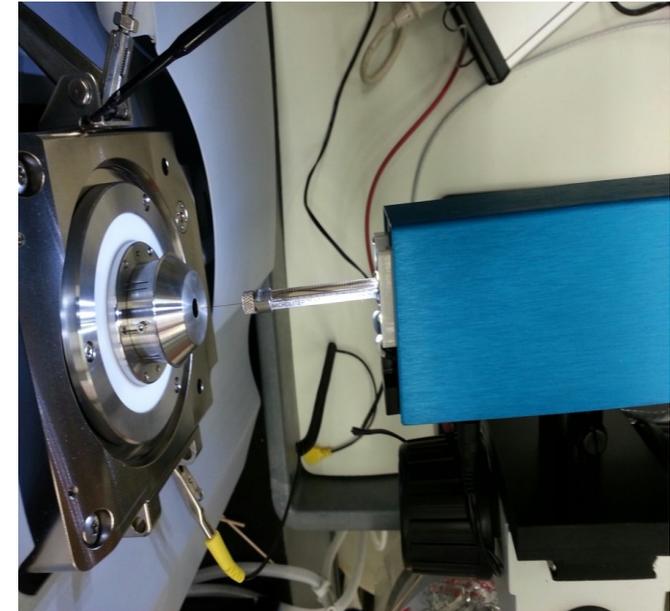
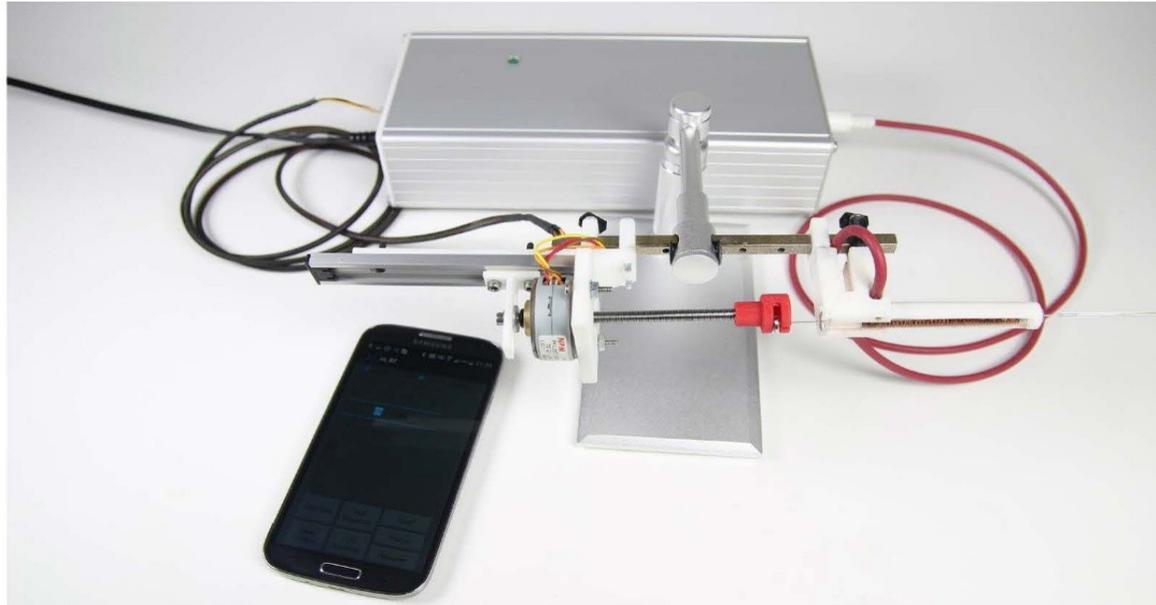


# Nanoliter

**CAN PESTICIDES & POTENCY BE ESTIMATED AT ONE SECOND/SAMPLE  
WITH A CELL PHONE & A MS?**

Drew Sauter and Andrew D. Sauter III  
nanoLiter LLC  
Nanoliter.com  
HD,NV  
702-882-5413



# Nanoliter

## Who is using rapid nanoLiter sample input now?

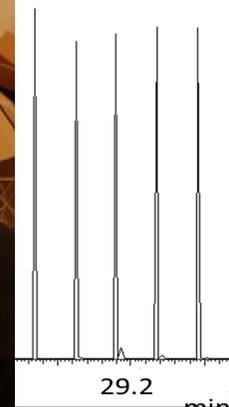
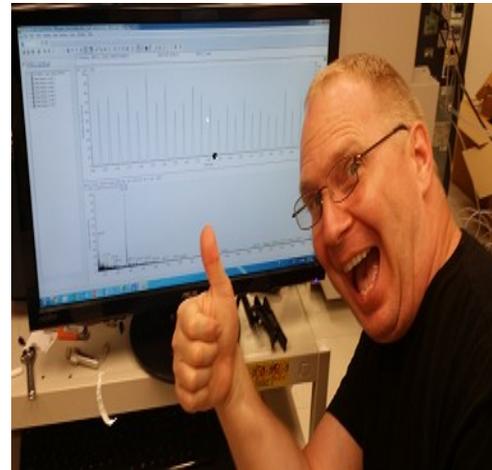
US DOE at Idaho National Lab, Lanthanides/Actinides.



US Army at Aberdeen Proving Ground MD. Highly toxic, VISCOUS liquids/agents.



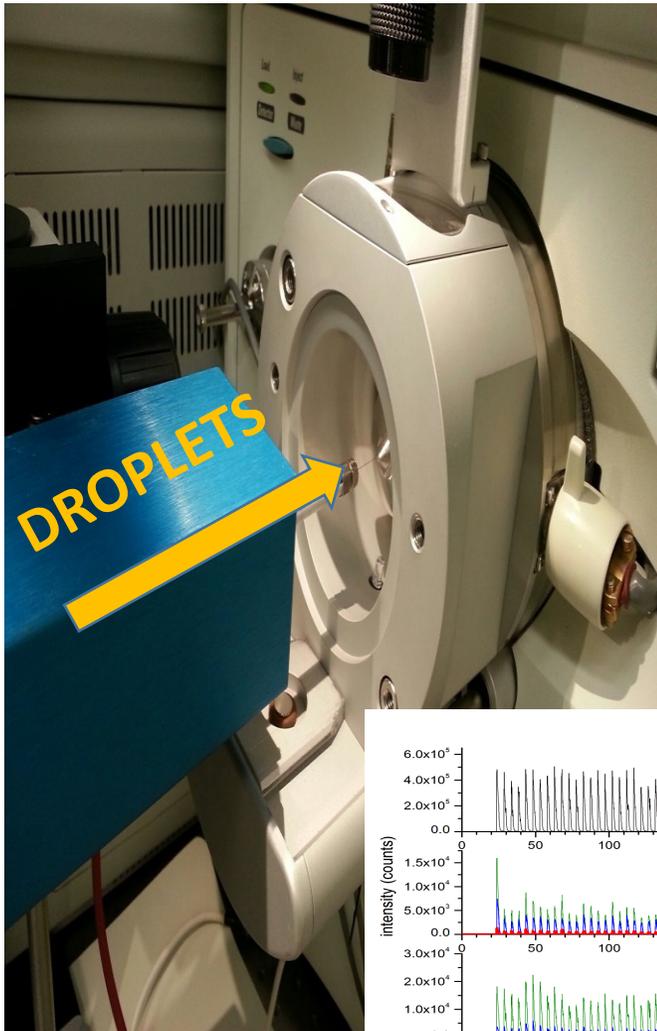
University of Cincinnati, nucleosides, nucleotides and related entities.



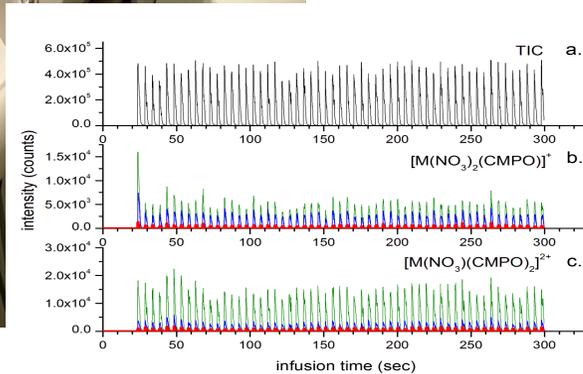
Example customers, clients: U's of Ill, WI, CA, Cinn., MUSC, Wash. U., USF, USU, US Army APG, ECBC and Natick, Abbott, Biogen Idec, Genentech, Amgen, Hitachi, Allergan, Spark, Douglas, NIH, NIST, USDOE INL, Ga Tech, UNH, Duquesne, NASA, Air Force, Air Force, and Sciex offered to license. +. Agilent's John Sausen request IBF information.

# Patented Droplet Devices.

## ESI

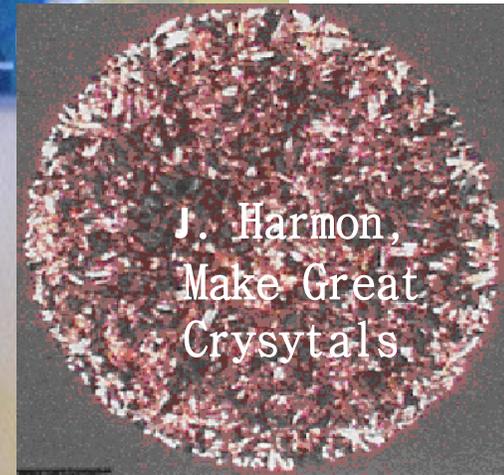


SAME Cell Phone Controller.



Fly droplets into MS!

## MALDI

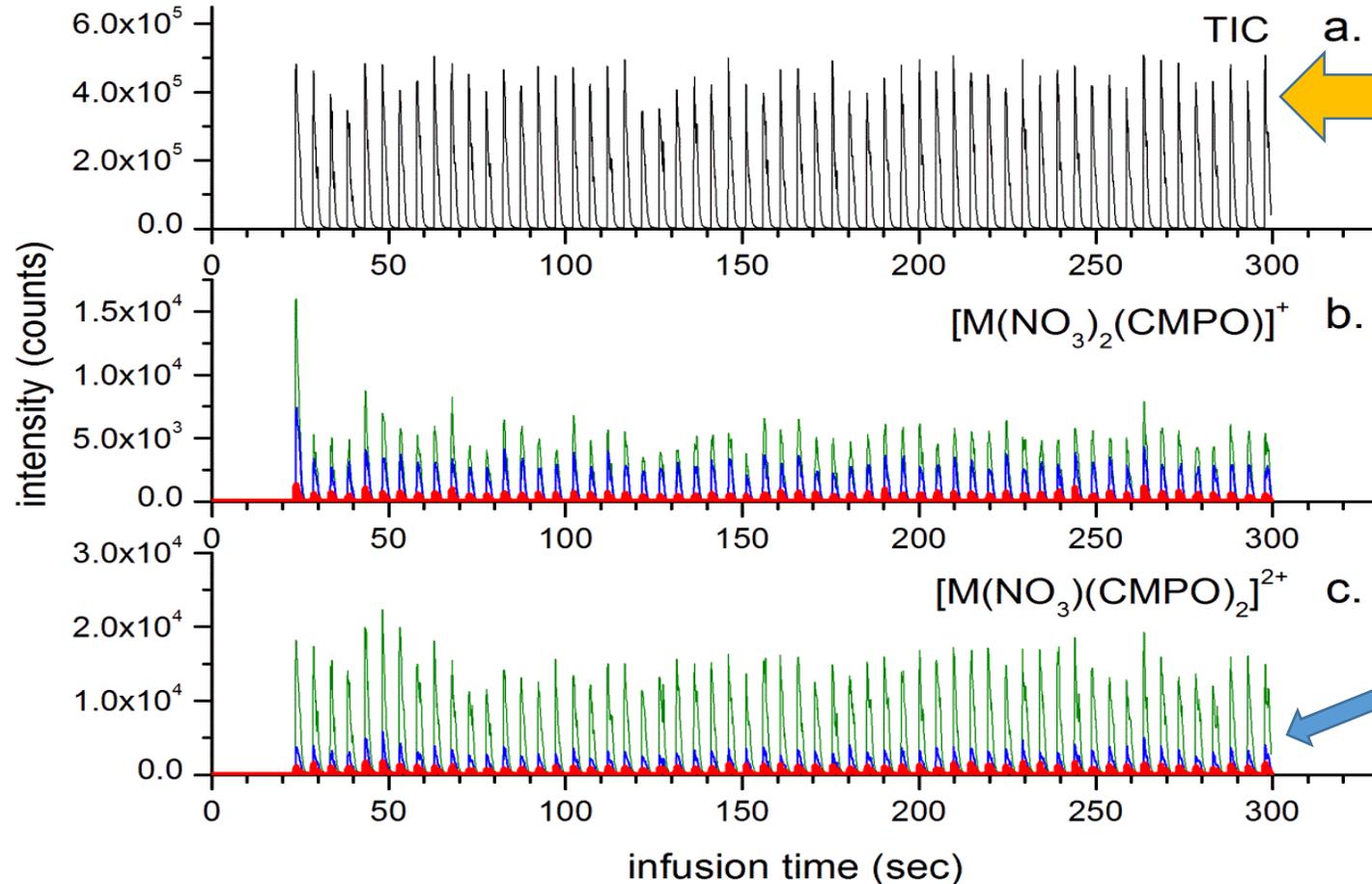
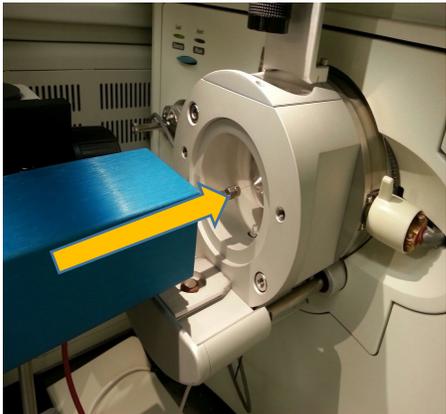


Fly droplets onto target for MALDI, SIMS & LDI.

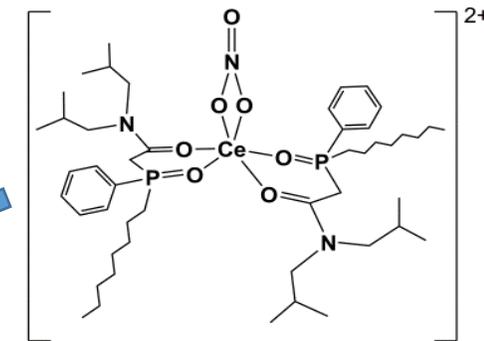
# DROPLETS: IBF MS, Lanthanide Chelate From Idaho National Lab.\*

Fastest, very efficient (100% or less), versatile and simplest MS sample introduction technology in the world!  
non-touch, low volume, dispensers, treatment devices for ESI or MALDI.

Droplets into MS's,  
Rapid, INL, G. Groenewold  
reproducible with 100%  
"all-in" !

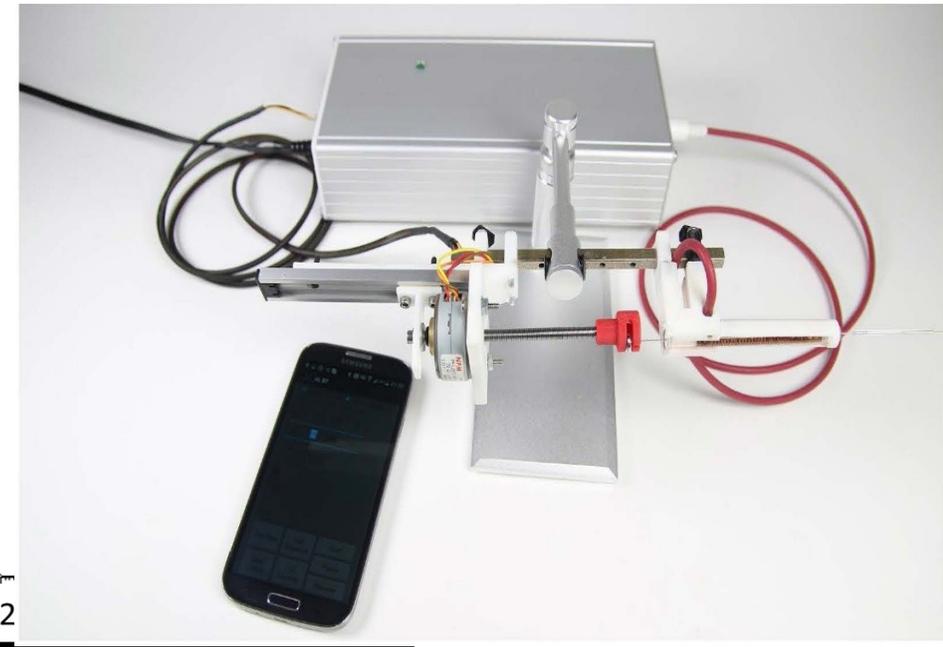
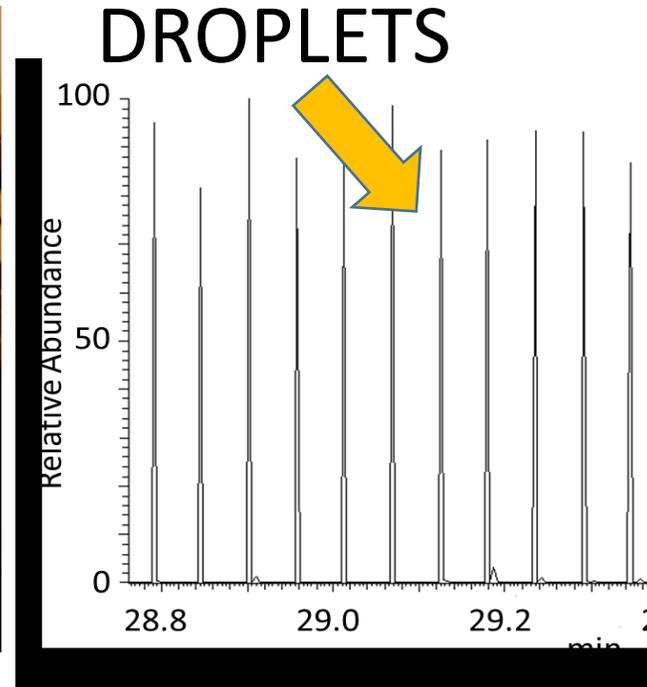
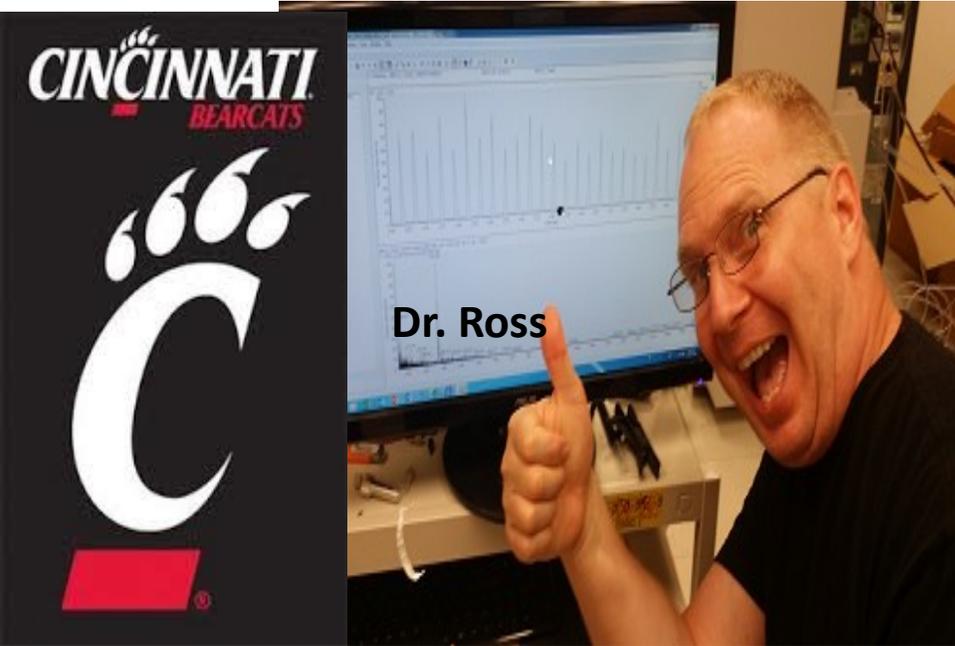


← DROPLETS



Positive ion profiles generated by individual drops. a. Total ion current. b.  $M(NO_3)_2(CMPO)]^+$ .  
c.  $[M(NO_3)(CMPO)_2]^{2+}$ . Blue = Ce<sup>3+</sup>, Green = Tb<sup>3+</sup>, Red = Lu<sup>3+</sup>. \* Bruker u-ToF, +eV, reflectron, 12 Hz, 50-2000 amu. (16).

# DROPLETS: IBF MS/MS Infusion of Nucleosides, Nucleotides, RNA Hydrolysates, U. Cincinnati.



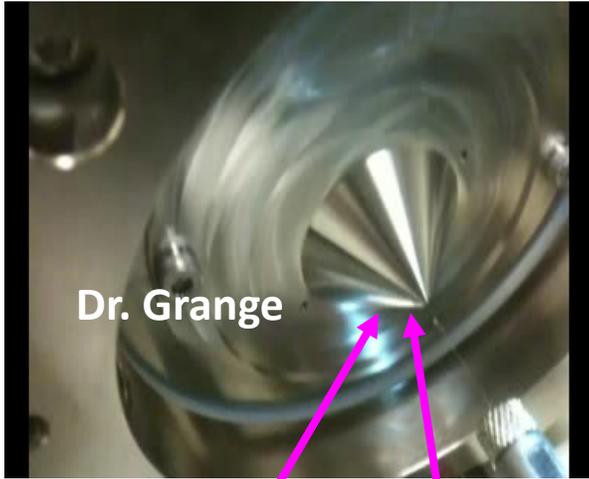
IBF-LC-MS/MS data of droplet introduction over a one minute acquisition window., 5, nucleosides (Cy, Ur, 5MeUr, Ad, 2MeAd.), ASMS 2017, P. Limbach, et al. Dr. Ross celebrating. Device, nL Programmable Wave, an Android based source,

The intervals between droplet arrival in the mass analyzer are characterized by no background. More importantly, the relevant sample information is present within a single droplet. That is, an integrated mass spectra across droplets agrees with that from a single droplet as previously published in Analytical Chemistry in 2013 by us and P. Limbach et al.

It is thought, but not proven, that this intensity variance shown by the yellow arrow and ? is because there was no cover over the inlet. Lots of other data shows excellent reproducibility. Data is + eV, conditions reported ASMS poster of Limbach, Sauter, et al.

# DROPLETS: Shoot “cells & cellular” liquids into an MS systems. EPA LV.

100% reproducible cell/saliva sample introduction into an ESI/MS ! Biomarker, direction discovery tool ?

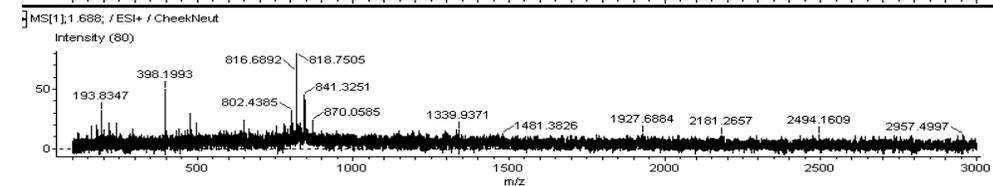
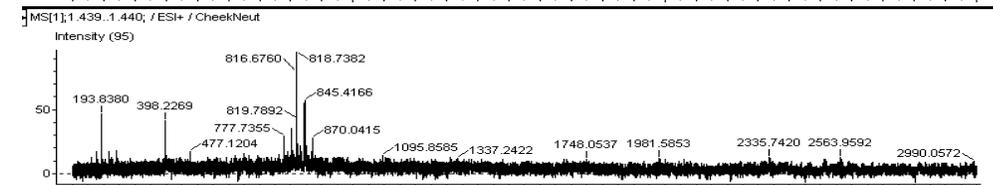
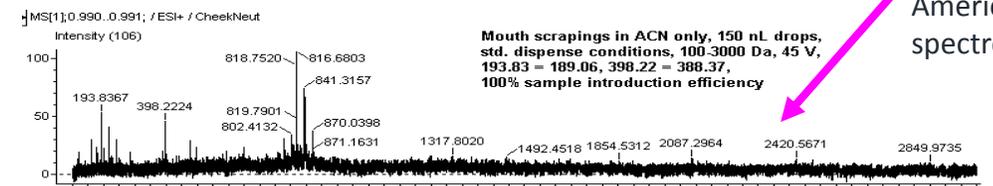
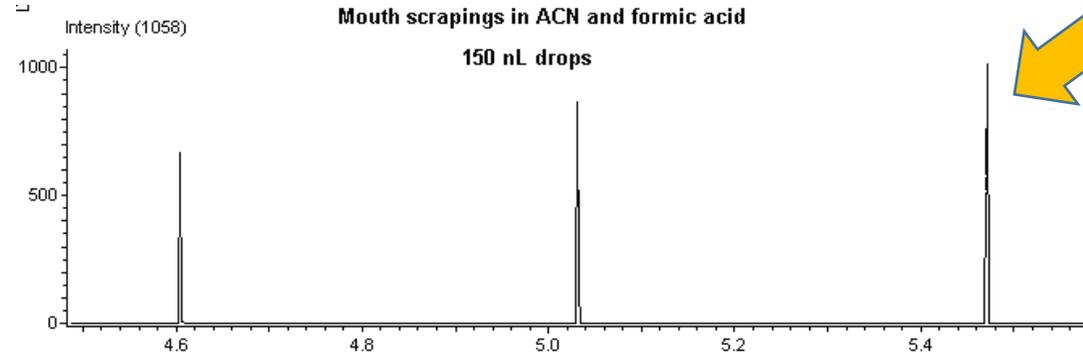


Dr. Grange

Cancer,  
disease  
cells

Adjacent,  
healthy  
cells

## DROPLETS



Mass spectra from three 150 nL droplets containing white matter, cells, human saliva.

Can IBF of cells, fragments efficiently direct biomarker discovery?

I believe so and I’m seeking cancer, disease R&D collaborators.

NIH considering doing bacteria this way, may not need a laser or may have an alternate approach.

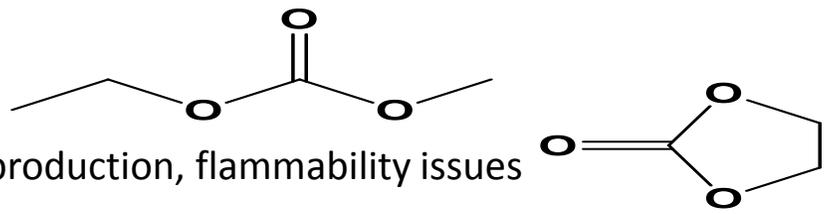
# DROPLETS: Single drops from an OPERATING! Li+ battery electrolyte + fire retardants, DOE INL.

Dr. G. S. Groenewold, et al, Idaho National Lab. Very early input by Drew Sauter nanoLiter LLC.

- Coin cells: dependent on Li<sup>+</sup> transport in carbonate electrolyte – weakly coordinating solvents

- EMC
- EC

- Breakdown can lead to H<sub>2</sub> production, flammability issues



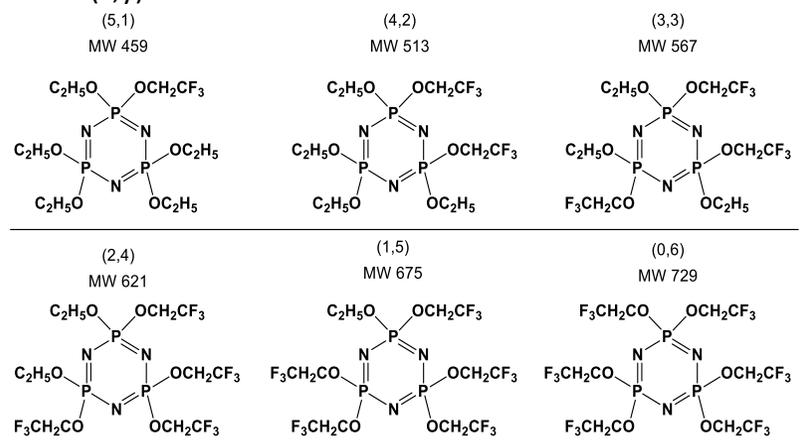
100% Shot into MS!

FedEx to Elon Musk!

ESI  
MS,  
MS,  
IMS

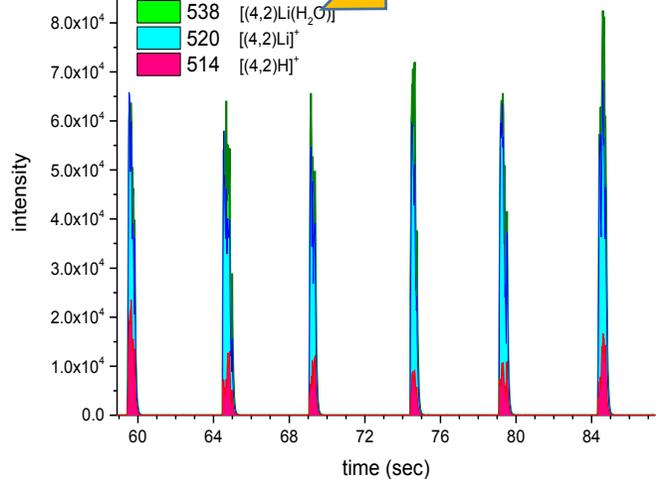
## Lithium ion battery w/fire retardants

(Etoxy)<sub>x</sub>(2,2,2-trifluoroethoxy)<sub>y</sub>phosphazene cyclotrimers  
(x,y) short hand nomenclature

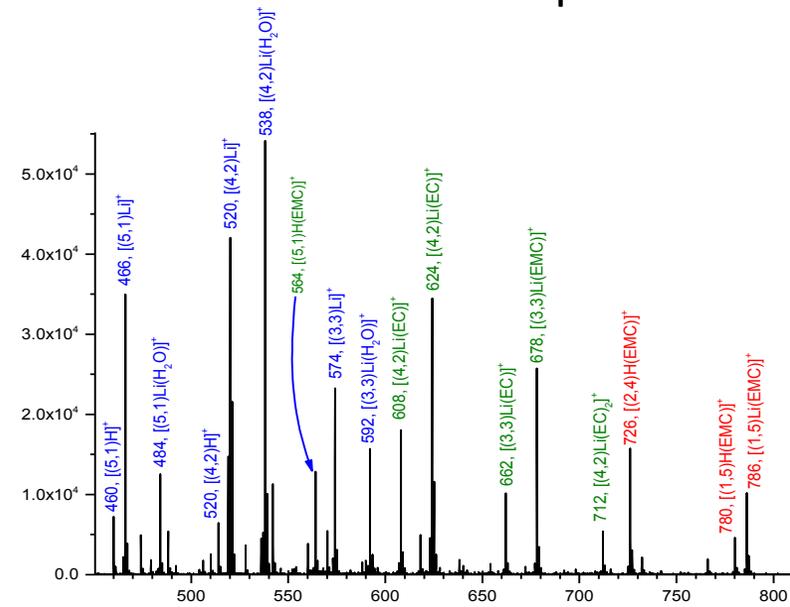


## DROPLETS into an n ESI!

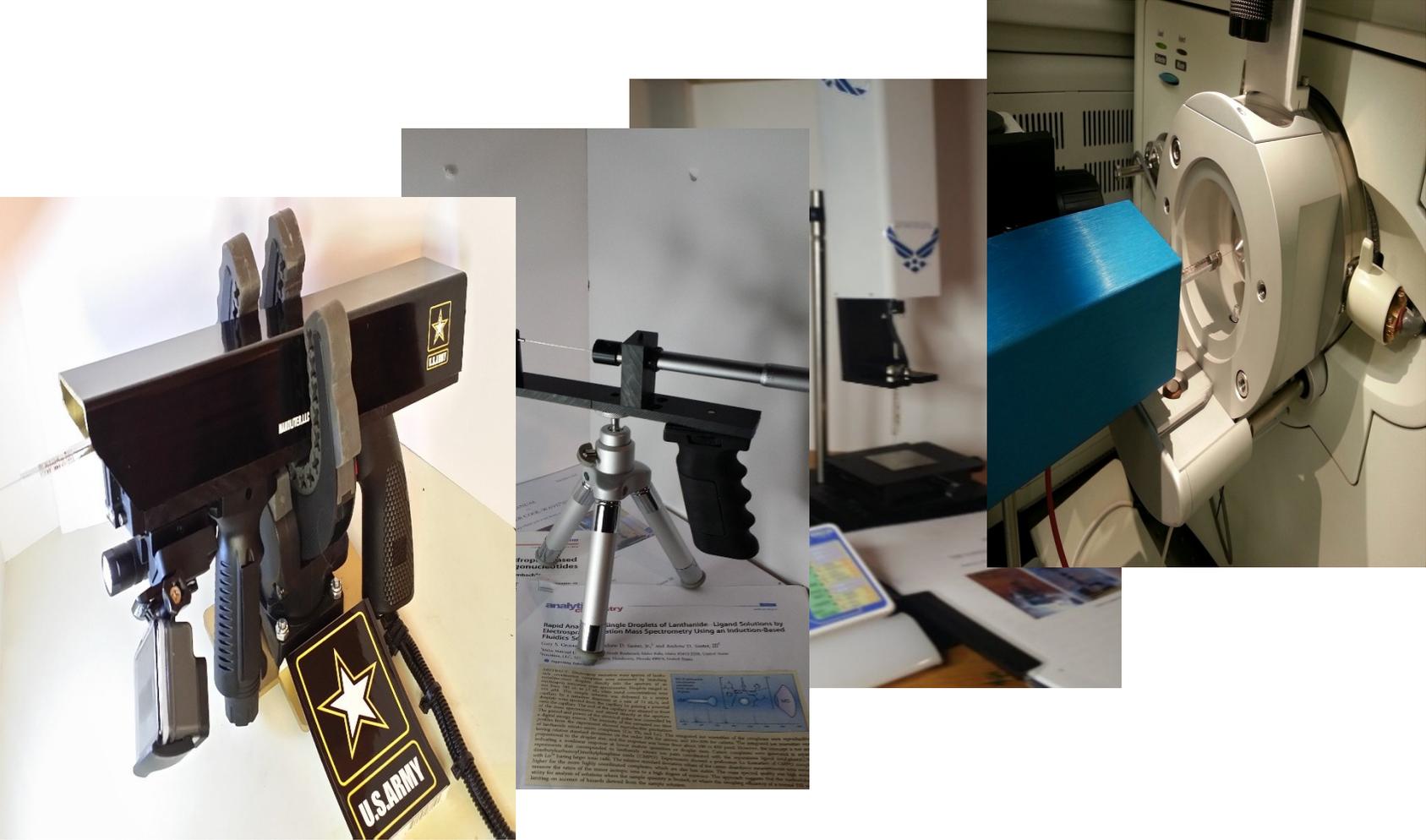
Extracted ion chromatograms, 100 nL droplets



## HRMS of nanoLiter droplets!



# DROPLETS for US ARMY APG-X1 DEVICE: INTO/ONTO TARGETS. CLASSIFIED WORK.



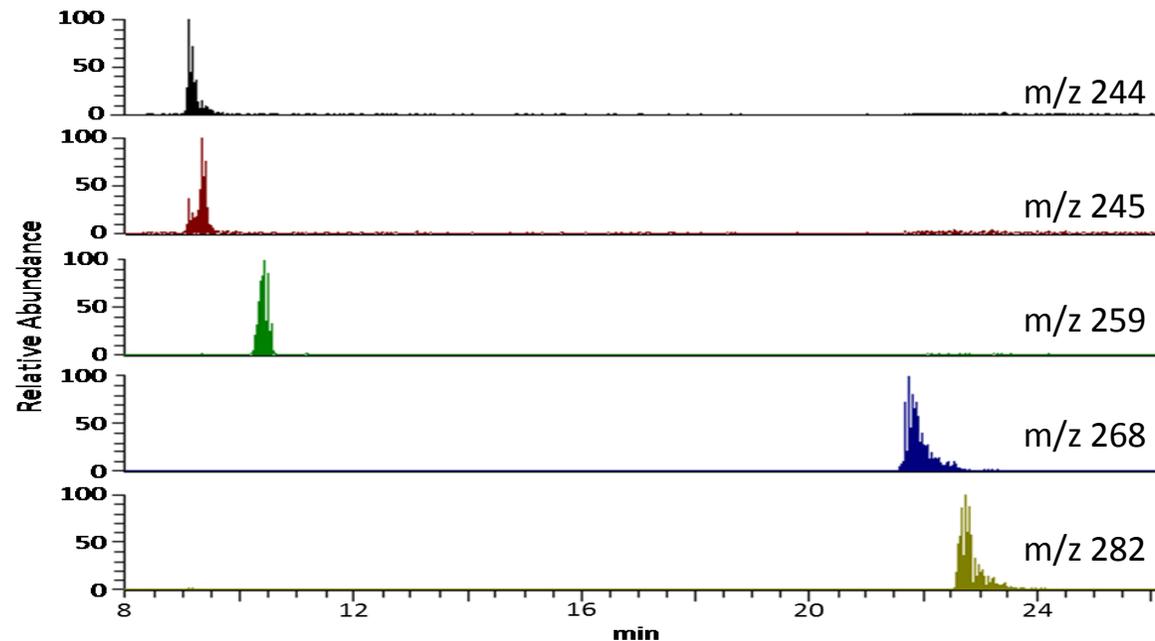
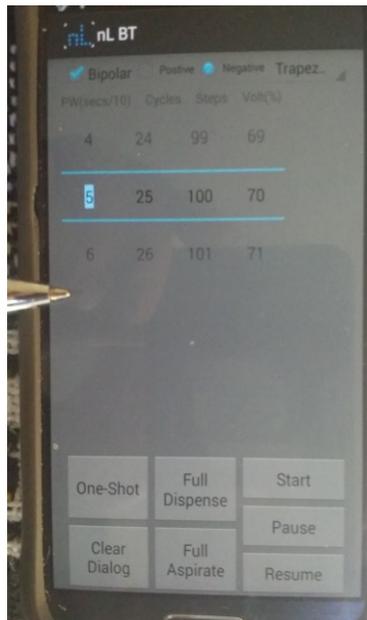
Fly's nLs to targets of even viscous liquids in classified projects and other efforts onto or into targets!  
APG,MD Army validation from 5 – 500 nLs. ASMS 2016. Drs. Oyler and Koplovits, et al, Note: GoPro® too!

**IF CHROMATOGRAPHY NEEDED.**

**THE nL PROGRAMMABLE WAVE= 100% INPUT EFFICIENT ESI UPLC MS. ANDROID CONTROLLED**

**ALLOWS YOU TO CREATE & CONTROL DROPLET TIMING, ENERGY, WAVE FUNCTION, VOLUME, POLARITY & LOCALE.**

**A POWERFUL VERY RAPID ESI LCMS & ESI INFUSION R&D DEVICE! WE CONSULT TOO!**



Extracted ion chromatograms of nucleosides, top, cytidine, uridine, 5-methyluridine, adenosine, and 2'-O-methyladenosine separated on a PGC capillary column and introduced into the MS by inductive charging. per Asilomar 2016 at U. of Cincinnati with Drs. Ross & Limbach. Also, see P. Limbach, et al, JMS Oct. 2015.

**THE PROGRAMMABLE WAVE ALSO MAKES EXCELLENT MALDI, SIMS, LDI CRYSTALS VIA THE SAME IBF DEVICE! IT ALSO HAS WET LAB APPLICATIONS, e.g., CRYSTALLOGRAPHY, TLC, and OTHER VERY COOL APPS (OVER).**

# Nanoliter

## ISSUES REGARDING PATENTED RAPID ( 1 to 10 SECOND/SAMPLE) POTENCY SCREENING.

ARMY, DOE, MAJOR U's, AIR FORCE & OTHERS USING THE TECHNOLOGY ACROSS THE USA.

- \* IBF. It's speed. It's plenty fast enough!  $> 1$  Hz,  
100% sample introduction efficiency in milliseconds possible.
- \* Ion trap, simple might be possible! QQQ CID or HRMS if needed!
- \* Solves the N & sampling problem. You can acquire analysis variance!
- \* Isobaric interferences a big problem?
  - 1 Second MRM Droplet integration!?
  - Alternate analytes or scans types.
  - Parallel analysis.
  - Reactive, other CID.
  - SPE, Really Rapid chromatography?
  - Other ?

**Pics & video clips.**

[10 Slide Overview](#)

[Cool Video,](#)

[5 sec](#) IBF, ESI sample input, INL

[0.5 sec](#) IBF, ESI sample input, INL

[1.0 sec,](#) IBF, ESI sample input UCSD.

[Robot/MALDI & LC/MALDI](#)

nL [Programmable Android Dispenser,](#)

IBF [UPLC MS.](#)

\*DOABLE? I BELIEVE SCREENING CAN BE DONE GIVEN THE INCENTIVE.

More at [nanoLiter.com](http://nanoLiter.com)

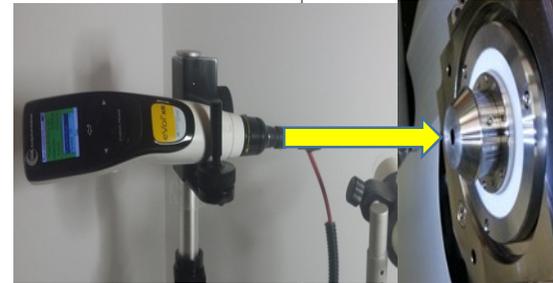
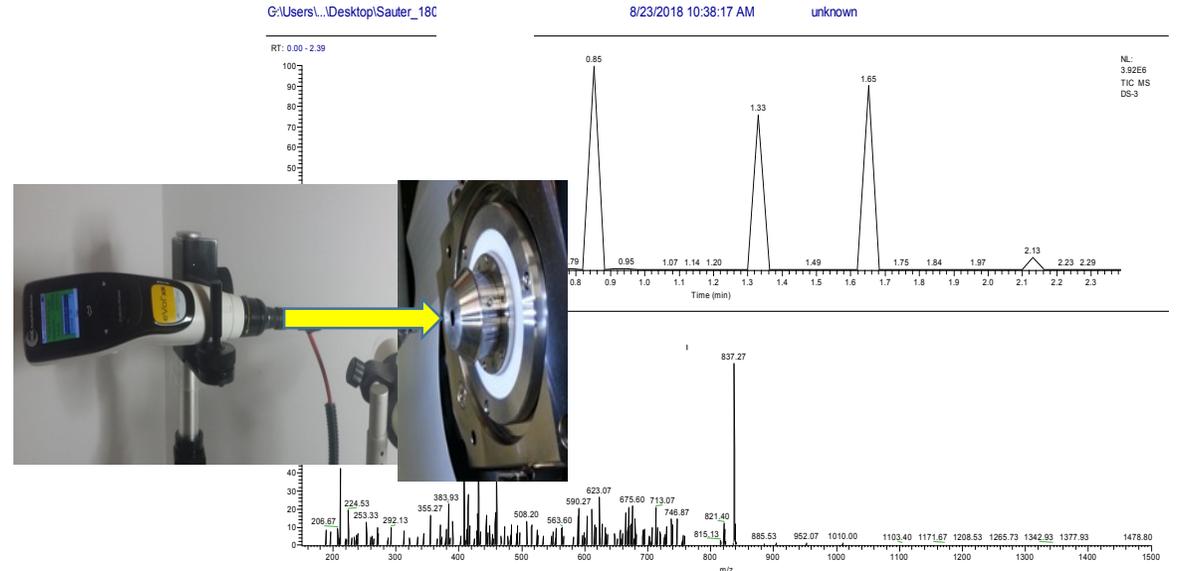
# NEW DEMO!

## Fastest Nevada Pesticide SCREEN 2 Second/Sample via IBF Droplets.

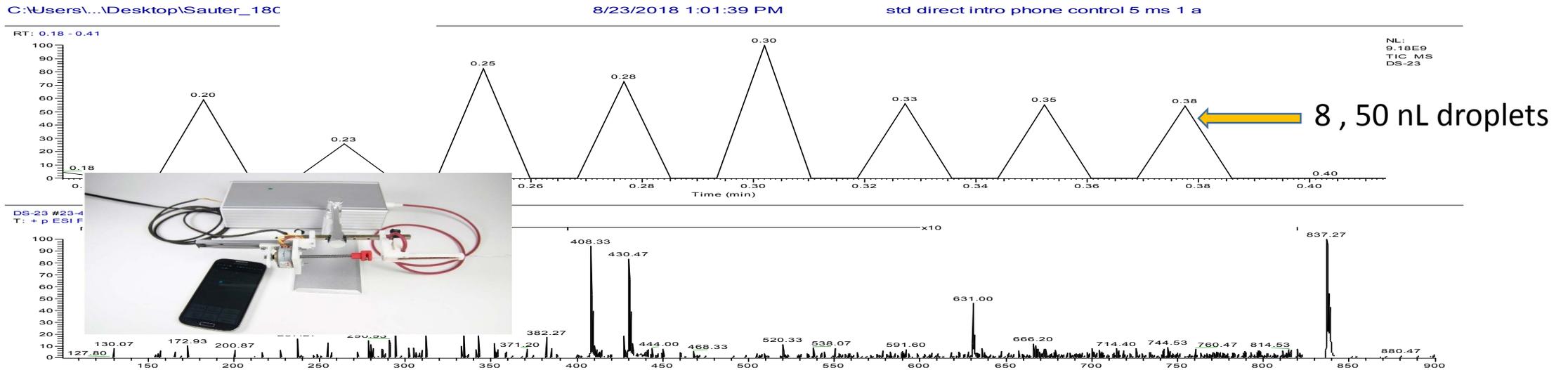
By

SIS, Caltech & nL LLC  
Drew Sauter 702-882-5413

25 analytes composite Nevada pest std\_150ms  
3 Droplets: Handheld Device\_1<sup>st</sup> Attempt @ Caltech.



8 , 50 nL droplets, 1 PPM, 25 analytes composite pesticide std\_5ms. **2 Seconds/sample Nevada Pesticide SCREEN!**



LCQ MS nanoLiter Programmable Android Dispenser. 75% fs, 1 sec time, BP, Linear, SIS pump, IBF syringe

# Nanoliter

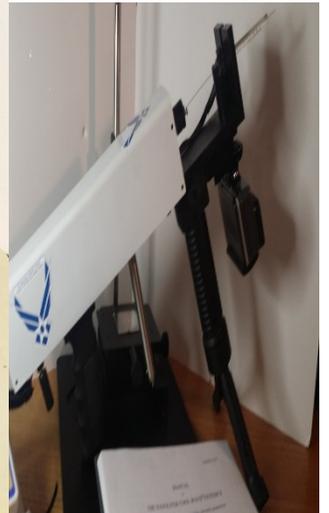
Doing Science & Business.

Developing Very Rapid MS Screening and Analysis Technology & Methods.

Seeking Licensed Marijuana collaborators, growers?

Video clips

Cool Video, 5 sec input, 0.5 sec input, 1.0 sec UCSD Data, nL Programmable, IBF UPLC MS.



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