

# The Source of Data: More than Hairs, Fibers, Paint and Glass

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**In the fields of  
observation,  
chance favors  
only the  
prepared mind.**

**-Louis Pasteur**



- We believe that reference collections are a fundamental necessity of the forensic trace evidence analysis laboratory.
- Experience has shown that the ready availability of reference collections, covering of a wide range of authentic materials, is of incalculable value, on a day to day basis, when analyzing unknown substances and attempting to interpret the results.
- Example: The Green River Serial Murders – Initial identification of the DuPont Imron spray paint spheres made from specimens in our reference collections.



# Data: Where does it come from?

- **From evidence**

- Example 1: Visual examination with the unaided eye, magnification, various light sources.
- Example 2: Acquisition of spectra containing chemical or elemental information.

- **From reference materials**

- Example 1: searchable infrared & mass spectral databases
- Example 2: physical collections, e.g, animal hairs



# Data: What can we do with it?

- **From evidence**

- Example 1: Compare data from questioned item to known.
- Example 2: Utilize data from questioned item in an attempt to develop an investigative lead.

- **From reference materials**

- Example 1: Use reference data to help interpret results, e.g. How common is the R.I. of the questioned glass?



# Data: What can we do with it?

- **From reference materials (cont.)**
  - Example 2: Utilize reference sample to compare a Q to an authentic specimen, e.g. compare a suspected raccoon dog hair to an authentic specimen of the species.
  - Example 3: Provide authentic materials for research regarding a particular property or properties of a class of evidence, e.g. batch variations in a particular dye with lot or manufacturer.
  - Example 4: Use them to construct **databases**.



# Reference collections are the foundation on which databases are built

- Dr. Max Frei-Sulzer, scientific director of the Zurich police laboratory, advised me years ago that every scientist on his staff was responsible for curating at least one reference collection.
- We have adopted the same principle in our laboratory.



# Physical reference collections held at Microtrace

- **Fibers** - man-made, woody (papermaking), non-woody (Dorothy Catling collection), mineral (glass, slag, mineral wool, asbestor, etc.) >2,500 specimens
- **Hairs** – human and non-human animal >2,230 specimens
- **Minerals** – 1. sand and soil samples from various depositional environments and geographical locations from all over the world. >2,000 2. isolated mineral grains (from Maria Mange). 3. oriented single mineral grain microscope slides for optical crystallographic identification.
- **Pigments** – Commercial organic and inorganic pigments. >1,000 specimens





# Physical reference collections held at Microtrace (cont.)

- **Dyes** – 1. dry dyes from manufacturers (multiple lots from same manufacturer and other manufacturers in many cases). >5,600 2. shade cards from dye manufacturers. > 25,000.
- **Botanicals** – 1. basic food products and ingredients. 2. powdered vegetable drugs from the U.S. and foreign pharmacopias. 3. pollen and spores (dry pollen and acetolyzed and prepared microscope slides). >1,500
- **Dusts** – dusts from the clothing of individuals working at different jobs and travel to diverse locations from all over the world. ~ 500





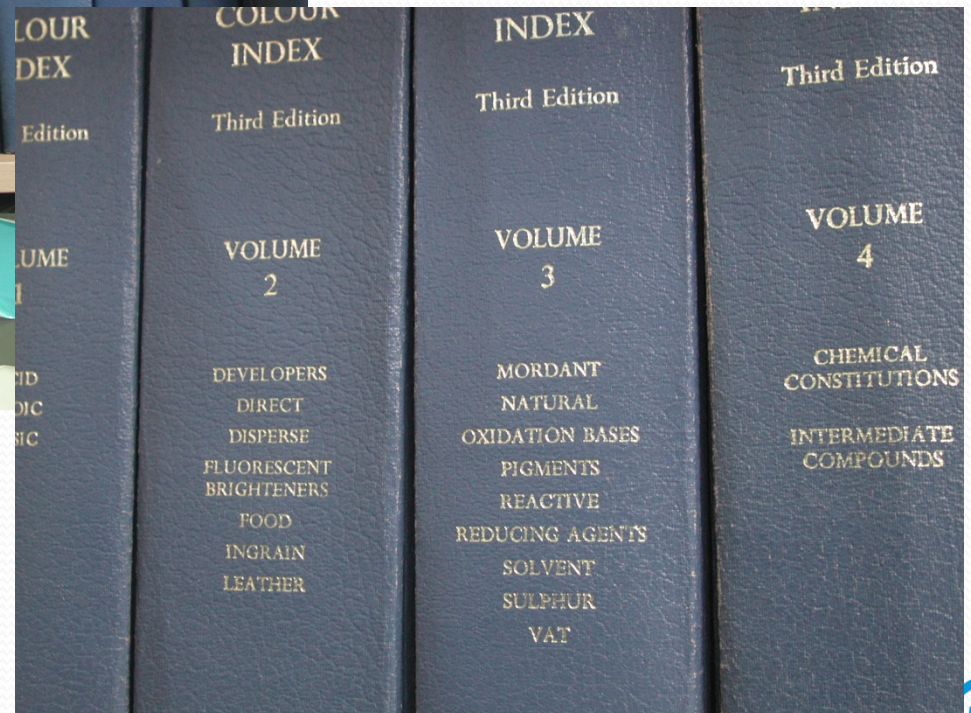


- To be of practical value, reference collections must be:
  - Well organized
  - Readily accessible
  - Traceable and/or properly authenticated.





# The Colour Index





# Our collection of dye powders





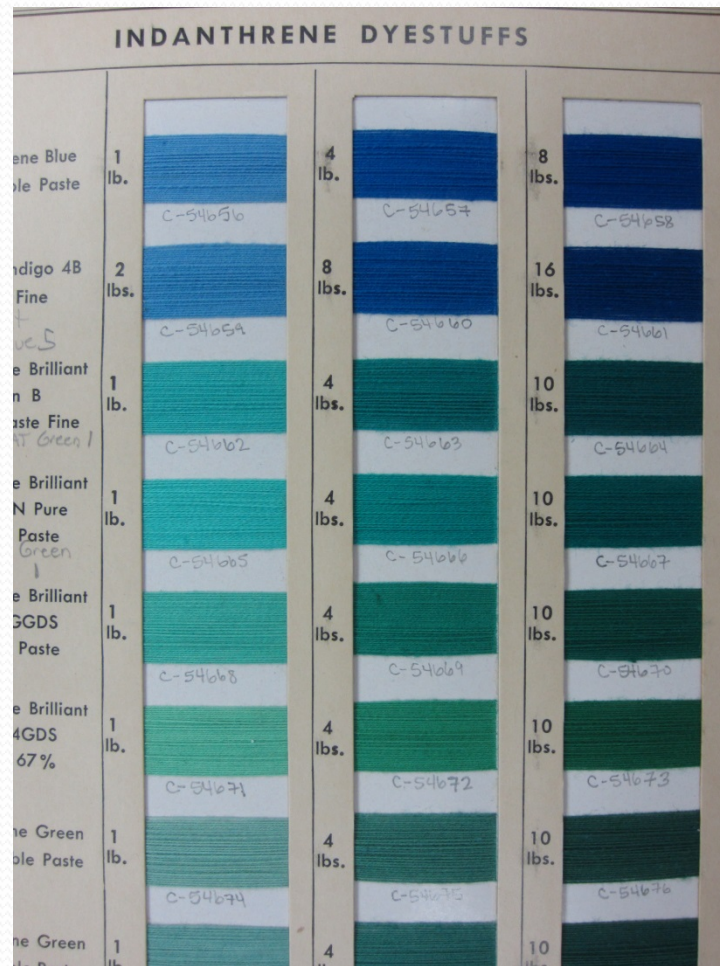
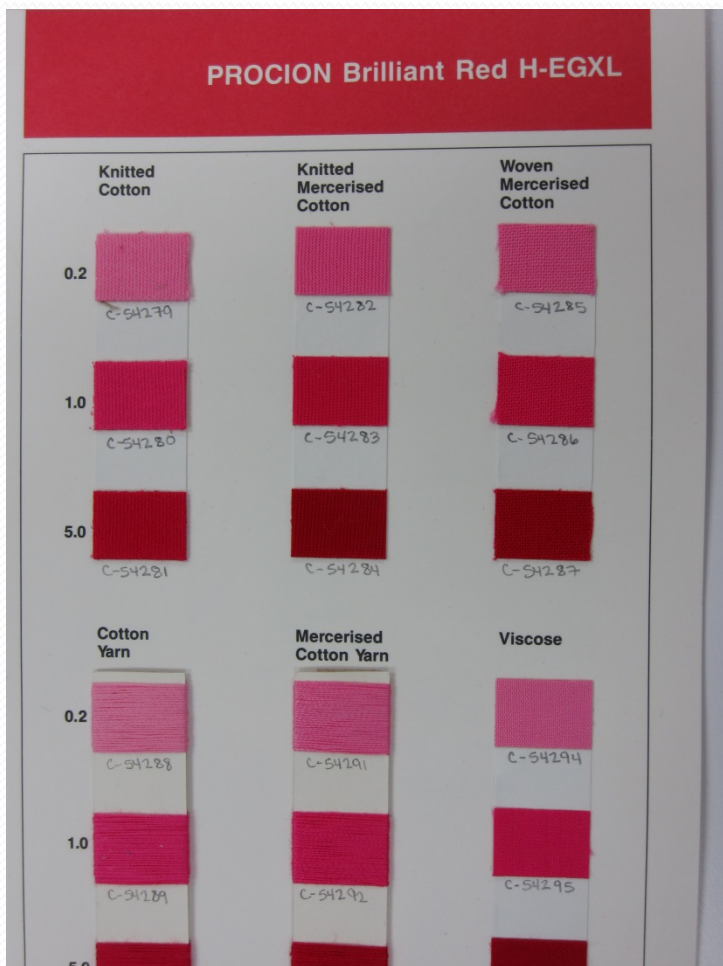
## We have assembled a still larger collection of manufacturers' shade cards

- These are produced by dye manufacturers for use by their customers.
- They are specimens of the actual commercial dyestuffs that have been dyed by the approved method on recommended fibers.





# Examples of pages of dyed fibers







Indigo 4B Fine ve 5	2 lbs.	C-54659	8 lbs.	C-54660	16 lbs.	C-54661
e Brilliant n B aste Fine AT Green 1	1 lb.	C-54662	4 lbs.	C-54663	10 lbs.	C-54664
e Brilliant N Pure Paste Green	1 lb.	C-54665	4 lbs.	C-54666	10 lbs.	C-54667
e Brilliant GGDS Paste	1 lb.	C-54668	4 lbs.	C-54669	10 lbs.	C-54670





## Continuous Dyed Residential Line

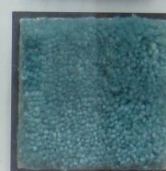
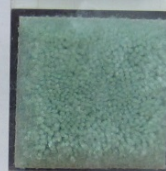
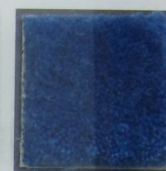
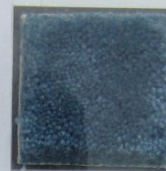
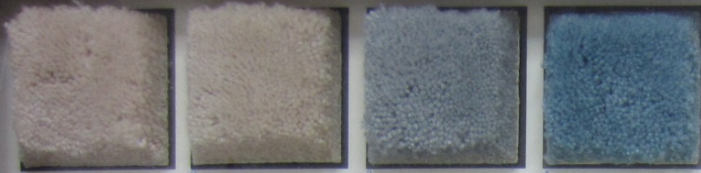
Tectilon Yellow 3R 200%

Tectilon Red 2B 200%

Tectilon Blue 4R 200%

72 oz/yd<sup>2</sup>

Face Wt.









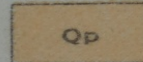


## INDUS BASIN



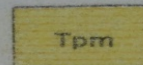
Alluvium

*Unconsolidated surficial deposits of silt, sand, and gravel*



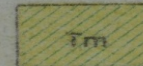
Pleistocene sedimentary rocks

*Bostan formation\* in central Axial belt: mostly clay and silt, some conglomerate and sandstone; forms "badlands" topography; thickness up to 2500 feet. Dada conglomerate\* in Kirthar province; thickness up to 2000 feet*



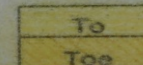
Pliocene and Miocene sedimentary rocks

*Manchar formation\*, mostly Pliocene in age, in Kirthar province: shale, sandstone, and conglomerate; thickness up to 4500 feet. Sibi group\* in southern Sulaiman province and Urak group\* in central Axial belt; shale, sandstone, and conglomerate; mostly Miocene and Pliocene in age but includes Oligocene fossils in lower members and inseparable Pleistocene conglomerate beds at the top; thickness up to 23,000 feet. Siwalik Group and the inseparable Nari Formation (Oligocene) in the Sulaiman and Kohat-Potwar provinces: mostly sandstone, conglomerate, and siltstone; also includes inseparable Pleistocene conglomerate beds; thickness up to 15,000 feet*



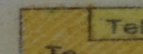
Miocene sedimentary rocks

*Gaj Formation in the Kirthar province: shale, sandstone, and limestone, some marl, gypsum, and conglomerate; thickness up to 2500 feet. Rawalpindi Group\*\* (Kamlial Formation and Murree Formation) in the Kohat-Potwar province: mostly dark colored shale and sandstone of continental origin.*



Oligocene and Eocene sedimentary rocks

*Nari Formation, To, in the southern Axial belt and Kirthar province: mostly sandstone and limestone; thickness up to 6000 feet. Brahui group\*, Toe, in the same area, comprising the Oligocene Gorag limestone\* and the Eocene Kirthar formation\*; thickness up to 4000 feet*









**Soil - (S-1156)**  
TAUNSA, DERA GHAZI KHAN  
February 2010-thru [redacted]



