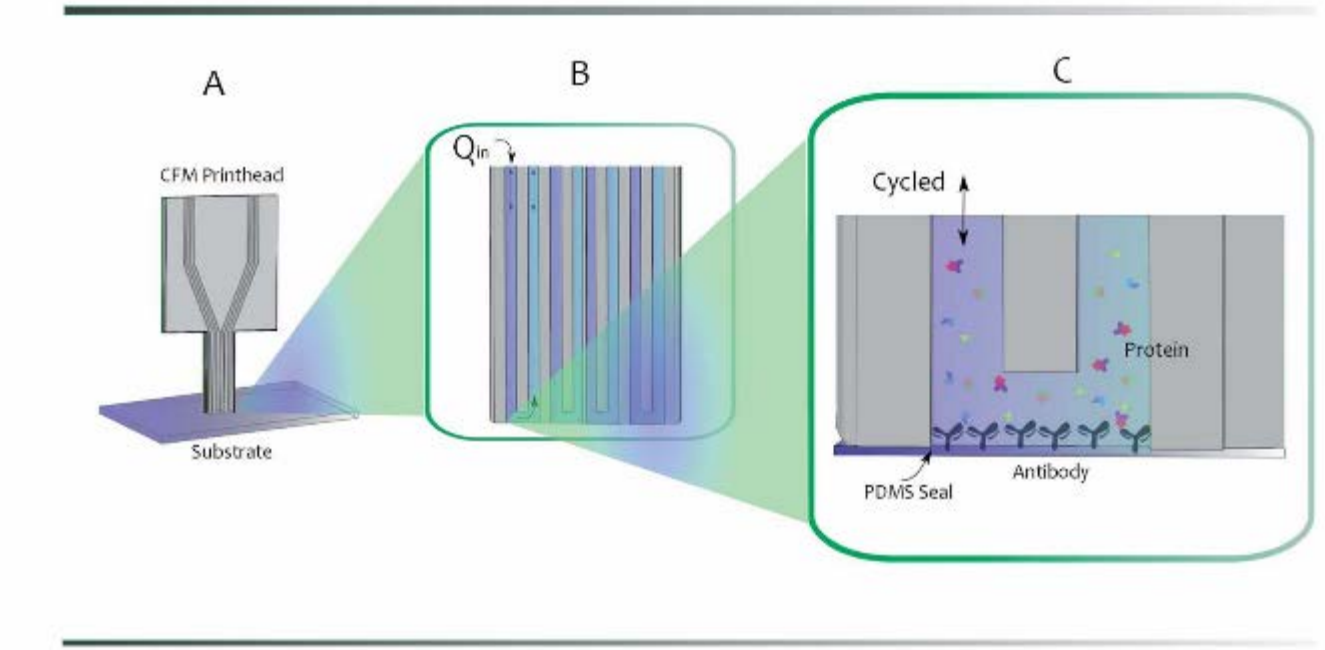
Analyst, 2014, **139**, 1303–1326

Microstamping



Analyst, 2014, **139**, 1303–1326

Flow Printing



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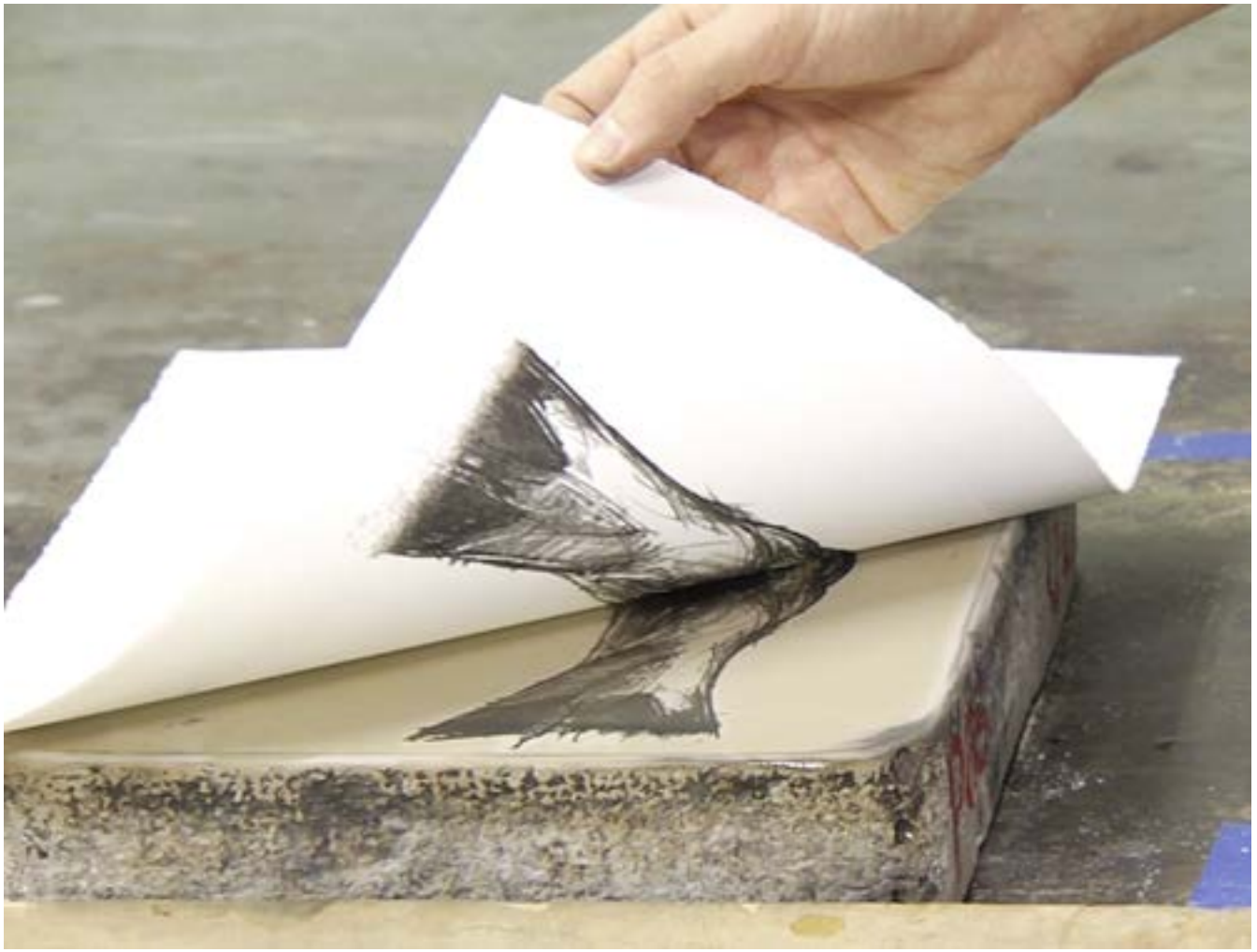
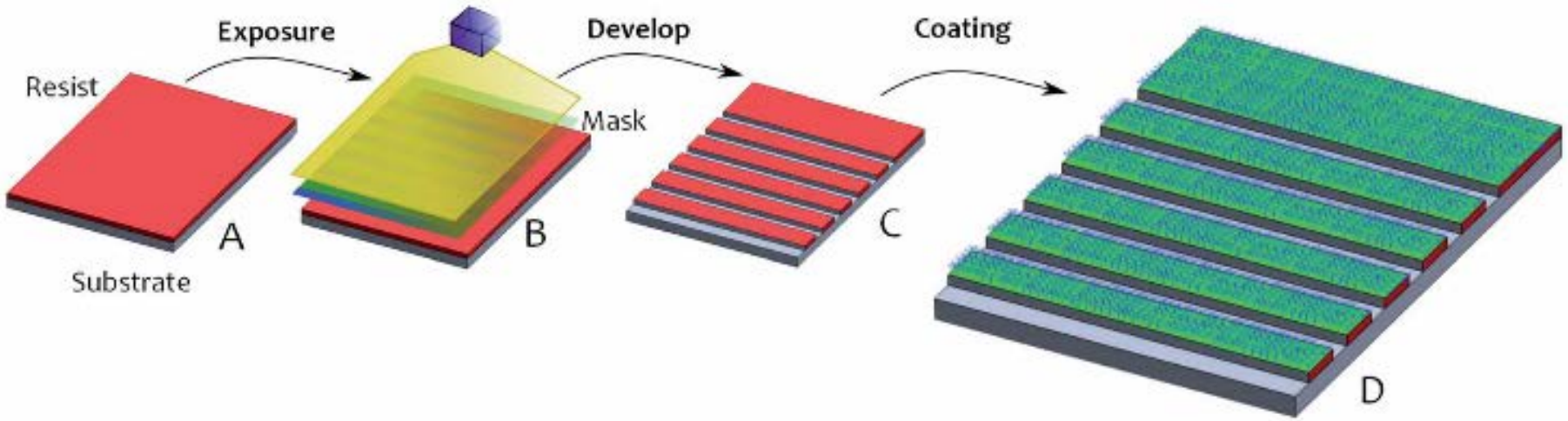
Lithography



Photolithography



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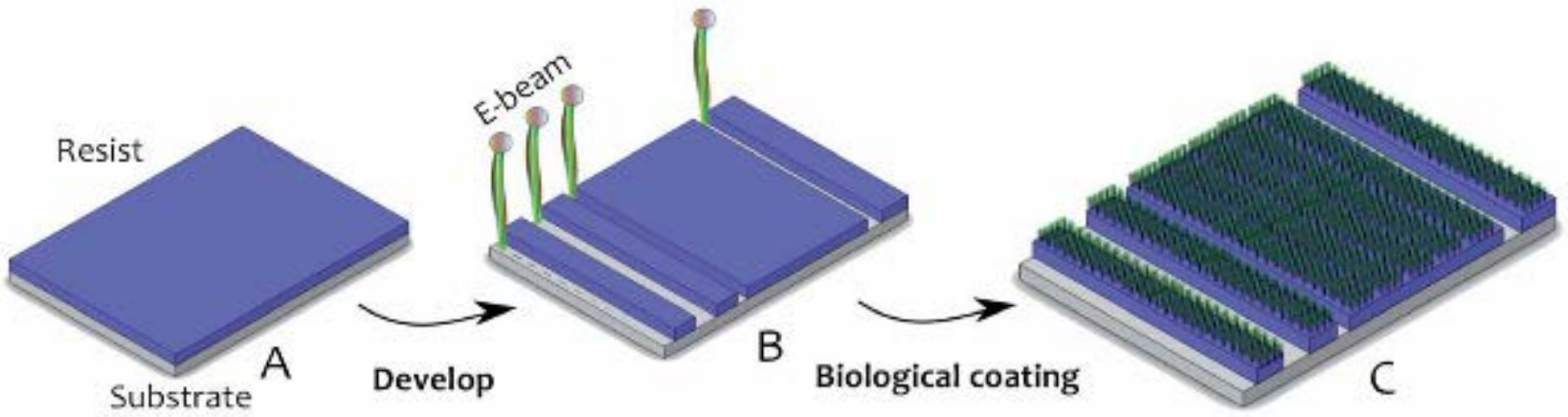
Electron Beam



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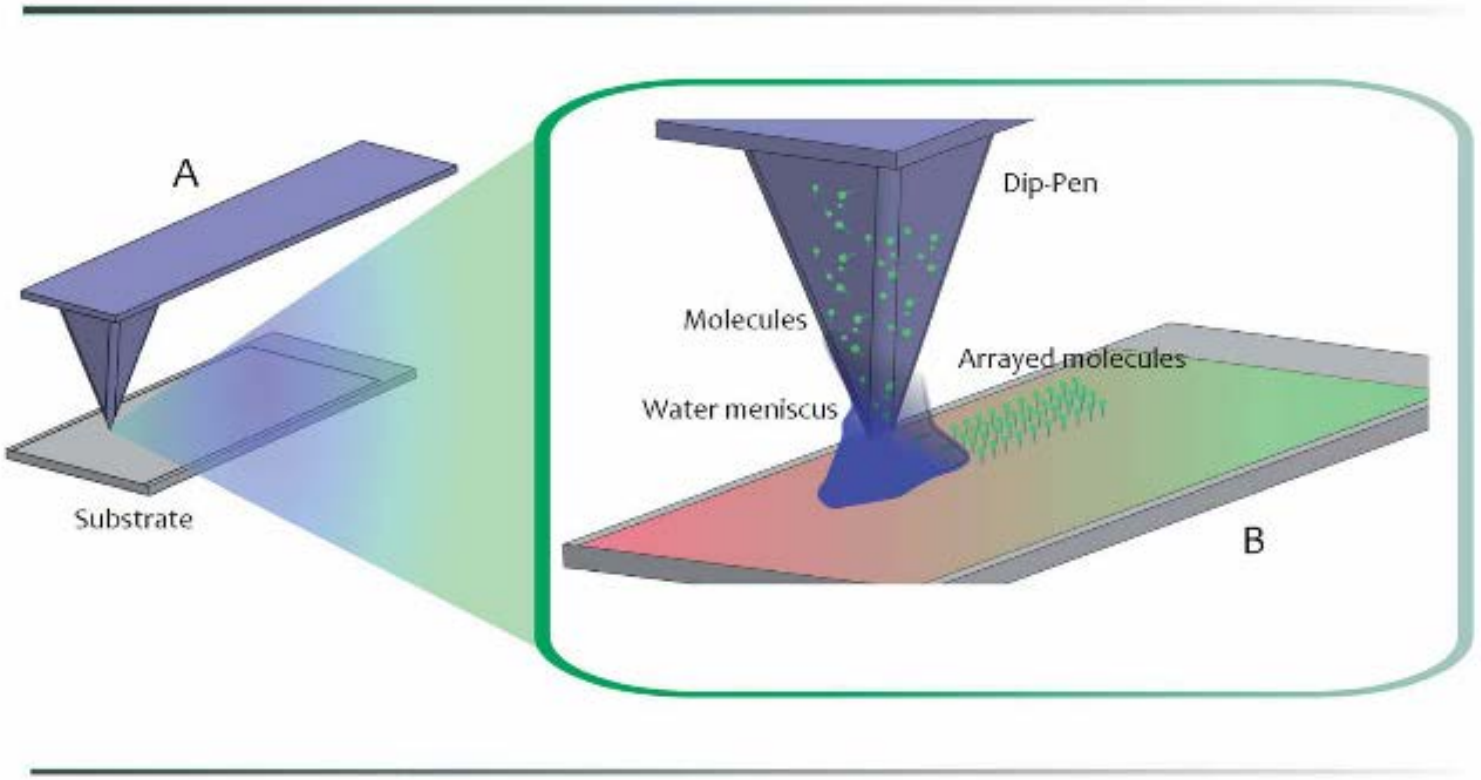
Dip Pen Nanolithography



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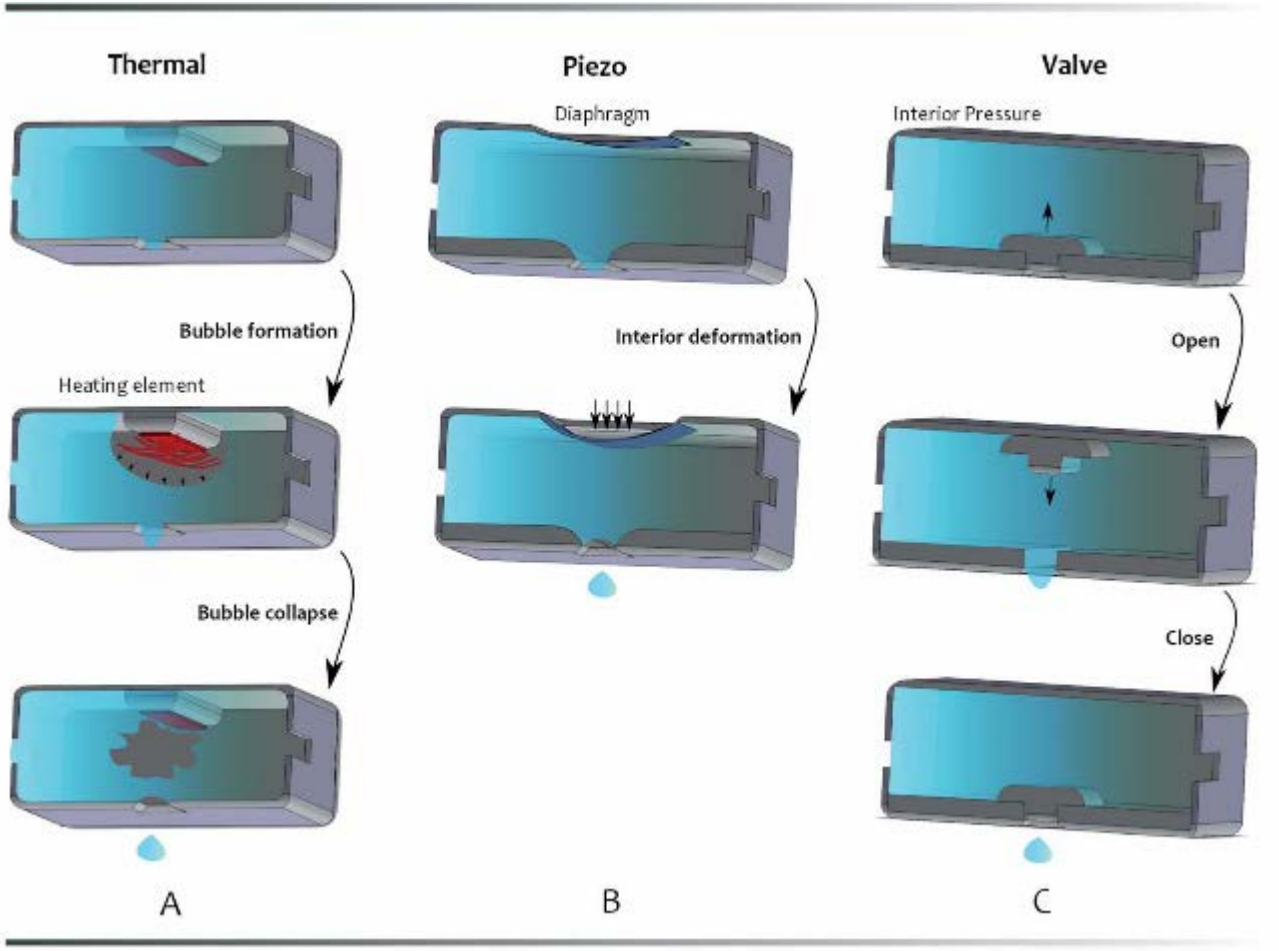
Non-Contact Printing

Non contact Printing



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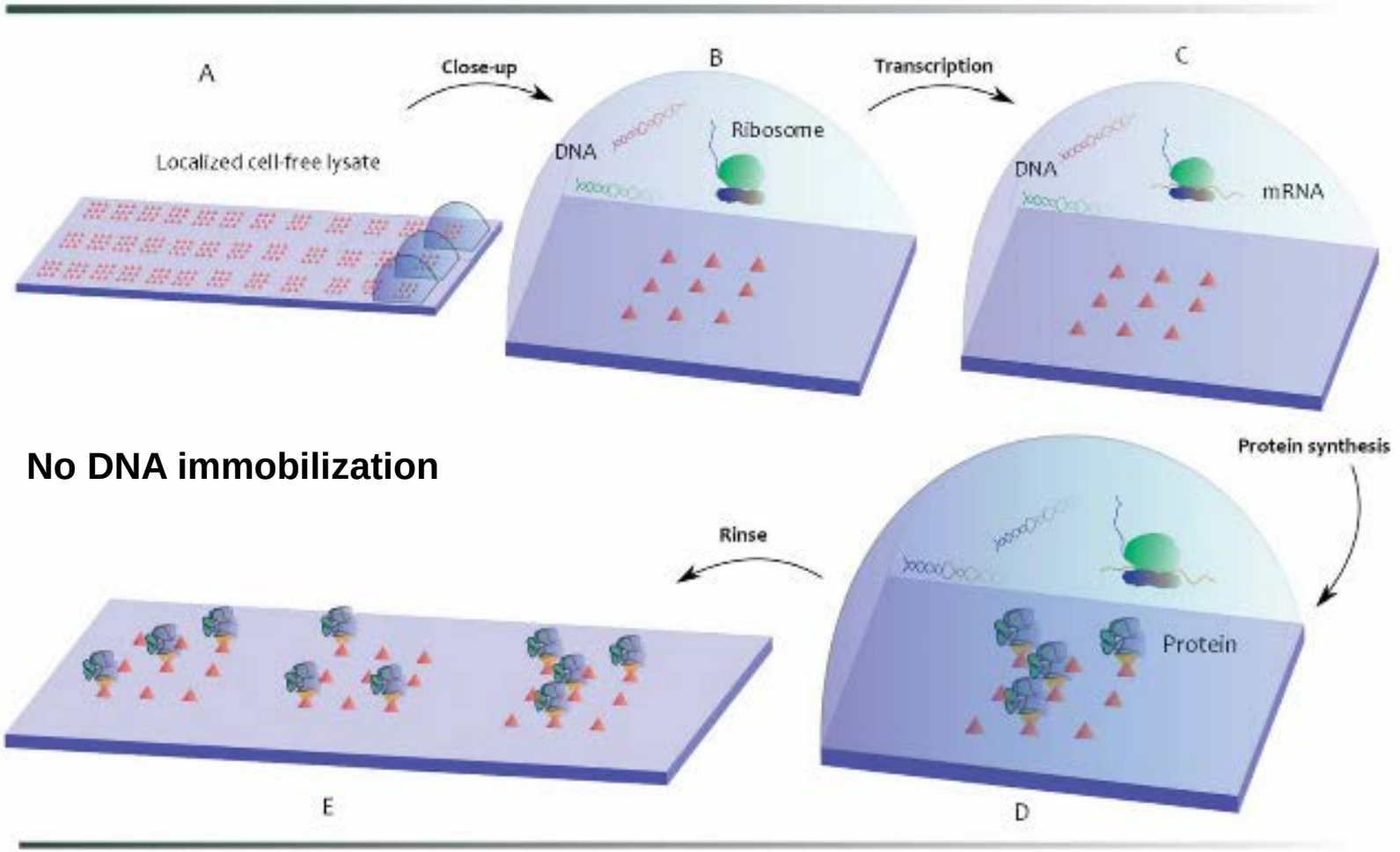
Cell Free Systems

Protein In Situ Array (PISA)



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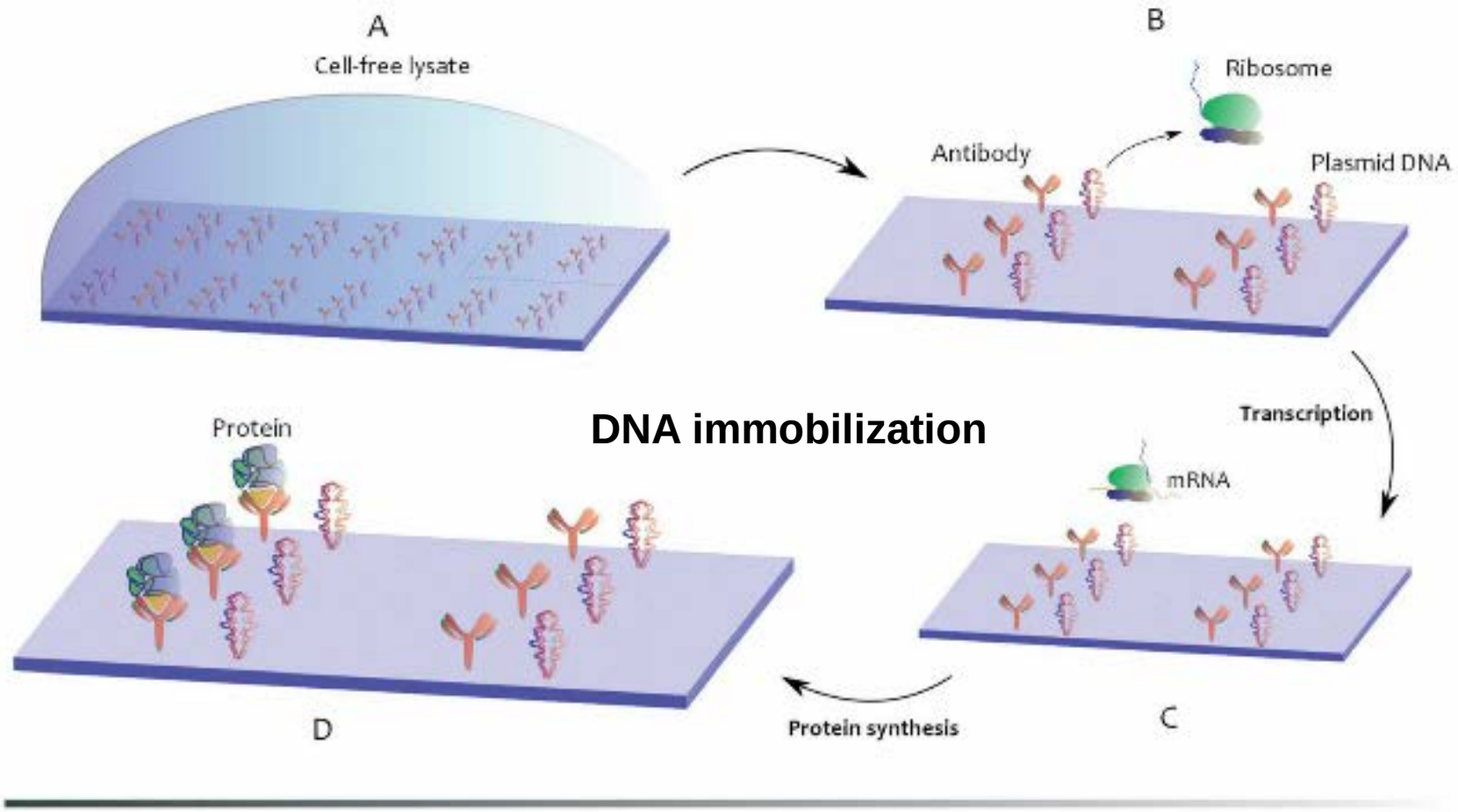
NAPPA



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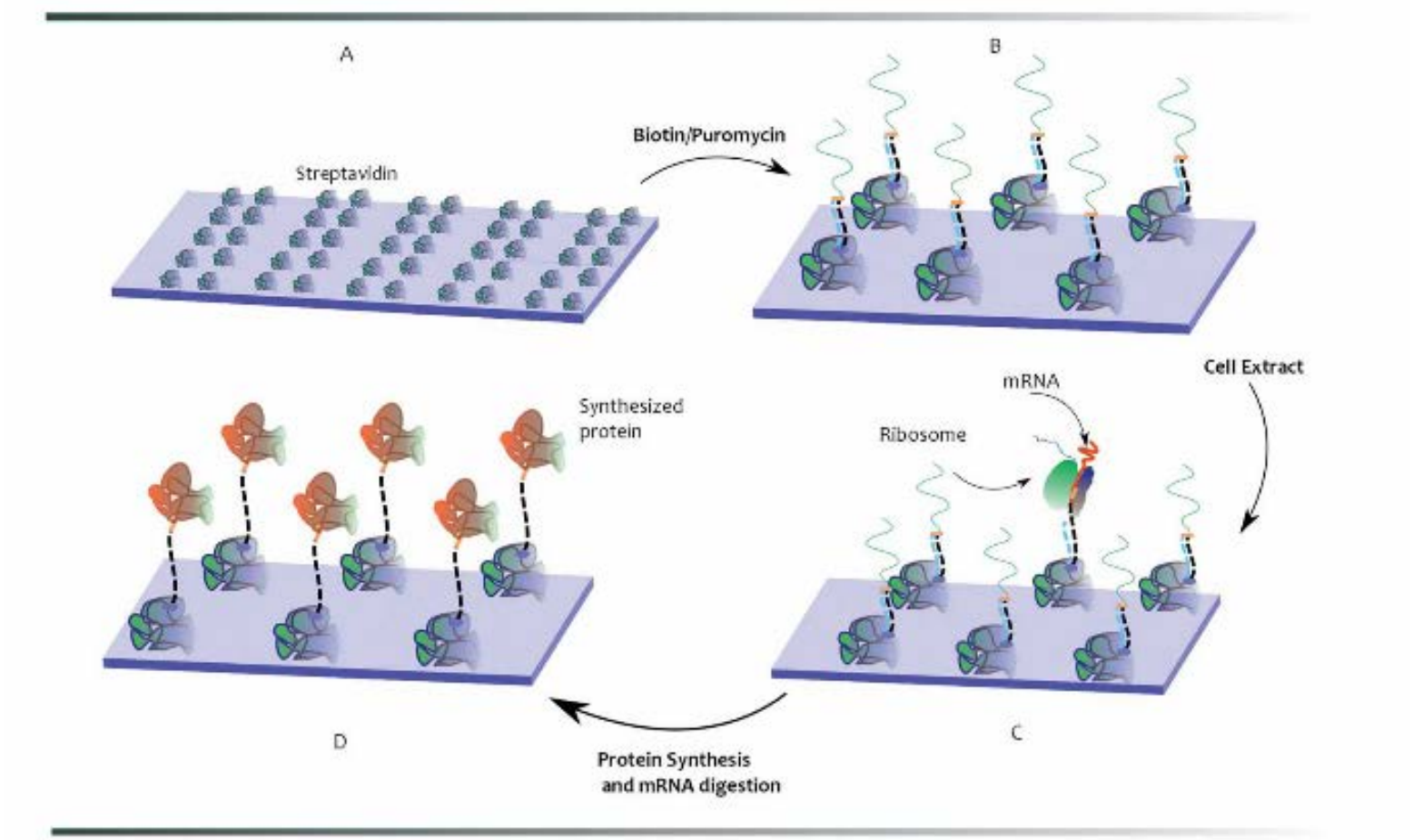
In Situ Puromycin Capture



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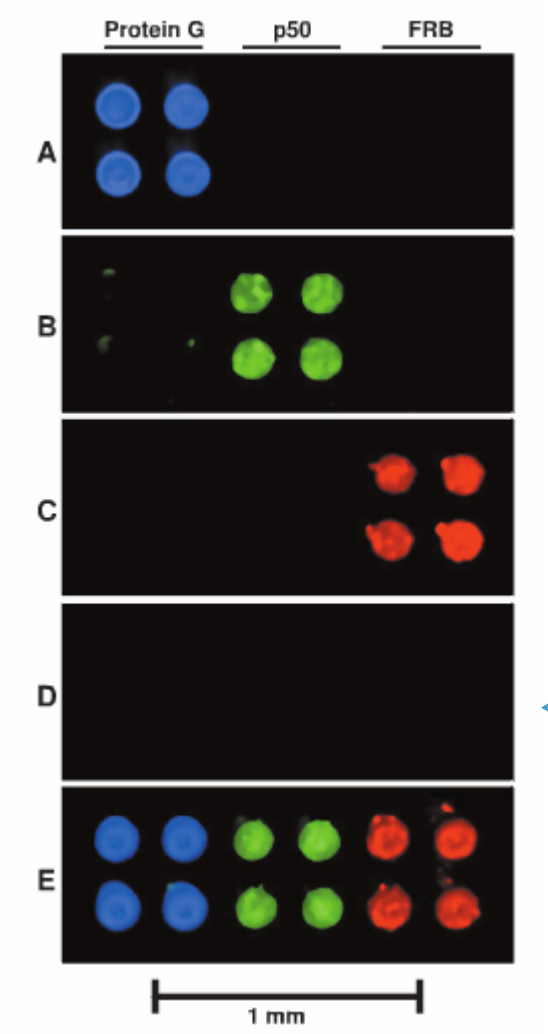
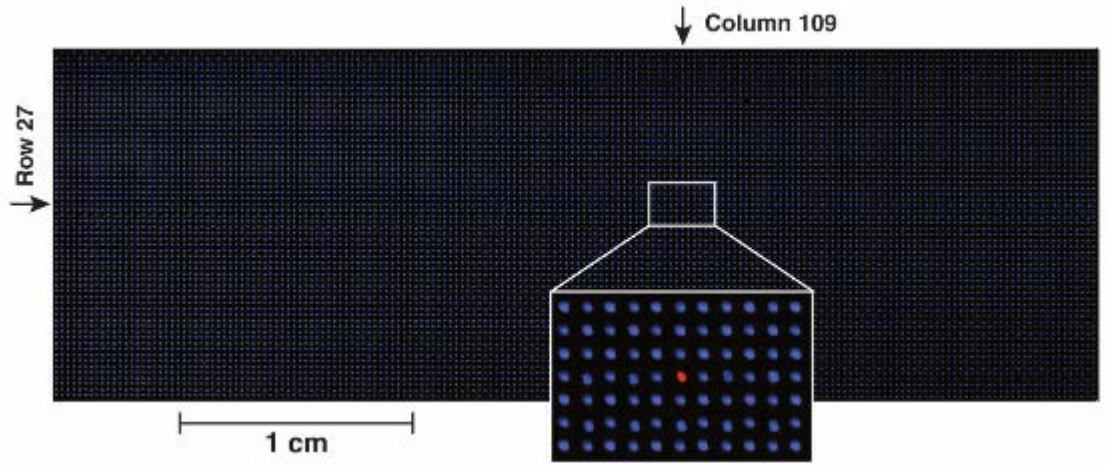
Printing Proteins as Microarrays for High-Throughput Function Determination
Gavin MacBeath and Stuart L. Schreiber
Science **289**, 1760 (2000);
DOI: 10.1126/science.289.5485.1760

Proof of Concept

Protein-Protein interaction



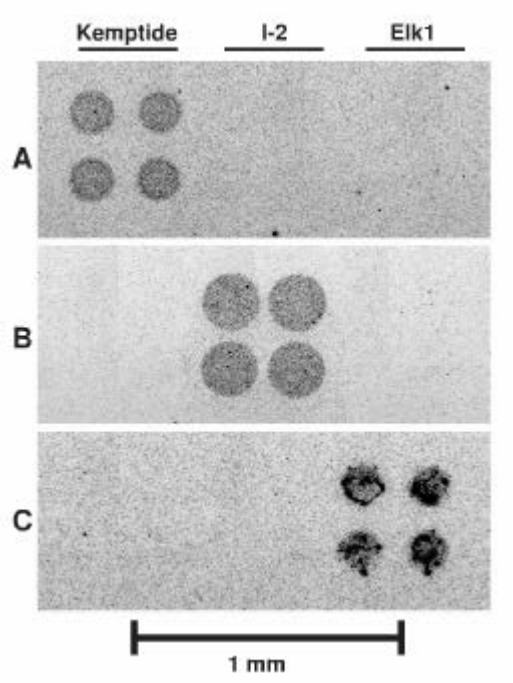
Single spot detection



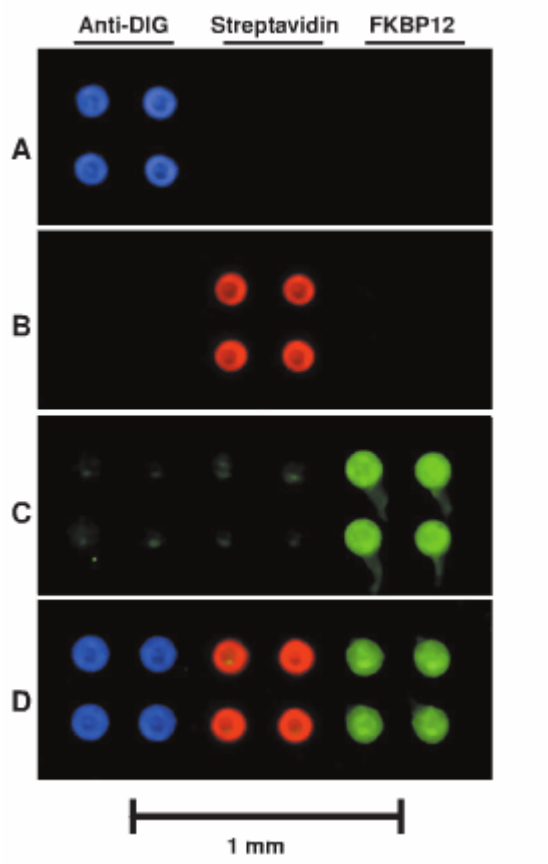
No rapamycin

Proof of Concept

Detection of kinase substrates



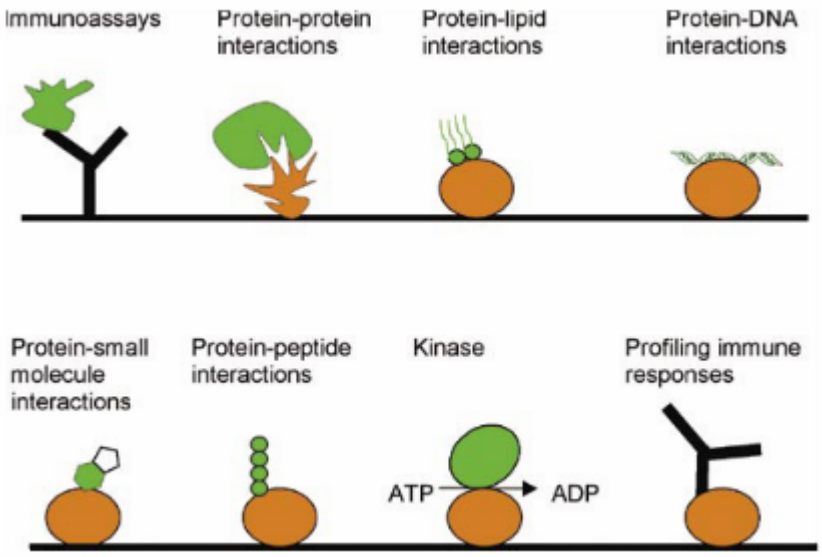
Detection of small molecules targets

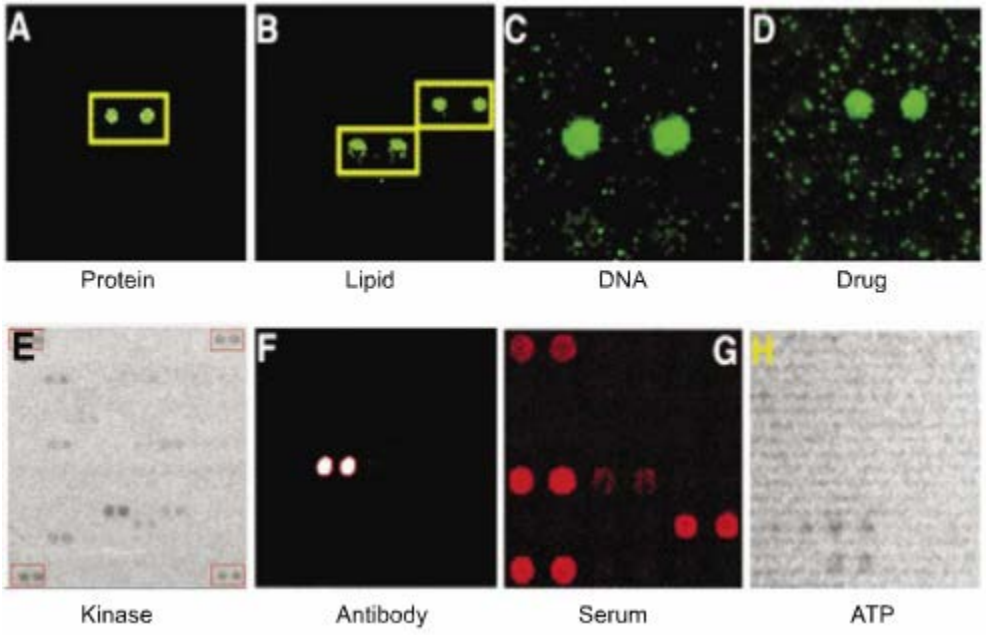


Protein Microarrays

Chien-Sheng Chen and Heng Zhu
Department of Pharmacology and Molecular Sciences/High-Throughput Biology Center, Johns Hopkins University School of Medicine, Baltimore, MD, USA

Applications





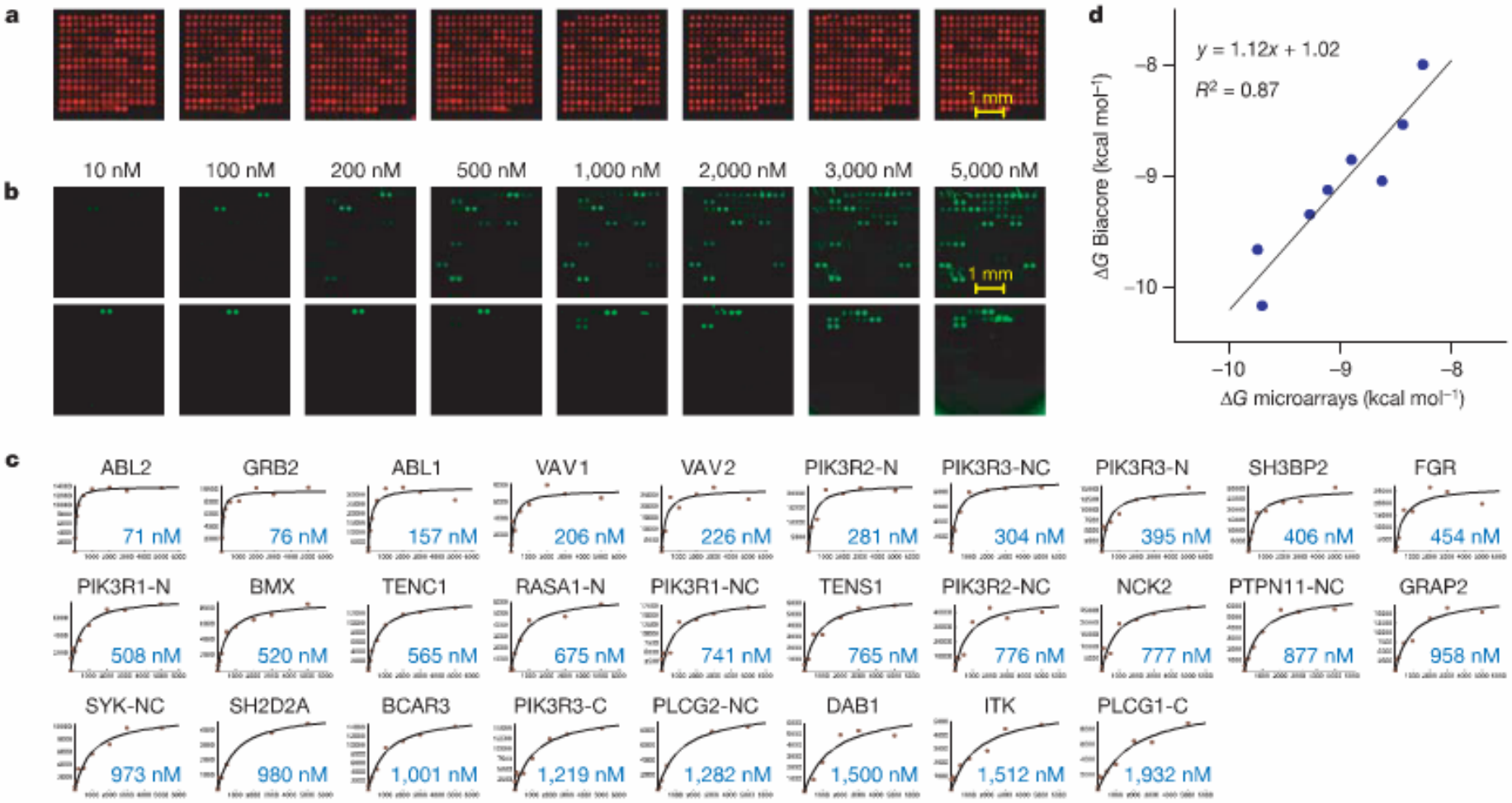
nature Vol 439|12 January 2006|doi:10.1038/nature04177

ARTICLES

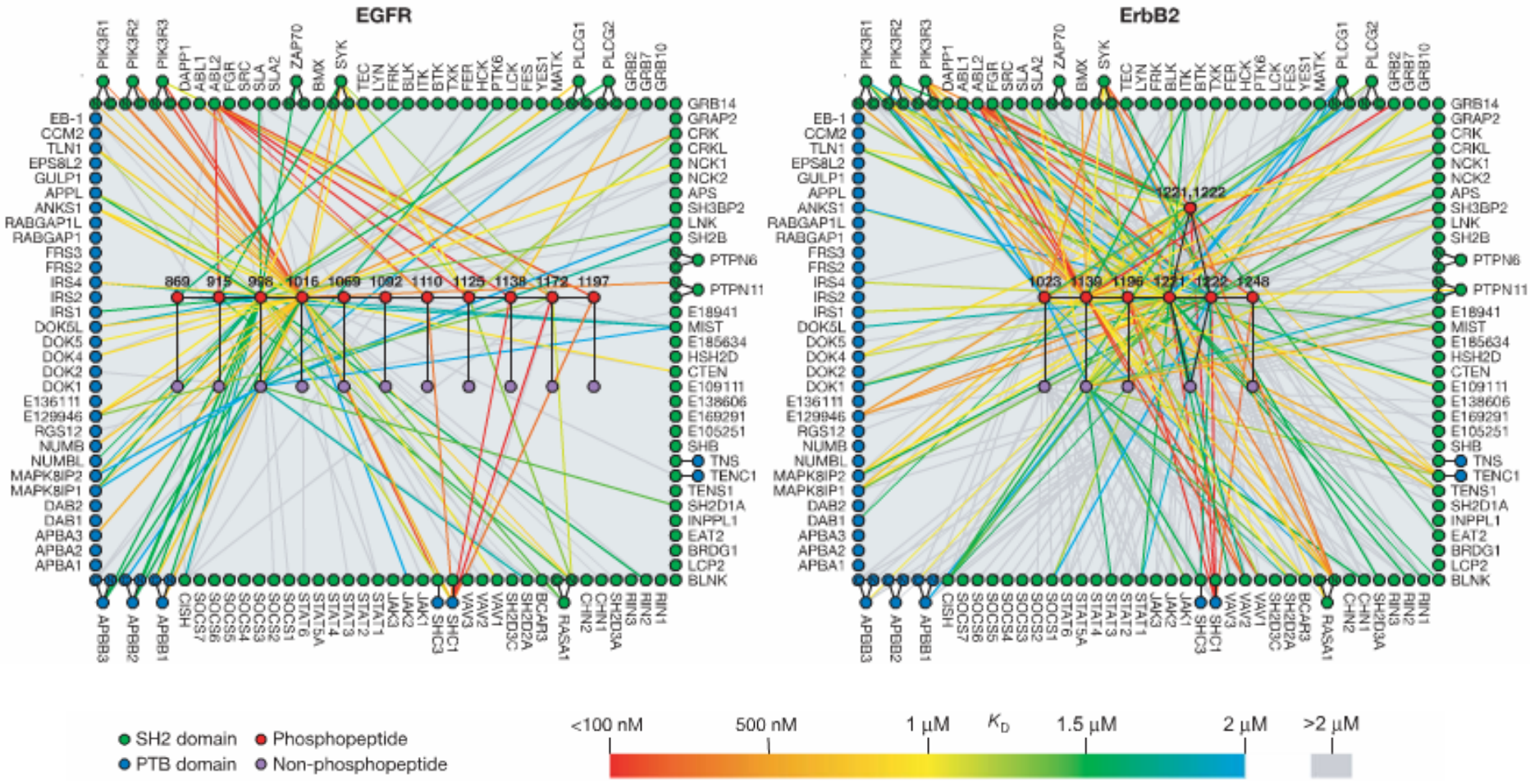
A quantitative protein interaction network for the ErbB receptors using protein microarrays

Richard B. Jones[1]*, Andrew Gordus[1,2]*, Jordan A. Krall[1] & Gavin MacBeath[1]

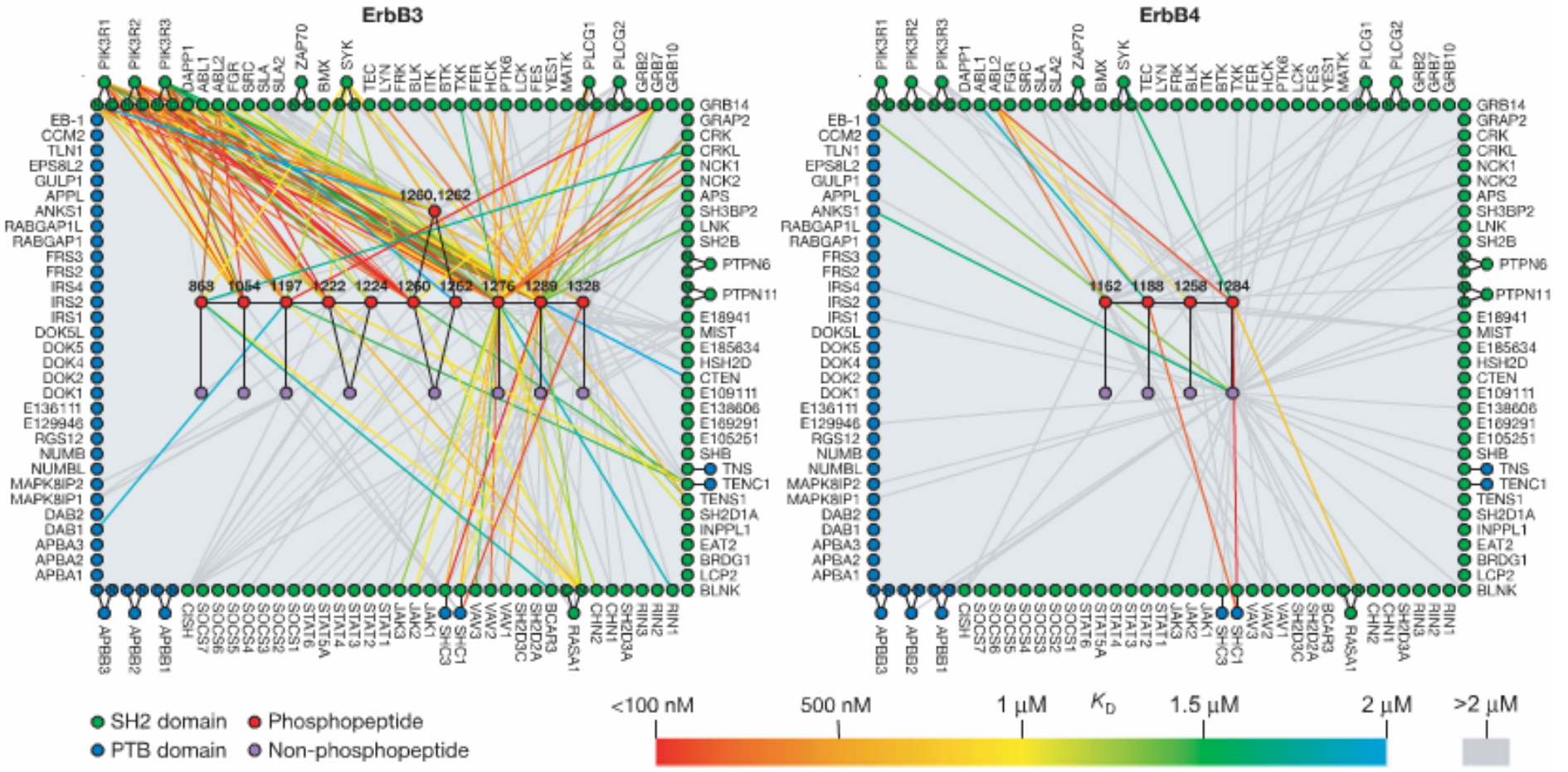
Binding Affinity



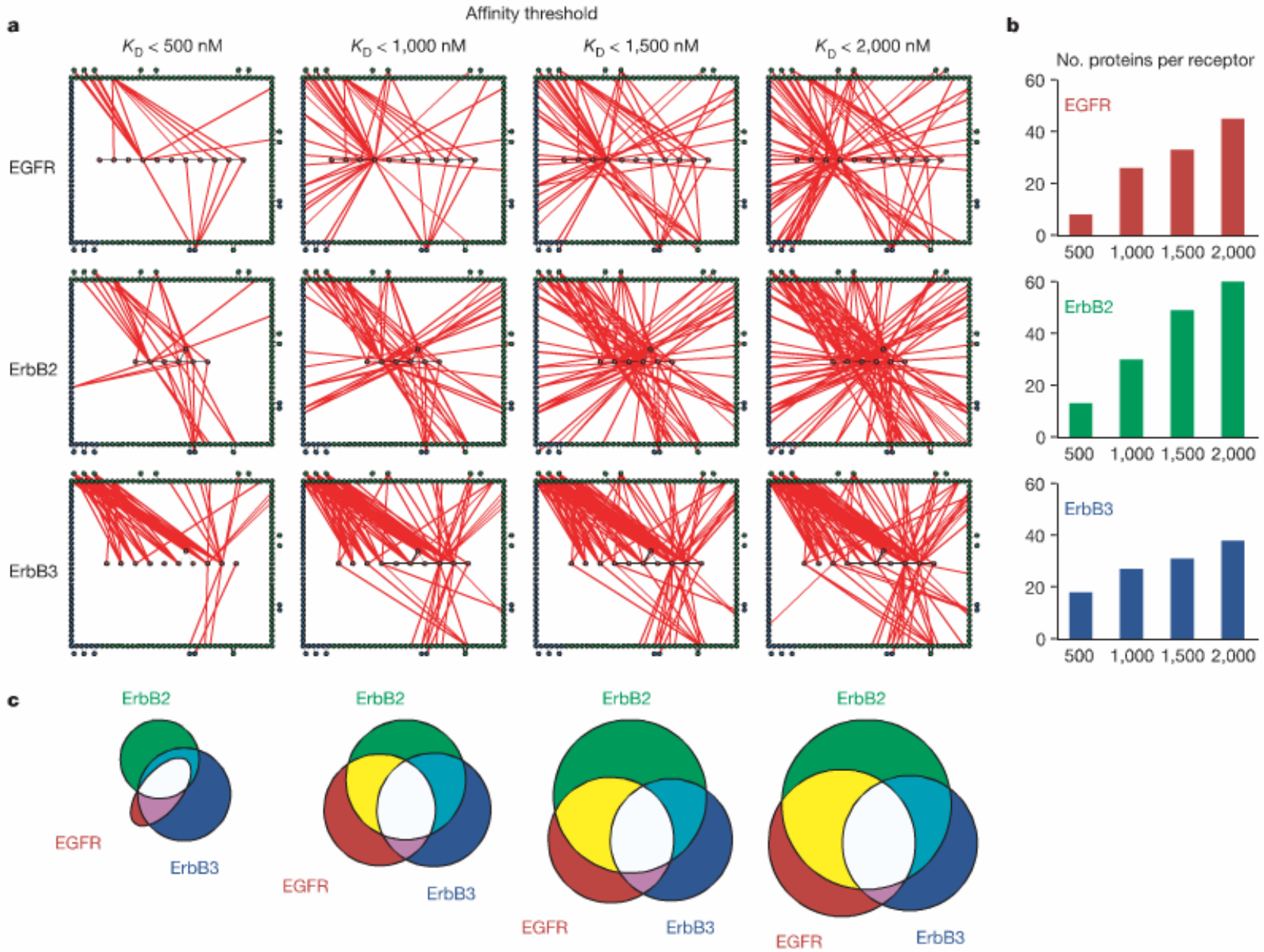
Quantitative Interaction



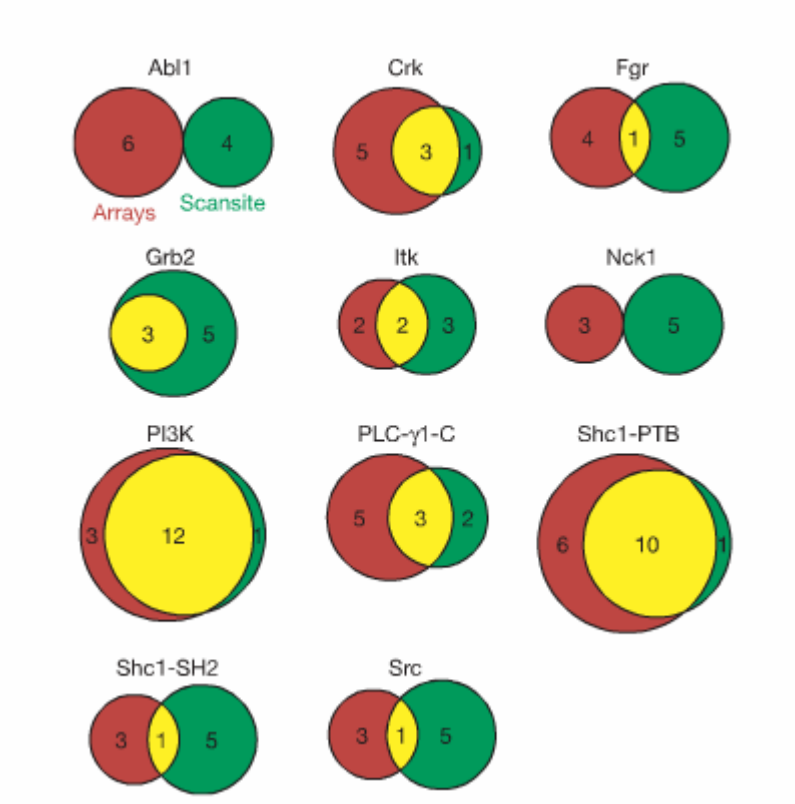
Quantitative Interaction



System-level View



Available Domains



PROTOCOL

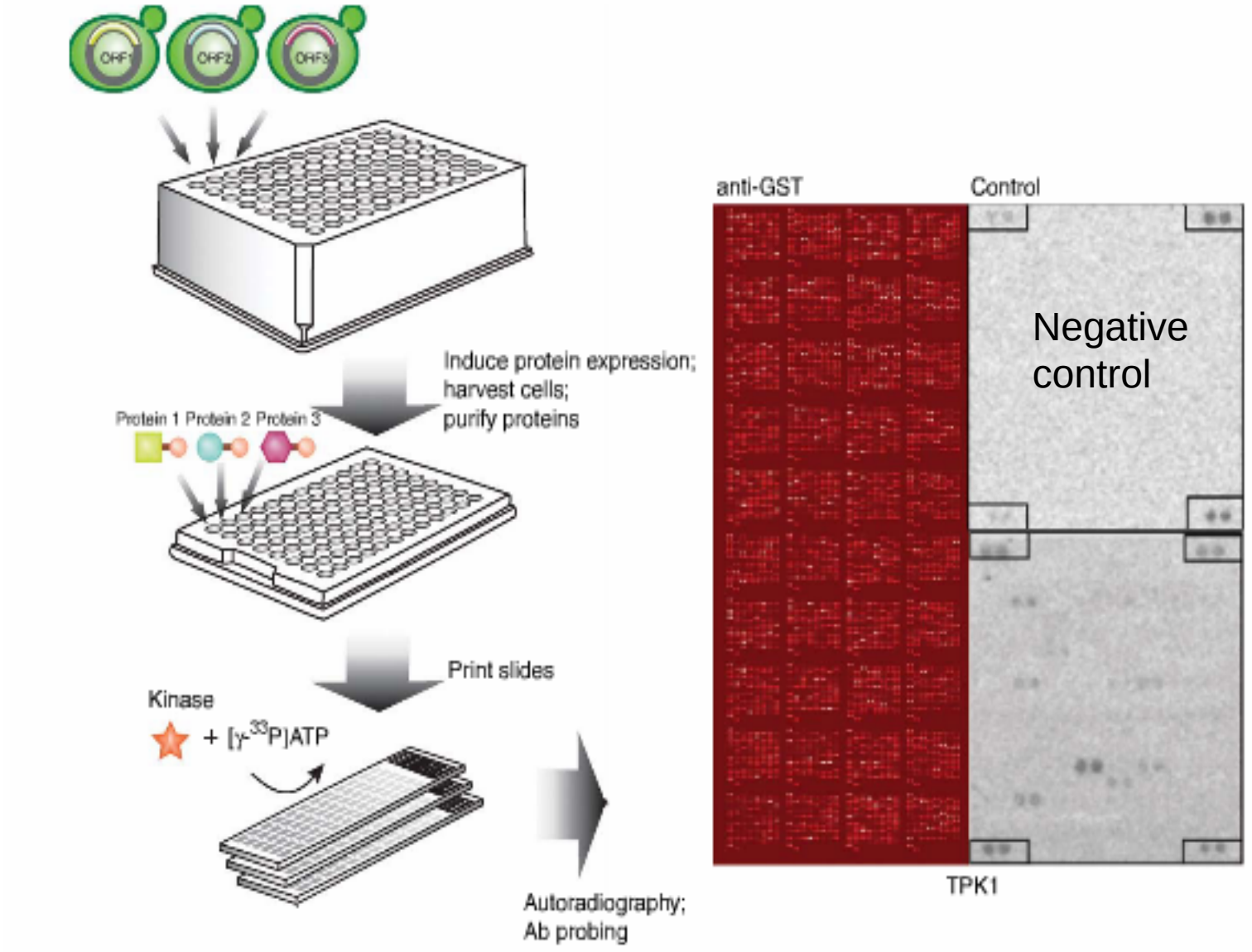
Global identification of protein kinase substrates by protein microarray analysis

Janine Mok[1–3], Hogune Im[1–3] & Michael Snyder[1, 2]

[1]Department of Molecular, Cellular and Developmental Biology, Yale University, New Haven, Connecticut, USA. [2]Present addresses: Stanford Genome Technology Center, Stanford University, Palo Alto, California, USA (J.M.); Department of Genetics, Stanford University, Palo Alto, California, USA (H.I. and M.S.). [3]These authors contributed equally to this work. Correspondence should be addressed to M.S. (MPsnyder@stanford.edu).

Published online 19 November 2009; doi:10.1038/nprot.2009.194

Yeast Kinase Identification



Biosensors and Bioelectronics 47 (2013) 490–495

Contents lists available at SciVerse ScienceDirect

Biosensors and Bioelectronics

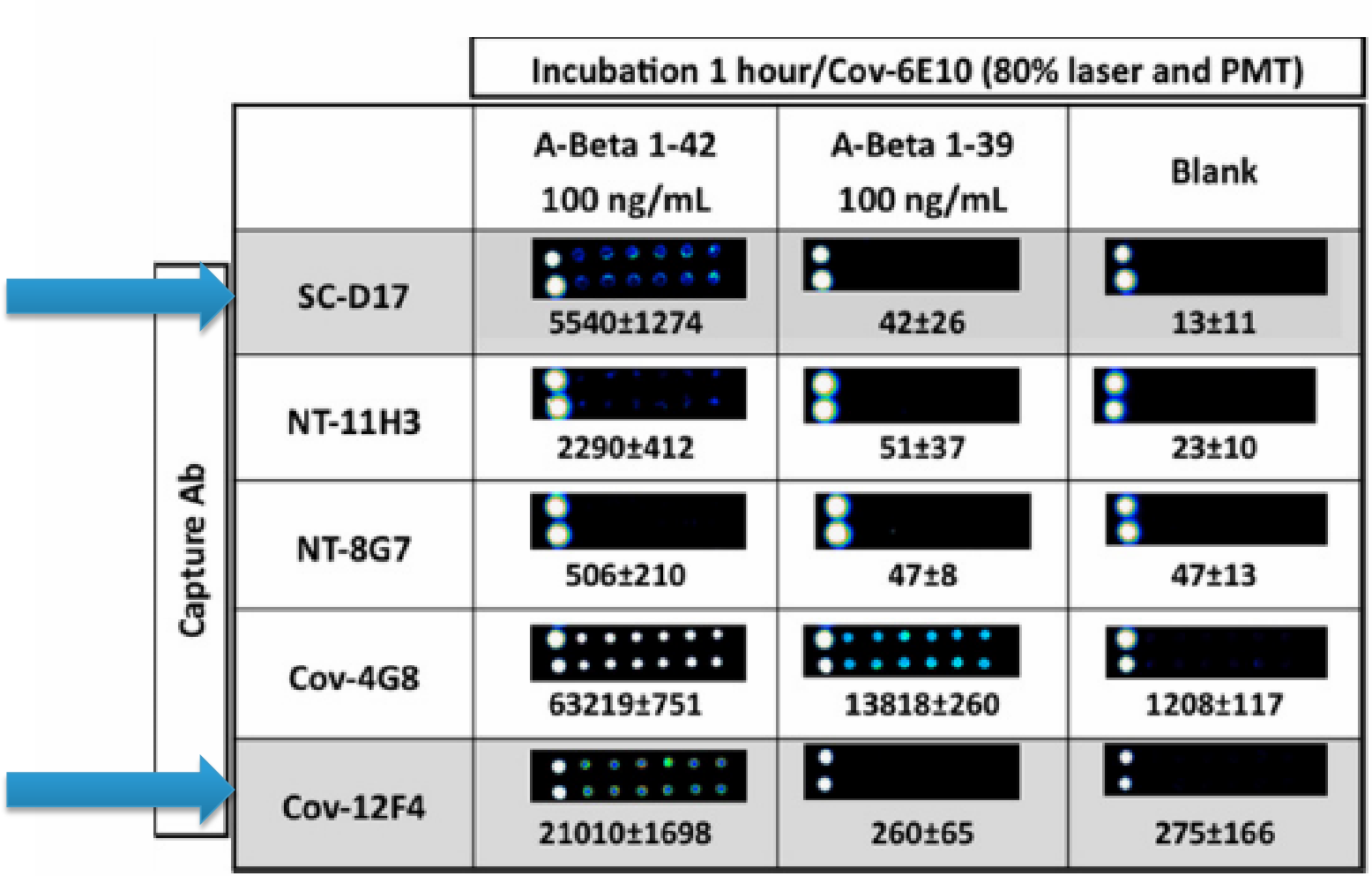
journal homepage: www.elsevier.com/locate/bios

Development of a high-sensitivity immunoassay for amyloid-beta 1–42 using a silicon microarray platform

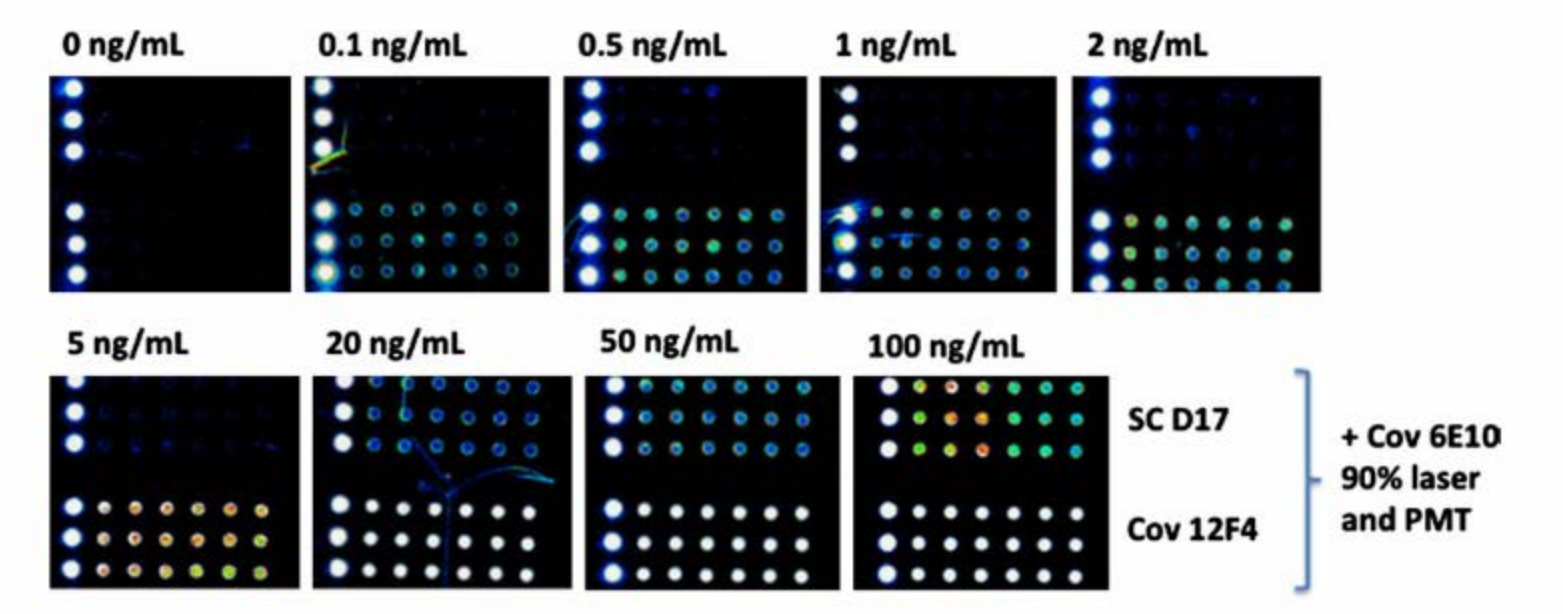
Paola Gagni, Laura Sola, Marina Cretich*, Marcella Chiari

Consiglio Nazionale delle Ricerche, Istituto di Chimica del Riconoscimento Molecolare (ICRM), Via Mario Bianco, 9 20131 Milano, Italy

Capture Ab selection

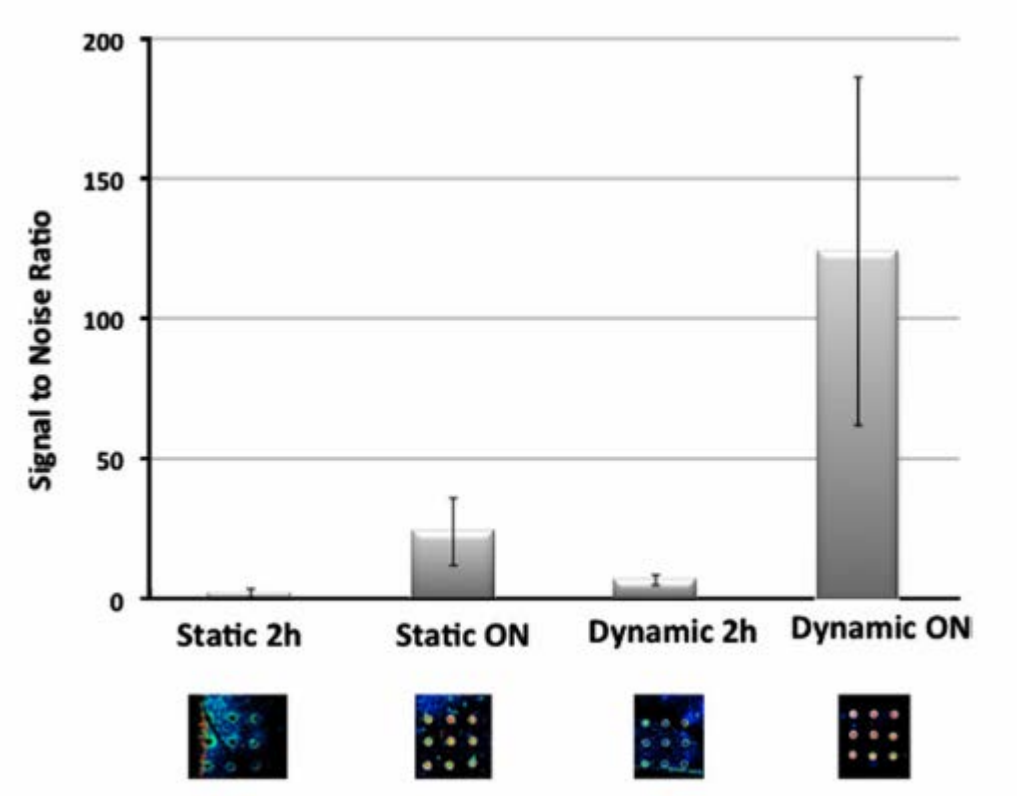


AB 42 Detection



Artificial CSF

Signal to Noise ratio



Human CSF

Conclusions

- 15 years after the first landmark papers and proof of concepts the technique is limited to a few applications
- Use of arrays is discouraged by
  - The laborious preparation processes
  - Cost and equipment
  - Complexity of data generated
- Protein folding and missfolding remain a challenge and an obstacle for protein chip
- Protein chips are already available commercially, but major publications validating their use are still missing

Questions?