

Public Meeting – Detection and Avoidance of Counterfeit  
Electronic Parts – Further Implementation

# **SigNature<sup>®</sup> DNA Marking**

*The Authentication Platform DLA Has  
Selected for Counterfeit Prevention  
of High Reliability Electronics*

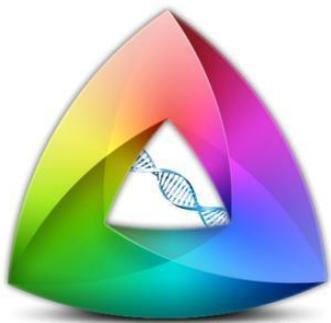


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March 27, 2014

# SigNature DNA

**Precision-engineered, botanical-DNA mark, applied on an item to provide absolute authenticity at a forensic level.**

- Cannot be copied.
- Expert witness reporting supported.
- Versatile - custom DNA markers can be created for each supplier.
- Can be combined with other security features to create a unique solution.
- Compatible with a wide range of products.



## **Multi-component optical marks**

- Interactive optical centers; both solid-state and soluble.
- Fluorescence pattern is defined by DNA & environment.



# DLA Funded Requirement for SigNature DNA Marking on FSC 5962 Microcircuits

**DNA AUTHENTICATION MARKING ON ITEMS IN FSC 5962**  
DLA is implementing new requirements for deoxyribonucleic acid (DNA) authentication marking on items falling within Federal Supply Class (FSC) 5962, Electronic Microcircuits, which have been determined to be at high risk for counterfeiting. A new clause at Defense Logistics Agency (DLAD) 52.211-9074, Deoxyribonucleic Acid (DNA) Marking, will be included in new solicitations and contract amendments. Items, when the item description states that the item requires contractors to provide items that have been marked with botanically-generated DNA produced by Applied DNA Sciences or an authorized licensee, if any. Contractors shall obtain the DNA marking material from Applied DNA Sciences or an authorized licensee. Contractors shall contact them at [militarymark@adnas.com](mailto:militarymark@adnas.com) or call 1-800-451-4511 with an invisible DNA mark on the item. The DNA marking shall be unique to the contractor. Contractors shall retain traceability documentation that demonstrates the DNA marking process.

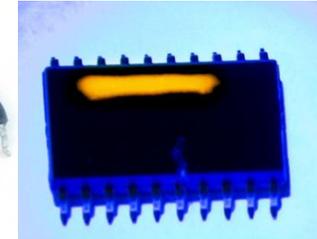
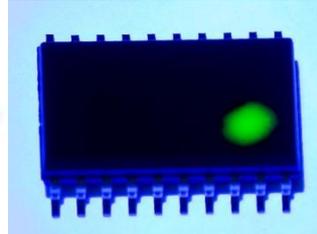
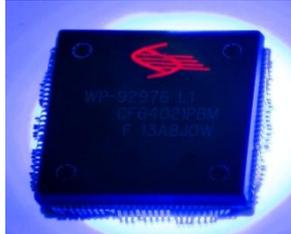
“ This policy requires contractors to provide items that have been marked with botanically-generated DNA marking material produced by Applied DNA Sciences or its authorized licensees, if any. Effective November 15, 2012. ”

# In Field Rapid Screening

Original Component Manufacturer

Legally Authorized Distributor

Independent Distributor



Red Authenticity Mark

Green Authorized Mark

Yellow Provenance Mark

# In Lab Forensic Authentication



Sample is received



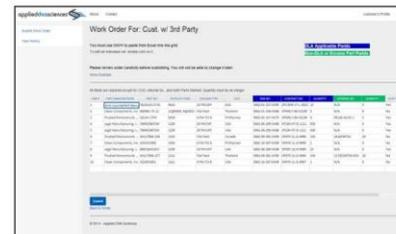
Sample preparation



Purified DNA sample into vial



DNA authenticated using PCR machine and CE analysis



Results are absolute and definitive

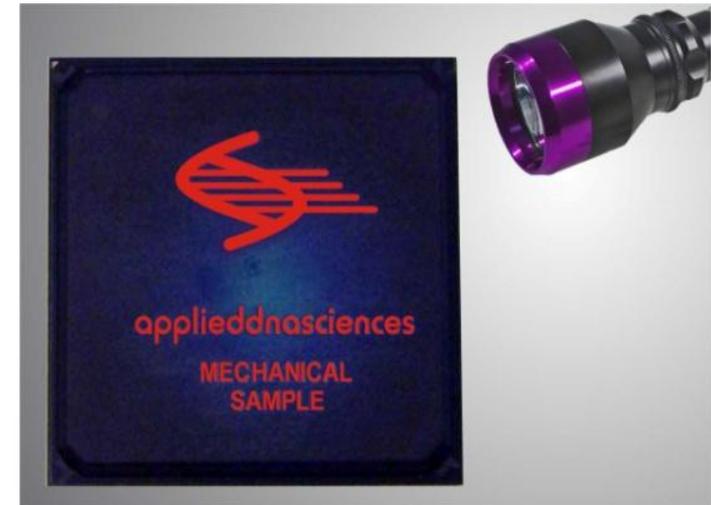


# Protecting the Supply Chain



## Why DNA Marking?

- Deters counterfeiters
- Enables trace to DLA's source of supply
- Complements testing & trace, providing a more secure distribution pipeline
- Represents valid legal audit trail back to DLA's source of supply
- Supports DOD Policy & Section 818 to mitigate counterfeits entering supply chain



# *Current Status*

*(March 21, 2014)*

- 29 Companies SigNature DNA marking (OCMs, OEMs, Authorized Distributors, QSLD / QTSL Distributors)
- DLA has let over 1,500 awards
- 500,000+ DNA marked parts in circulation
- Three of DLA's Industrial Product Support Vehicles (Lockheed Martin, SAIC and Herndon) must procure SigNature DNA-marked 5962 parts from SigNature DNA Markers
- Other Federal Agencies and Primes in various stages of briefing / consideration / adoption

# Counterfeit Prevention Authentication Program



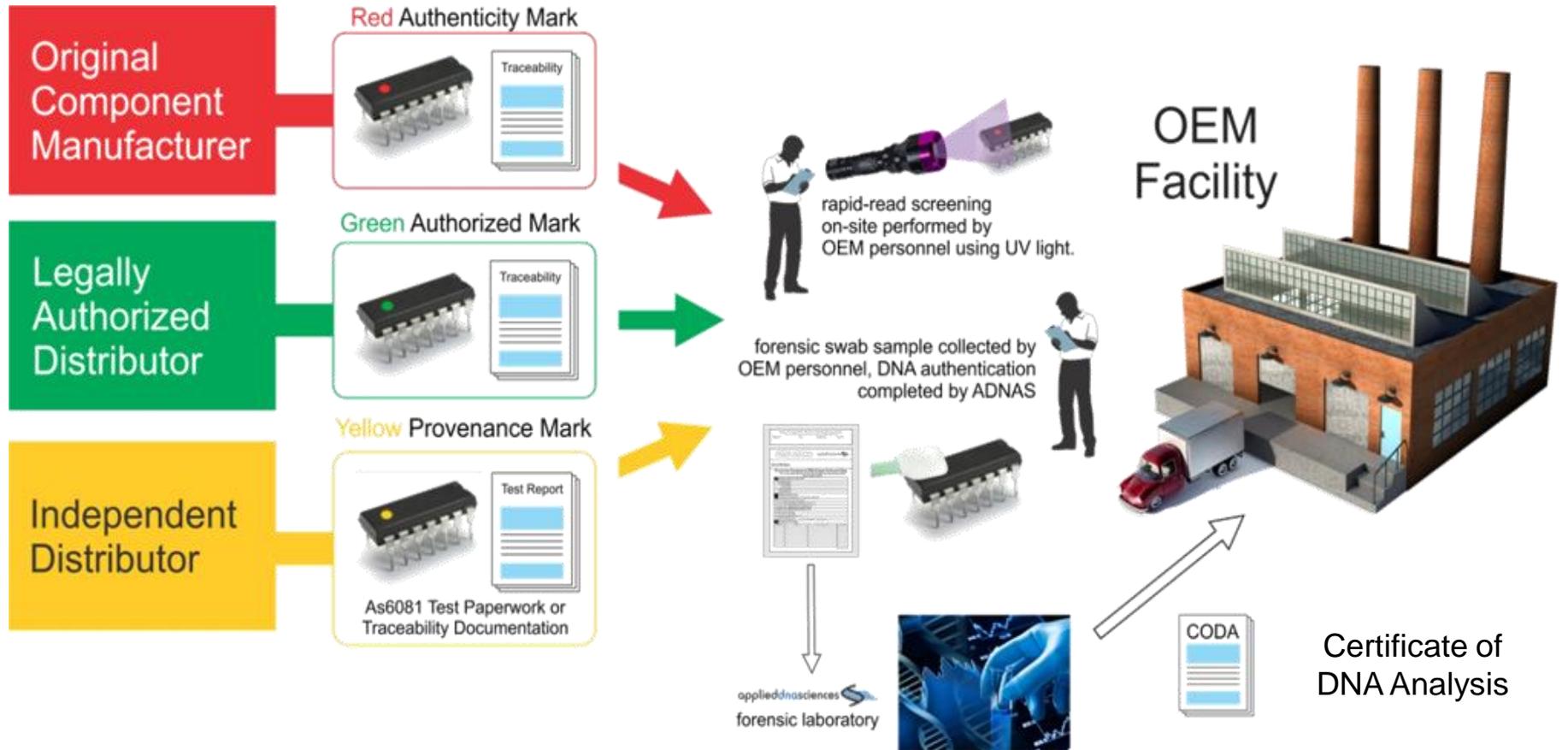
The CPA program empowers end-users to verify the originality or provenance of parts which have been marked by their suppliers with SigNature® DNA.

Prime defense contractors and commercial OEMs are now able to authenticate the SigNature DNA mark on incoming items even if those end-users did not themselves initiate the marking.

- ✓ *Receive in DNA marked components and materiel*
- ✓ *Mitigate counterfeit component risk through rapid read detection & forensic ID*
- ✓ *Manufacturers can offer value-added product as market differentiator*

# CPA Program

## Forensically Secured Supply Chain





# DLA is Exploring Anti-Counterfeit

## Solutions for other High Risk Items

- DLA is exploring DNA marking, along with other technologies as a possible solution to mitigate counterfeits in these high risk items
  - FSC 3110, Bearings (Aviation)
  - FSC 4730, Fittings, Hoses, and Tube (L&M)
  - FSC 5325, Fasteners (Troop Support)
  - FSC 5935, Electrical Connectors (L&M)
  - FSC 5961, Semi-conductor Devices (L&M)

# DOD'S Annual Industrial Capabilities Report to Congress for 2013

- Within this report, DOD describes counterfeit electronic parts as *“one of the worst trends to emerge in military systems spare parts”*.
- The only specific area in which DoD reports its use of industrial capability toward counterfeit prevention concerns DLA's application of **DNA marking** as an “authenticity” taggant for microcircuits.
- *“DLA demonstrated a capability to assure the source of microcircuits, which will be a huge step in defeating counterfeiters, and will be far less expensive than the current approaches to guarantee the source of parts.”*

# Missile Defense Agency SBIR Contract – Phase I Complete

Applied DNA Sciences company officials judge our progress against the specific tasks of our contract with the Missile Defense Agency (MDA) to be ahead of schedule.

For example, execution against the company's technology roadmap has led to increases in scale needed to penetrate industry sectors from independent distributors, to authorized distributors, to component manufacturers and prime contractors. The company expects corresponding increments in scale for printing and marking methodologies to be relevant to multiple industries and federal agencies.

# The need for a technical solution to counterfeit prevention



*Imagine the problems if our PCs did not have anti-virus and malware programs installed*

# Applied DNA Sciences

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Vice President

Government & Military Programs

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## Safe Harbor Disclaimer OTCQB: APDN

The statements made by Applied DNA Sciences, Inc. (the Company) may be forward-looking in nature and are made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. Forward-looking statements describe the Company's future plans, projections, strategies and expectations, and are based on assumptions and involve a number of risks and uncertainties, many of which are beyond the control of Applied DNA Sciences, Inc. Actual results could differ materially from those projected due to changes in interest rates, market competition, changes in the local and national economies, and various other factors. The Company undertakes no obligation to update publicly any forward-looking statements to reflect new information, events or circumstances after the date hereof to reflect the occurrence of unanticipated events.

# Background Information

# Leverage DLA Effort

## Support and Protect the Warfighter

*Who:* DOD, Prime Defense Contractors, Trusted Suppliers

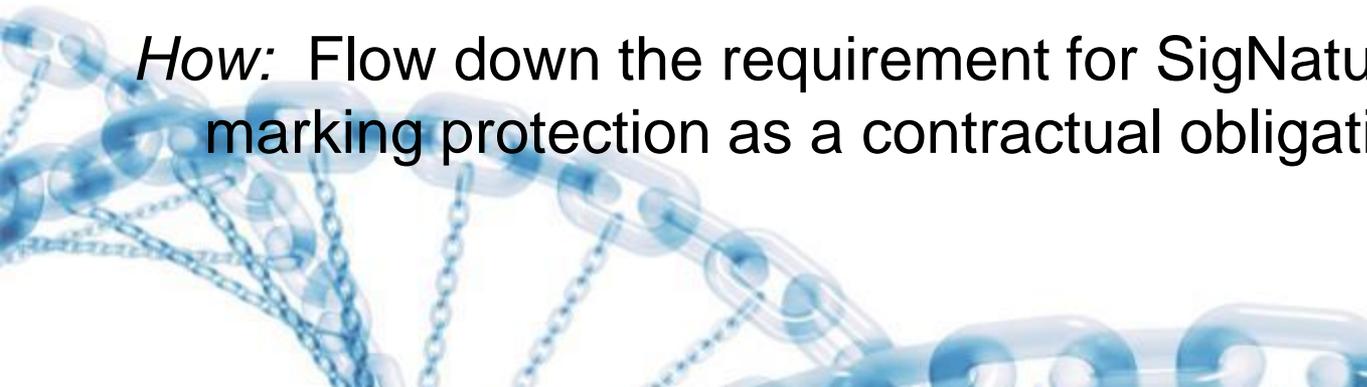
*What:* Have counterfeit prevention and per part forensic traceability as part of a comprehensive inventory management system

*Where:* Trusted suppliers, depots, sub-contractors

*When:* As new contracts are issued; as existing contracts are modified and/or extended

*Why:* Be in compliance with NDAA 2012 Section 818 for “Detection and Avoidance of Counterfeit Electronic Parts”

*How:* Flow down the requirement for SigNature DNA marking protection as a contractual obligation



# Different Optical Appearances of Forensic SigNature DNA Marks

- **SigNature DNA Authenticity Mark** – applied by the manufacturer to ensure originality
- **SigNature DNA Legally Authorized Distributor Mark** – applied by the legally authorized distributor to assure identity as sourced from an authorized channel
- **SigNature DNA Provenance Mark** – applied by DLA's QSLD / QTSL trusted supplier, but only when accompanied by full OCM trace documentation or successful completion of SAE AS6081 testing



# 2 Log R&D Programs (2010 & 2011)



**SRI International**  
SARNOFF

**Raytheon**

# Independent Assessment of SigNature DNA Marking

- Battelle Labs tried to defeat the technology
- Zero successes in over 200 attempts
- Assessed maturity of technology
- Literature search and data review were



# SigNature DNA

Tested on metal, ceramic and epoxy surfaces

- Thermal Cycle\*
  - MIL-STD-883 TM 1010: **100** cycles, -65°C to +150°C
- Thermal Shock\*
  - MIL-STD-883 TM 1011: -65°C to +125°C; 15 cycles
- Unbiased HAST\*
  - JESD22-A118, 130°C/85% RH; 100 hours
- Cyclic Moisture Resistance\*
  - MIL-STD-883 TM 1004 (+25°C - 65°C, -10°C); **100** cycles
- Resistance to Solvents
  - MIL-STD-883 TM 2015

\*Conducted by Silicon Cert Laboratories without applied voltage.

# SigNature DNA

Tested on metal, ceramic and epoxy surfaces

- Simulated wave solder immerse in solder\*; JESD22-B102E, Sn96.5Ag3.0Cu0.5, at 245° C for 5 seconds
- Simulated solder reflow solder\*; JESD22-B102E reflow at 260°C
- Ten X-ray exposures\*; MIL-STD-883 TM 2012 Radiography
- Salt Atmosphere\*; MIL-STD-883 TM 1009 Condition D, 35° C, 240 hours
- Resistance of Insulating Surfaces\*\* ASTM D-257 07 Sample exceeded the measuring capability of the Megaohmmeter. Surface Resistivity ( $\Omega$ /square) is greater than 5.24E+15; SigNature DNA is non-conductive

\*Conducted by Silicon Cert Laboratories without applied voltage.

\*\*Conducted by Intertek

# SigNature DNA

Tested on metal, ceramic and epoxy surfaces

- **Outgas Testing<sup>\*\*\*</sup>**; ASTM E 595, Vacuum <  $5 \times 10^{-5}$  torr – 24hrs @ 125°C, DNA falls 30-80% below the rejection criteria
- **Non nutrient for fungus<sup>\*\*\*\*</sup>**; **MIL-STD-810G METHOD 508.6**: Resistance to Fungus Test; all SigNature® DNA-embedded inks are NEGATIVE in 28 day test
- **Ionizing radiation<sup>\*\*\*\*\*</sup>**; **MIL-STD-883 METHOD 1019.7**: DNA survives RHA level H; radiation total dose  $10^6$

<sup>\*\*\*</sup>Conducted by Pacific Testing Laboratories

<sup>\*\*\*\*</sup>Conducted by APDN Laboratories

<sup>\*\*\*\*\*</sup>Conducted by Aeroflex-rad

# Creating a SigNature DNA Marker



Large Botanical DNA is acquired.



DNA is segmented.



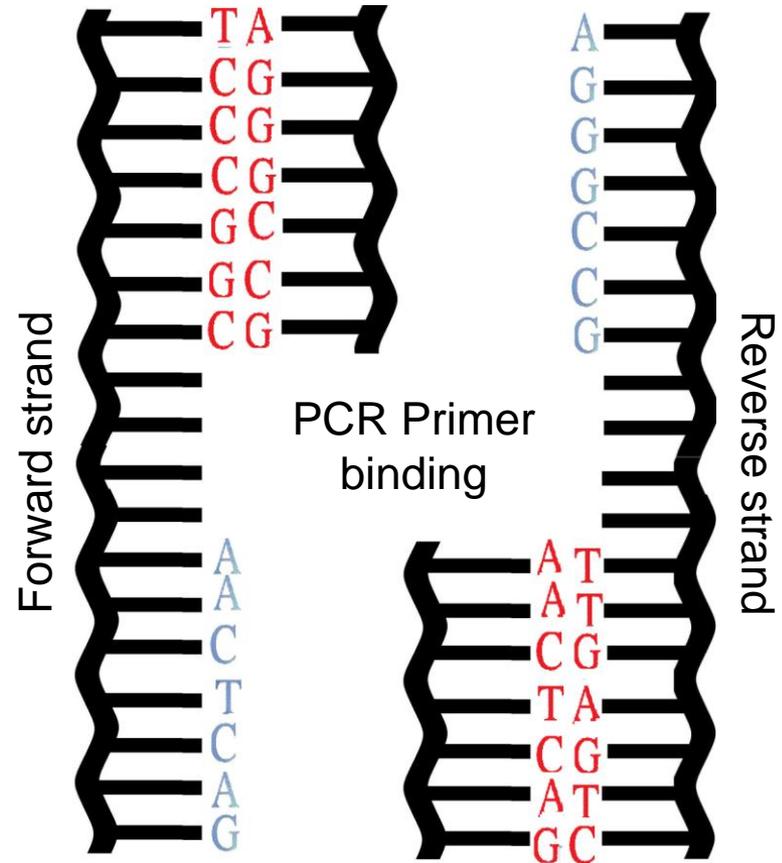
Segments are shuffled and reassembled to form a unique, secure DNA marker.



# Uncopyable?

## First principles:

- Probability of matching any single nucleotide is 1 in 4
- Probability of matching 2 sequential nucleotides is  $(1/4)(1/4) = 1/16$
- Probability of matching two 15-base primers is  $((1/4)^{15})^2 = (1/4)^{30}$  (1 in a quintillion)
- Probabilities radically diminished by multiple marks & decoy DNA



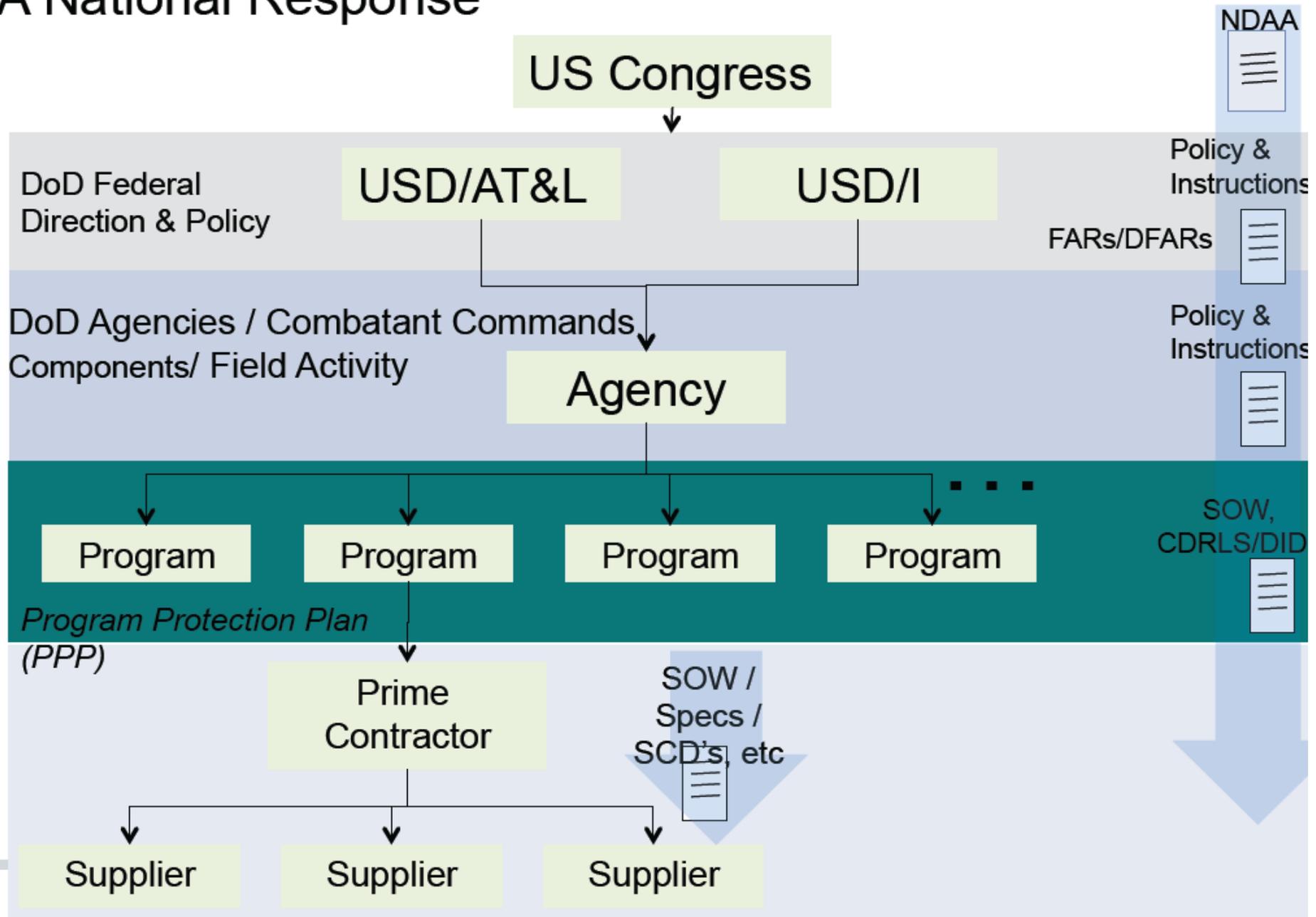
*Worse than finding a needle in a haystack, is trying to find a needle in a stack of needles*

# Lessons from Paleontology

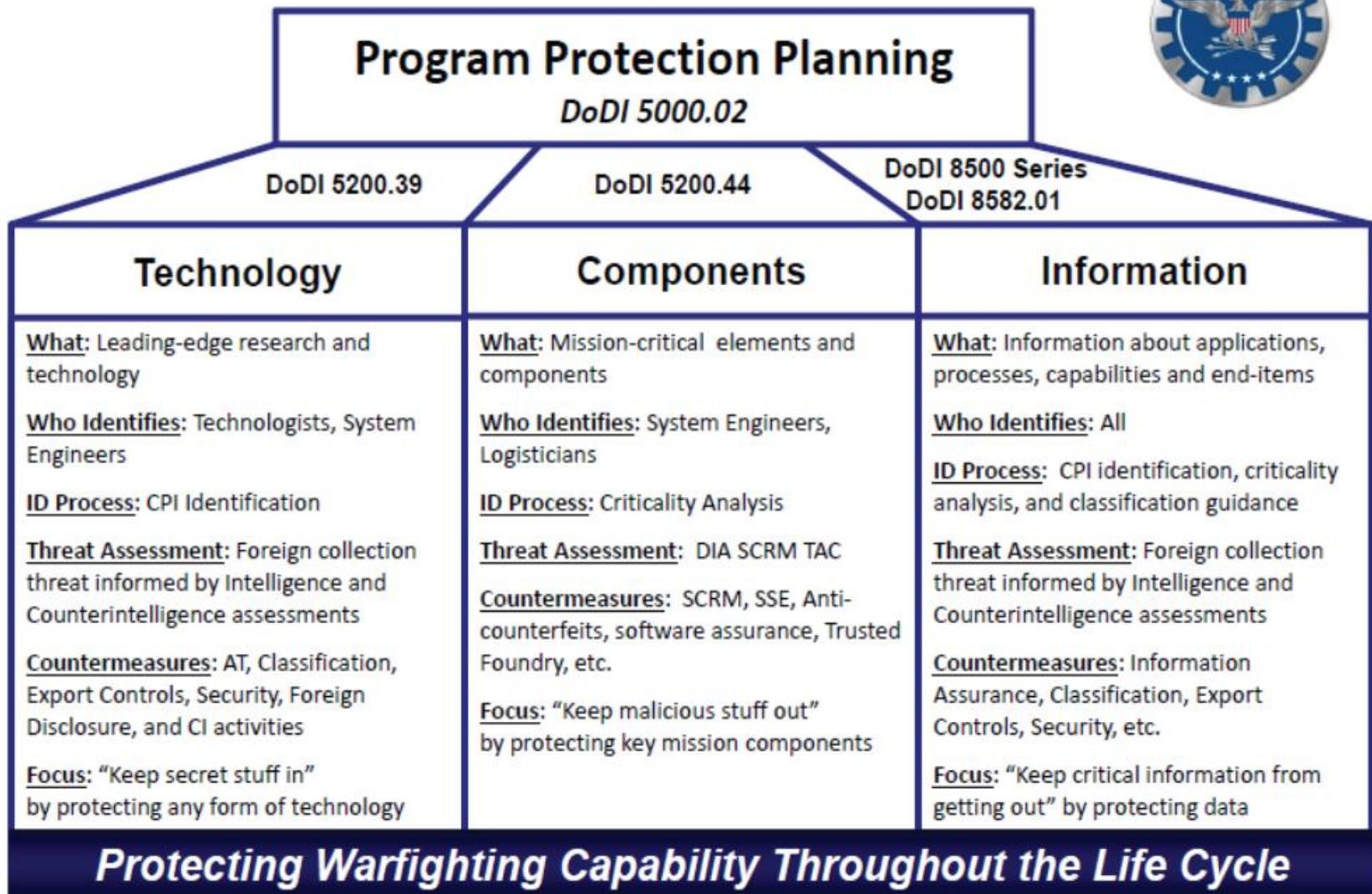
- DNA survives in amber for thousands of years (anhydrous, limited diffusion, etc.)
  - APDN mimics these conditions in our chemical hosts
- **Markem-Imaje** mil spec inks ~ amber
- Low DNA concentration



# A National Response



# What are We Protecting



# SAE G-19 Committee

## *Standards on Prevention and Detection of Counterfeit Parts & Materials*

- AS5553 Standard, “Fraudulent/Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition”
- AIR6273 Aerospace Information Record, “Terms and Definitions - Fraudulent/Counterfeit Electronic Parts”
- AS6171 Standard, “Test Methods Standard; General Requirements, Suspect/ Counterfeit Electrical, Electronic, and Electromechanical Parts”
- AS6496 Standard, “Fraudulent/Counterfeit Electronic Parts: Avoidance, Detection, Mitigation, and Disposition – Authorized/ Franchised Distribution”
- AS6174 Standard, “Counterfeit Materiel; Assuring Acquisition of Authentic and Conforming Materiel”
- ARP6178 Aerospace Recommended Practice, “Fraudulent/Counterfeit Electronic Parts; Tool for Risk Assessment of Distributors”
- AS6301 Standard, “Fraudulent/Counterfeit Electronic Parts: Avoidance, Detection, Mitigation, and Disposition – Independent Distribution Verification Criteria”

# A Concept of Operations...

## Effective Protection Through Knowledge

Agency-Level: Supt LL Sharing with Community  
Program: Develop LL & share across enterprise  
Industry: Develop LL & Share across Industry

## Effective Defensive Posture

Agency-Level: Policies and Guidance  
Program: Standards, requirements, oversight  
Industry: Disciplined RM, QM, CM, etc.

Prevent

Share

Implement

Agency-Level: Vigilance, Infrastructure support  
Program: Effective PM, active oversight  
Industry: Disciplined execution, oversight

## Effective Prevention & Protection Program

Resolve

Identify

Agency-Level: Infrast Supt  
Program: Partner with Industry to find resolution,  
Industry: Partner with Govt to find resolution

Agency-Level: Awareness, Infrastructure Support  
Program: Involvement, Alerting System  
Industry: Disciplined investigation

Report

## Effective Response

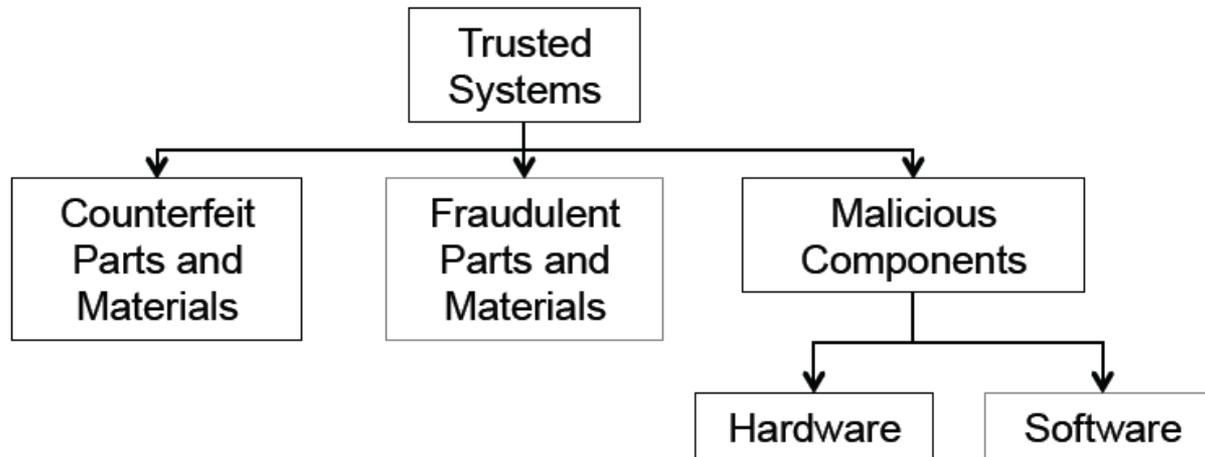
Agency-Level: Ensure stakeholder awareness  
Program: Ensure enterprise awareness  
Industry: Early reporting, disciplined investigation

## Effective Discovery & Alert



# Protecting the Supply Chain

## *Risk Management for Prevention and Protection*



USD (AT&L) issues new directives to prevent counterfeit and malicious hardware and software in All DoD Systems

- DoD D-5000.02 Operation of the Defense Acquisition System
- DoD I-4140.67 DoD Counterfeit Prevention Policy
- DoD I-5200.39 Critical Program Information (CPI) Protection within the DoD
- DoD I-5200.44 Protection of Mission Critical Functions to Achieve Trusted Systems and Networks
- IC Directive 731 Supply Chain Risk Management
- New FARs/DFARs and NDAA 2012, 2013 and 2014 Sections

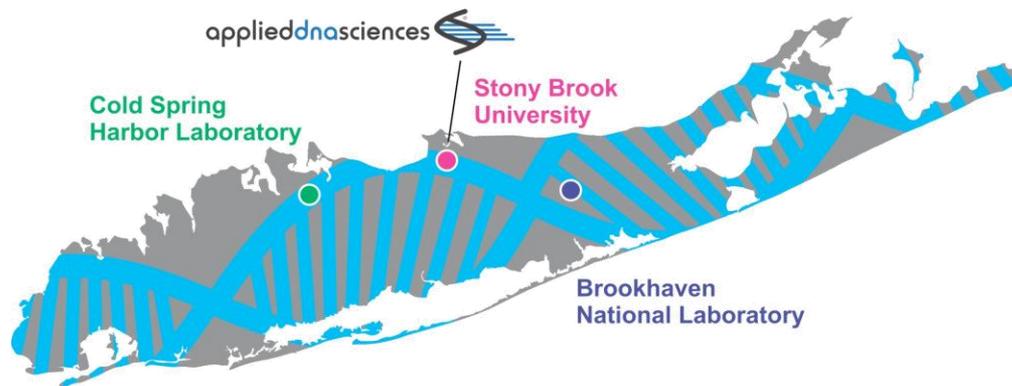
***Counterfeit is not just about Parts - Now it includes Software***



# About Applied DNA Sciences

- US Headquarters in Stony Brook, New York
- 30,000 square foot, multi-story facility
- 50+ Employees: Scientists, Engineers, Business Development Professionals
- Patents: 22 Issued, 31 pending
- Trademarks: 27 Registered, 2 pending
- 8-years old, publicly traded OTCQB: APDN
- Unparalleled success

“The DNA Corridor”



# Our Product Family

## SigNature® DNA

Custom DNA sequences created and embedded into a wide range of carriers such as ink, varnish, thread, laminates and metal coatings



## DNAnet

Tag criminals with a DNA spray or smoke



## SigNatureT

Uniquely identify textile production lots from origin to shop floor



Mark personal valuables for traceability



Mark cash and valuables in ATMs and in-transit

## Fibertyping

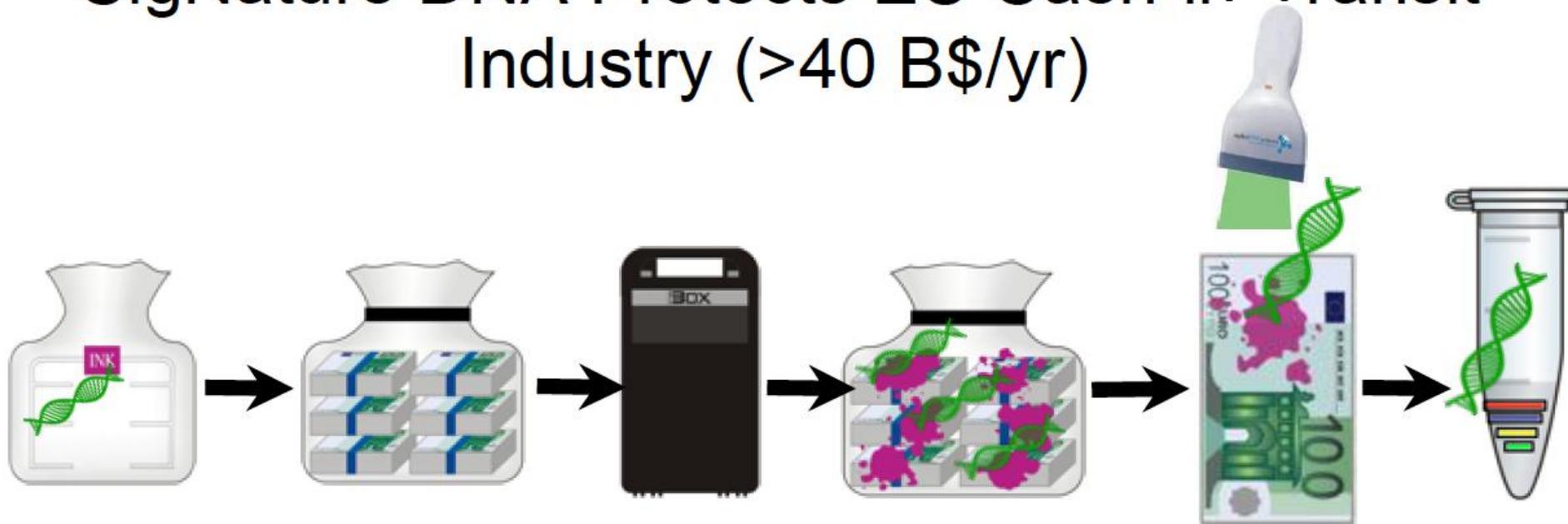
Identify native cotton and wool purity anywhere in the supply chain



Cloud and smartphone-based track and trace with secure forensic protection



## SigNature DNA Protects EU Cash-in-Transit Industry (>40 B\$/yr)



- In about 36 months, nearly 100 cases developed by the Crown, 48 have thus far gone to trial.
- 100% authentications, 100% convictions, aggregate jail time in excess of 242 years.
- Implementation across Europe.



## Applied DNA Sciences to Protect Energy Stations in Sweden Vattenfall Eldistribution AB Deploys smartDNA<sup>®</sup> for marking Copper Assets

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INVESTOR CONTACT: Debbie Bailey, 631-444-8090, fax: 631-444-8848

FCMN Contact: [info@adnas.com](mailto:info@adnas.com)

Web site: <http://www.adnas.com>

Twitter: @APDN, @APDNInvestor

**STONY BROOK, NY, December 13, 2012.** [Applied DNA Sciences, Inc.](http://www.adnas.com) (OTC Bulletin Board: APDN), (Twitter: @APDN), a provider of DNA-based anti-counterfeiting technology and product authentication solutions, announced today that its evidentiary smartDNA platform has been adopted by Vattenfall Eldistribution AB (subsidiary of Vattenfall AB) to protect copper assets located in Energy stations throughout Sweden. This will be implemented by the end of December 2012. Vattenfall in Sweden accounts for 50% of Sweden's electricity, with over 900,000 customers. It is the nation's largest regional and local service provider.



  
**smartDNA**<sup>®</sup>  
forensic tagging systems  
2 Miles of Stockholm railway  
copper marked with  
smartDNA



# The reach of the SigNature DNA Marking Program for Textiles



Supima



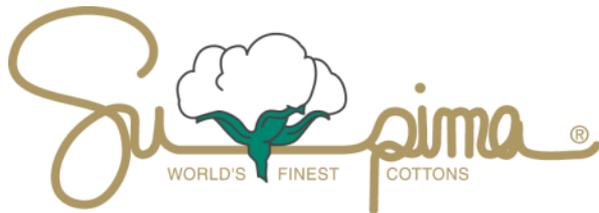
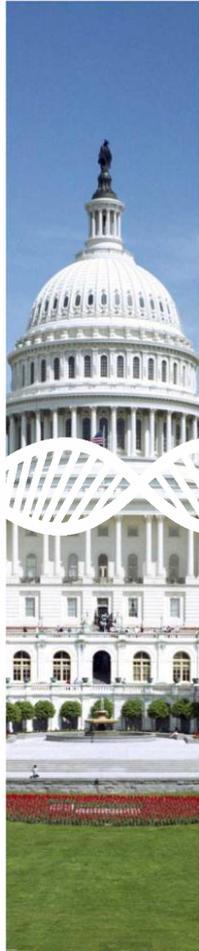
Weavers



Brand Owners



Retailers



## Coffee, Cotton Go Under Microscope

High-Tech Commodity Testing Advances

by Leslie Josephs

Jesse Curlee is on a mission to stamp out textile trickery, one strand of DNA at a time.

As president of Supima, the three-decade veteran of the textile industry is tasked with ensuring that the brand of premium U.S.-grown cotton touted on labels, such as those on Brooks Brothers and L.L. Bean shirts, is legit.

When a textile mill in Hong Kong flagged substandard yarn from a spinner in India, Mr. Curlee shipped a sample of the fiber off to Long Island for a genetic test. Supima canceled the Indian supplier's license after the results showed the fabric misleadingly was of a cheaper cotton.

"It was not Supima," Mr. Curlee said. "It's so easy to be deceptive."

The episode highlights the new tools that sellers of premium products from button-down shirts to coffee are using to protect their lucrative reputations for quality.

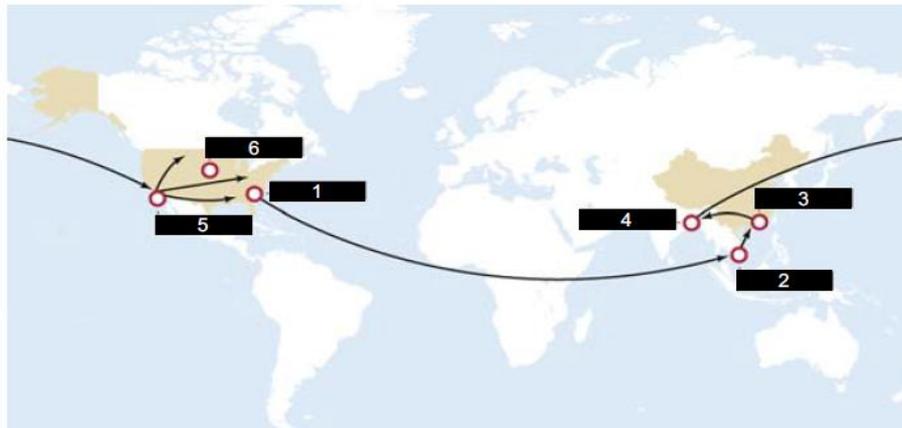
Crops like coffee and cotton travel thousands of miles and trade hands dozens of times before they reach consumers in the form of dress shirts and espressos.

The opportunities for mishaps are plentiful and worrisome, ranging from unscrupulous suppliers to shipping mix-ups.

Those who fail to certify their goods can face substantial penalties. In January, the Federal Trade Commission said companies including Macy's



Karim Berrada from Applied DNA Sciences holds up a tube of custom-made DNA used to mark cotton.



**Sew Far.** Cotton travels tens of thousands of miles from farms before it reaches clothing stores in the form of shirts, jeans and other apparel.

Right is a sample supply chain for jeans.

1. Cotton is grown and ginned in a Williamsburg Country, S.C.
2. The fiber is spun in Ho Chi Minh City, Vietnam.
3. That yarn travels to Guangzhou, China for weaving and finishing.
4. Denim fabric exported to Dhaka, Bangladesh, for assembly and washing.
5. Finished jeans exported to Los Angeles.
6. Jeans distributed to stores throughout the U.S.

## Applied DNA Sciences Provides Unique SigNature® DNA Mark to Brink's, Global Security Leader

### First Application Underway

STONY BROOK, NY--(Marketwired - Nov 13, 2013) - Applied DNA Sciences (OTCQB: [APDN](#)), (Twitter: [@APDN](#)), a provider of DNA-based anti-counterfeiting technology and product authentication solutions, announced today that Brink's, a leading global security solutions provider, has purchased a unique SigNature® DNA mark capable of deployment by Brink's in various worldwide operations.

The first Brink's SigNature DNA application will use the unique Brink's mark to protect cash and high-value items using a security tape for loss prevention purposes. Materials and support for the application will also come from The Label Printers, a leading custom label and packaging corporation globally.

SigNature DNA marks may be used in a variety of applications such as APDN's DNA Fog product, designed to repel and identify intruders into large areas such as warehouses, as well as evidentiary marking on individual items such as jewelry, protection of ATMs, and cash transport.

Based in Richmond, Virginia, Brink's is a global leader in security-related services for banks, financial institutions, retailers, government agencies, mints, jewelers, and a variety of other commercial and governmental customers. The SigNature DNA mark is relevant to many of these Brink's businesses, such as protection of high value items in transit, antitheft applications in banks and cash depots, and protection of cargo.

Richard Schurtleff, Brink's Senior Vice President for Global Security, commented:





## **MARTIN GUITAR TO PROTECT AGAINST COUNTERFEITING VIA PARTNERSHIP WITH APPLIED DNA SCIENCES**

*Dramatic New DNA-based System Provides Assurance that Musical Instruments are Genuine*

**Nazareth, PA and Stony Brook, NY – July 14, 2011** – C.F. Martin & Co. ([www.martinguitar.com](http://www.martinguitar.com)), an iconic American brand that has been creating the finest acoustic guitars in the world for over 175 years, has today announced that it has partnered with Applied DNA Sciences ([www.adnas.com](http://www.adnas.com)), creator of patented, DNA security solutions to protect products, brands and intellectual property from counterfeiting and diversion. As a result, according to both companies, Martin's customers will be protected by the "gold standard" in forensic anti-counterfeiting systems.



# Since 2009 Applied DNA has been actively involved:



**CALCE** – Center for Advanced Life Cycle Engineering

**CMSE** – Components for Military and Space Electronics

**DMC** – Defense Manufacturing Conference

**DMSMS** – Diminishing Manufacturing Sources & Materials Shortages

**IMAPS** – International Microelectronics and Packaging Society

**ISTFA** – International Symposium for Testing and Failure Analysis

**JEDEC** – 2012 Special Presentation / 2013 Technical Presentation

**LIFT** – Long Island Forum for Technology

**MDA PMPB** - Parts Materials & Processes Board Meeting

**NASA QLF** - Quality Leadership Forum

**PSMC** – Parts Standardization and Management Committee

**SAE CPAS** – Counterfeit Parts Avoidance Symposium

**CHASE at UConn** – Parts Standardization and Management Committee