

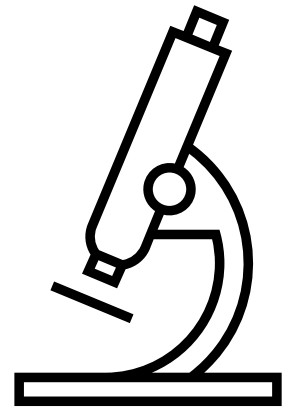


# Forensic Science!

## Spring Term, 2020

### Class Message & Material Covered

**Instructor:** Michael    **TA:** Síofra



Dear parents/guardians and students of the Forensic Science class,

Hello all! It's great to be able to chat to you all again! Thank you all for your participation and patience.

First and foremost, I hope you and your families are all keeping safe and are well. These challenging times have brought about many worries and difficulties for everyone, so bearing that in mind please do engage with whatever you can or are able to and don't feel at all pressured to do so.



I've tried to include as much content as I can to cater to all, and you guys will be free to do as much or as little as you like—hopefully there's something here for everyone, and most importantly I've spiced things up a little and included some forensic science quizzes and games for you to try out!!

I've prepared some bits here for you all to explore as much as you want—we've got some recordings, some slides, a brainstorm/word wall to hopefully help, videos and of course the quizzes, games and challenges for everyone to have a crack at. I have a little section as well on some cool websites and YouTube channels to check out as well, and a little bit on some books, kits and museums you might be interested in. Parents and students can team up to work through the above!



I've tried to include as much content as I can that I thought would be cool to include for the forensic science class, so hopefully there are some topics and bits that people will like—if not though do let me know! I can do another recording or some notes on something you



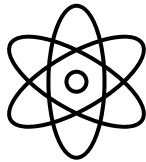
found more interesting if I didn't include it or if you wanted more info on it 😊 The Wordpress webpage is where you can send me comments or ask any questions you might have! I'll be more than happy to help, we have a slot for answering questions on the webpage this Saturday the 25<sup>th</sup> of April from 2.45 – 4 pm, so don't hesitate to ask me anything then. Feel free to email me or message me on the webpage outside these times too and I'll get back to you.

On behalf of myself and Síofra, it's been a pleasure to teach and get to know everyone over the past weeks—the class' enthusiasm, interest and willingness to participate have been commendable and I'd like to thank you for that.

We wish you all the very best in the future and perhaps we'll see you again soon! 😊

Very best wishes,

Mike



**My CTYI email:** [michael.glynn1.staff@ctyi.org](mailto:michael.glynn1.staff@ctyi.org)

**The webpage** (check for updates on the right column under 'DCU Forensic Science', or scroll through after clicking into 'Dublin Classes' to find the Forensic Science section—if you're missing anything here, I can email it to you directly):

<https://centrefortalentedyouthireland.wordpress.com>

Below is a summary of what we covered during each class if you guys would like a quick refresher or if your parents would like to refer to it...

We took a hands-on approach to learning with a focus on class participation in experiments and practical exercises. I've included the practical elements/exercises for each class below...



## Class I

Class introductions; having a chat about what forensic science is all about/what ideas the class had about what a forensic scientist might be interested in; ice-breaker: got class into four groups to write up a little fact file about themselves (favourite movie/book/animal etc.), and the other groups had to do some 'detective work' to figure out which fact file belonged to who; Introduction to DNA + cellular bio.; looking at various microscope slides and learning about using a microscope; an introduction into the chemistry behind DNA/cellular bio. and why this is important for a forensic scientist; Video on a recipe for making H<sub>2</sub>O to get the class thinking about chemistry (preparation for upcoming practical)

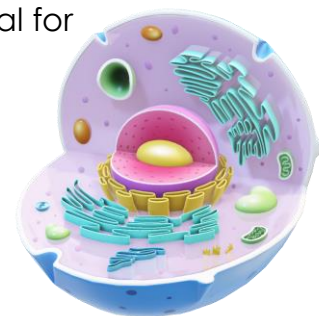
Practical element: Using a microscope — examination of various microscope slides (insect wings, plant parts, animal hairs, etc.)



## Class II

DNA extraction practical - strawberry DNA; strawberries as octoploids; review on cellular structure; making an experiment design: split up into groups - each group had to arrange the steps of the experiment in the right order, thinking about what reagents they would use to get through each barrier in the cell to expose the DNA; intro. to lab safety; chemical reactions; solutions, solubility; lab equipment (PPE, spatula, gloves, goggles, sample tubes, test tubes, cleaning equipment); filtration; applications of the practical for forensic scientists

Practical element: DNA extraction

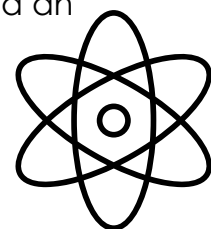


## Class III

More techniques that a forensic scientist might use in a lab, with a focus on chemistry; first practical: an ion displacement reaction using copper sulphate and an iron nail; What is a chemical reaction? The Alkali metals (video on reaction in water to liberate hydrogen gas); metals and non-metals in the periodic table; how the elements are ordered in the table; subatomic particles; acids and bases; the pH scale; how do we define an acid and a base; bee and wasp stings as acidic and alkaline, and how they can be neutralised with the right remedy; common acids and bases; more powerful

acids and bases, e.g. HF (video); using universal indicator paper to identify the pH of different solutions; how antacid tablets work; the importance of chemistry for forensic scientists

Practical element: ion displacement reaction using copper sulphate and an iron nail; pH



#### **Class IV**

Quick review of covered material so far, and also an update on an experiment we did last week w/ the copper sulphate and iron nail (the solution turned green); fingerprints - how forensic scientists use fingerprints as evidence; the chemical tools available to forensic scientists to uncover fingerprints; types/broad categories of fingerprints - loops, whorls, arches; finding what category of fingerprint we have using magnifying glasses and putty; minutia in prints; latent vs visible ('patent') prints; what fingerprints actually are on a biological level (looking at skin tissue - epidermal and basal layers); *Brainpop* quiz on fingerprinting; biometrics

Presentation for parents: material/experiments carried out and their link to forensic science; carried out a demonstration of the DNA extraction experiment for the parents with the students in two groups

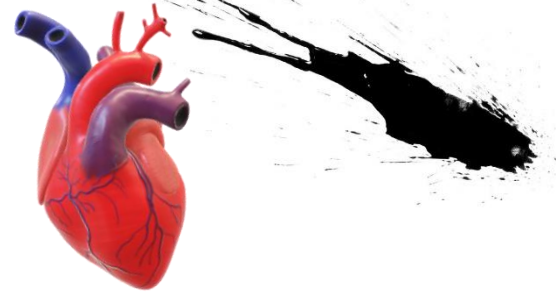
Practical element: fingerprinting; DNA presentation



#### **Class V**

More in-depth material on fingerprinting w/ a fingerprinting practical using fingerprint ink; matching exercise with the class (split into groups) to identify the fingerprint match to spot the suspect - identifying loop/whorl/arch/minutia etc.; electrolysis demonstration (some relevance to fingerprint development) - using water/sweet potato powder as indicator/water-absorbing polymer/battery, colour change of green and red at each electrode (building on acid-base knowledge); quick intro to blood spatter before next week - different categories of blood stain, factors influencing spatter (nature + location of wound, height, weapon used, force etc.); video on forensic blood spatter analysis

Practical element: More fingerprinting; electrolysis

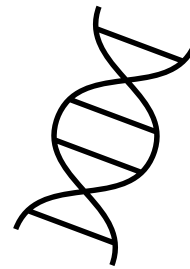


### Class VI

Importance of blood for a forensic scientist; blood spatter demonstration using fake blood made with water, red food colouring gel and flour/cocoa powder to mimic viscosity; 'viscosity' ...blood as 'gel-like'; various factors influencing blood spatter patterns analysed using a surface—velocity, height, volume, angle, location of wound (e.g. arterial) etc. physical properties of blood—fluid mechanics, viscosity etc.) Our fake blood versus real blood; Blood spatter diagrams: 'satellites', 'spines', elongation etc.

The circulatory system; composition of blood—plasma, platelets, erythrocytes and leucocytes; vascular structures—arteries, veins and capillaries. Touched on lymphatic system and the various blood types; antibodies and antigens, immunology; finished up with *Brainpop* quiz on blood + revision topics.

Practical element: blood spatter analysis



### Class VII

Personal Protective Equipment (PPE) in forensic science—usage at crime scenes and in the laboratory/comparisons with different kinds of PPE; choosing PPE for different situations; The importance of genetic analysis in forensic science; biometrics—fingerprints, eye colour, facial features, bone structure, blood (blood groups), height etc.; Re-cap of some important definitions; DNA re-caps; DNA animations; the genetic code; genetic engineering (CRISPR); cellular machinery—the ribosome; the phospholipid bilayer; eukaryotic vs prokaryotic cells; what makes things 'living'?; lab protocols; DNA experiment re-cap + explaining each step; molecules, chemistry—how forensic scientists use chemistry (e.g. luminol); re-cap on evolution and the basis of genetics—Mendel, peppered moth, Darwin...//Nancy Wexler, Rosalind Franklin; Blood — vessels, constituents, centrifugation, blood spatter, capillary action



Class materials: Slides, Kahoot, Sherlock Holmes puzzles, *ultimate* quiz, extra materials, recording



## Class VIII

Ballistics—muzzle velocity, bullet casings, bullets as 'projectiles'; modelling bullet flight paths using physics; using maths to find information about distance travelled, point of origin etc. (equations); Foot/shoe prints; more on techniques/equipment used at crime scenes and in the lab; Bone analysis; forensic anthropology; science and measurement—the importance of the scientific method; extra bits on blood spatter—angle influencing elongation + blood spatter as a projectile; Graphology (handwriting analysis); lifting latent prints using dusting powder

Class materials: Slides, Kahoot, Sherlock Holmes puzzles, *ultimate* quiz, extra materials, recording

