

# MSc Medical Genetics & Genomics

## MSc Clinical Genetics



# Lectures

Lectures are used to help communicate theory related to genetic disease (how changes in the genome lead to disease), methods of risk calculation for patients, techniques used in the genetics diagnostic laboratory, and interpretation of the data from tests. Lecturers are from both University and from NHS (West of Scotland Genetics Service).

**Next Generation Sequencing**

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**Different platforms, different chemistries**

- 1 Library preparation
- 2 Clonal amplification
- 3 Cyclic array sequencing

DNA fragmentation and *in vitro* adaptor ligation

bridge PCR

Sequencing-by-synthesis

Illumina

**"Tertiary" Analysis**  
Visualisation and Filtering

varseq

Increased Breadth

# Use of IT in teaching

Recording of lectures is used to ensure that students who miss a session can catch up later.

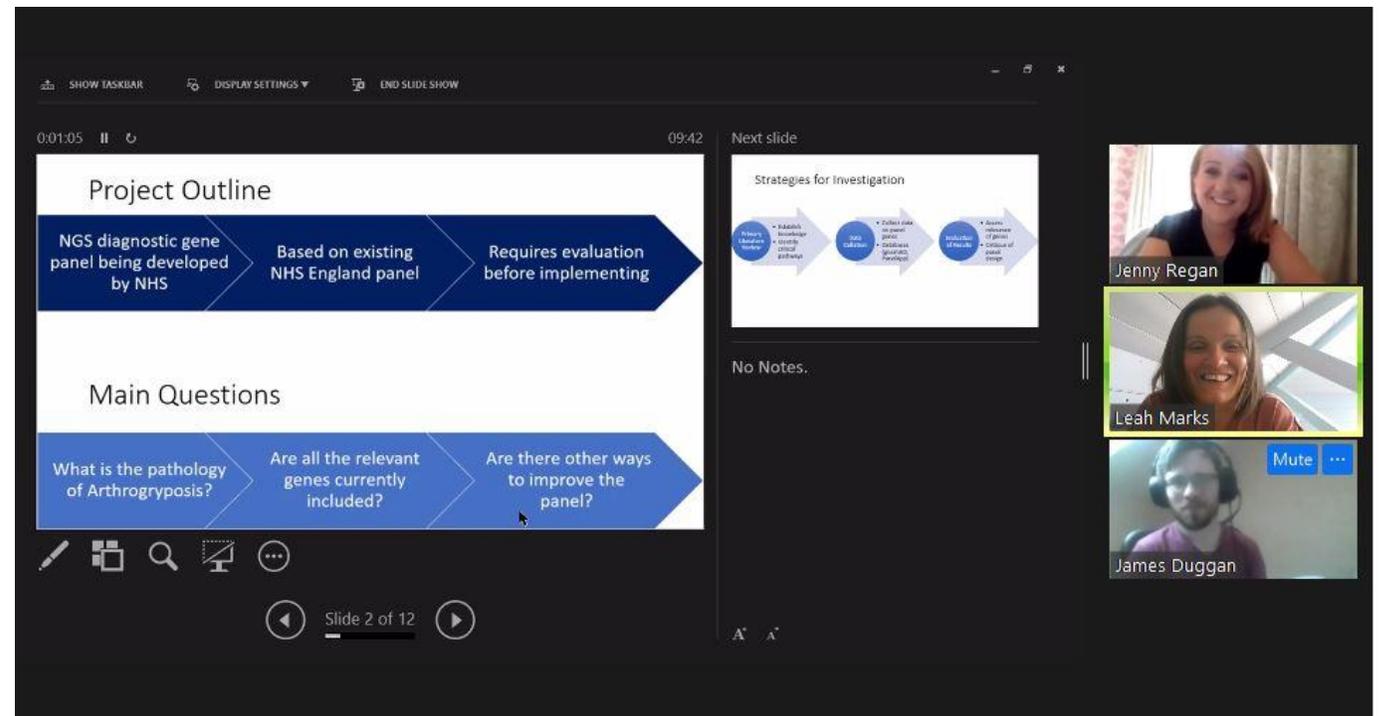
Chromatin & Gene Editing 1 [Dr Adam West]



The screenshot displays a video lecture interface. The main content area shows a slide titled "Genome editing" with a 3D visualization of DNA double helices in various colors (blue, red, green, purple) and glowing yellow spots. Below the slide, the text "Adam West", "Medical Genetics and Genomics", and "Nov 2019" is visible. The interface includes a top navigation bar with "echo", "Chromatin & Gene Editing 1 [Dr Ad...", "Thu Nov 28", and "MED5330 - Genetic Diseas...". The University of Glasgow logo is in the top right. A video window on the right shows a man in a blue shirt standing at a desk with a laptop. The bottom control bar shows a play button, "00:00 / 1:39:36", and icons for "Sources", "CC", "Settings", and "Full Screen".

# Use of Zoom in teaching

We are also currently making extensive use of Zoom to deliver live sessions in a “socially-distanced” context. Zoom can be used very effectively to ensure that students are able to easily meet with staff and “attend” teaching sessions remotely if these sessions cannot be delivered in a normal lecture theatre context.



The screenshot displays a Zoom meeting interface. The main window shows a slide presentation with the following content:

- Project Outline**
  - NGS diagnostic gene panel being developed by NHS
  - Based on existing NHS England panel
  - Requires evaluation before implementing
- Main Questions**
  - What is the pathology of Arthrogryposis?
  - Are all the relevant genes currently included?
  - Are there other ways to improve the panel?

Navigation controls at the bottom indicate "Slide 2 of 12". To the right, a "Next slide" preview shows "Strategies for Investigation" with a flowchart. Below the slide, it says "No Notes.". On the far right, three video feeds are visible for participants: Jenny Regan, Leah Marks, and James Duggan. A "Mute" button is visible next to James Duggan's feed.

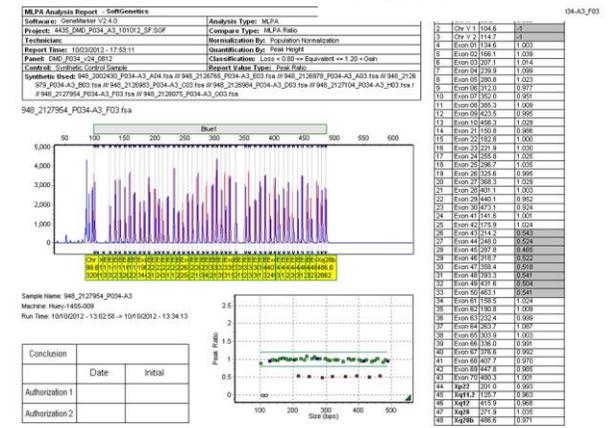
# Problem sessions

Lecture sessions are complemented by problem solving using clinical and laboratory data to enhance the learning process. Typically, students break into small groups to interpret data and think about any issues, guided by staff.

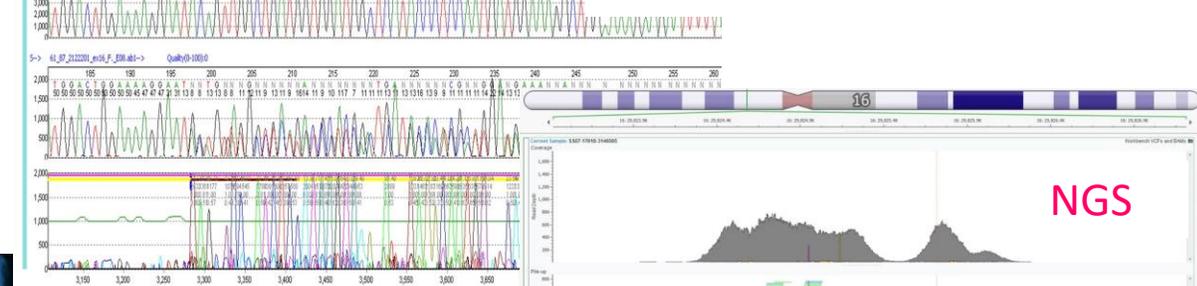
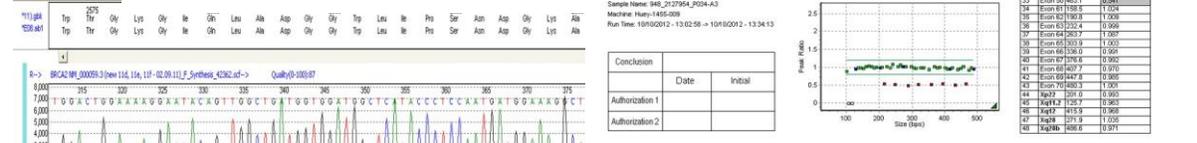


# Diagnostic data interpretation

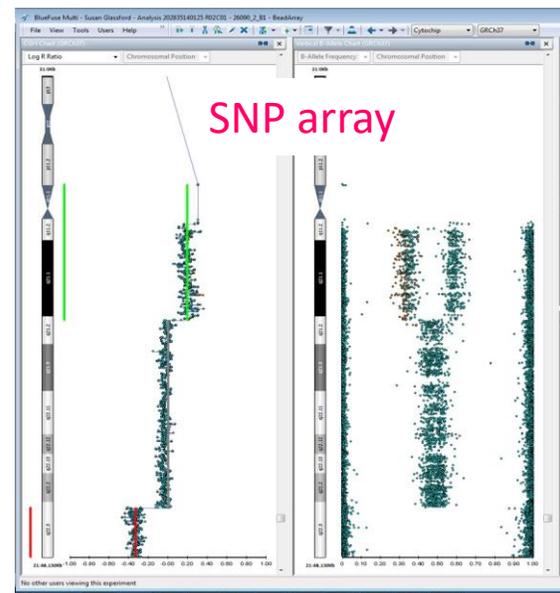
Students learn to interpret and evaluate data from a wide range of diagnostic techniques.



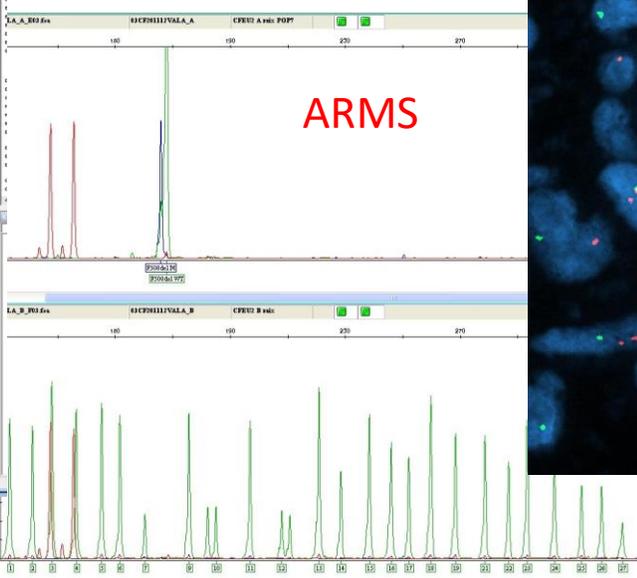
## Sanger sequencing



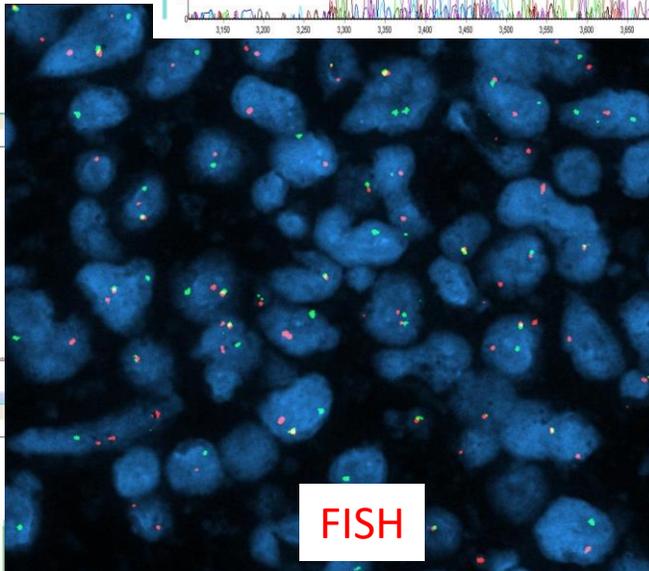
## NGS



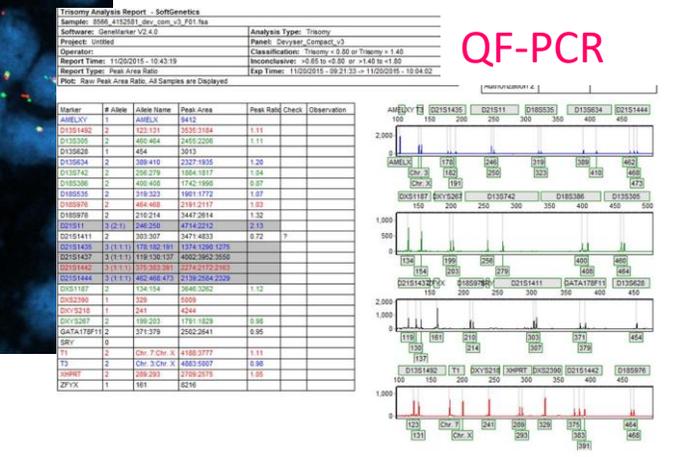
## SNP array



## ARMS



## FISH



## QF-PCR

# Case-based learning

Students work in small groups to analyse clinical case scenarios, decide on appropriate testing, and analyse results of diagnostic tests they have requested in order to reach a diagnosis for patients in the case, and consider genetic management approaches for the family.



# Laboratories (Medical Genetics & Genomics)

Students undertake PCR-based work in the laboratory, and design & validate their own assay for a human variant DNA sequence.



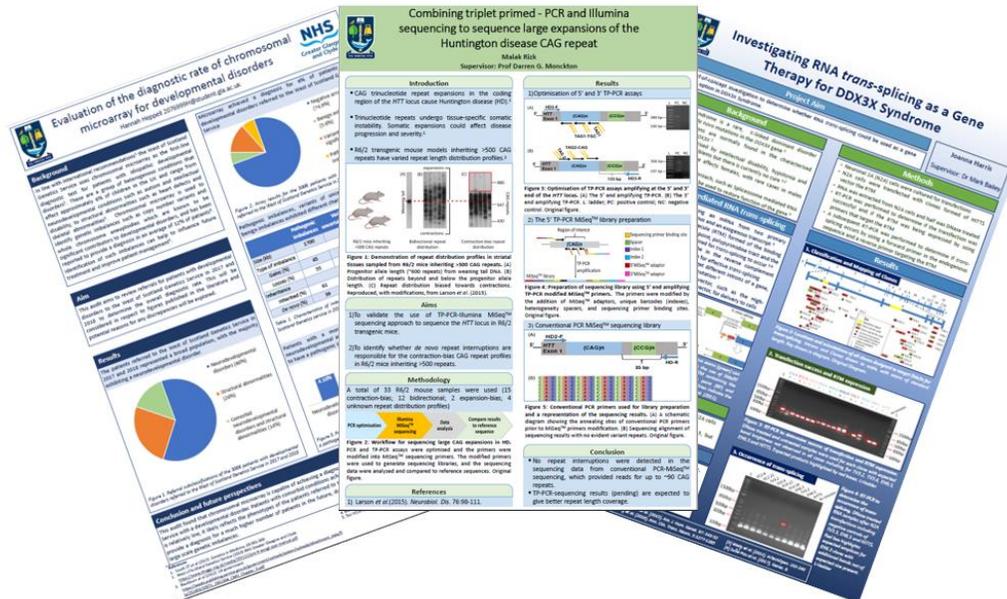
# Computer-based analysis

Students are guided through the use of some of the major genome browsers and analytic software to facilitate analysis of human genome variants.



# Projects

Each student selects an investigative project according to their interests and career objectives. To enhance relevant experience for research-based careers many students take projects involving laboratory research and / or bioinformatics analysis. Students interested in careers within NHS genetic diagnostics laboratories often undertake projects that involve audit of aspects of performance or evaluation of approaches used. Results are presented in written reports, oral presentations and poster sessions.



# Public engagement

Students are encouraged to become involved in events to communicate genetics to the wider population, particularly children. Our students have also helped local schoolchildren to produce podcasts like this one:

<https://soundcloud.com/user-273892016/harmonizing-mental-health-and-wellbeing-with-jessica-and-maggie>



Medical Genetics students preparing their materials for a schools session



Children attending the event get the chance to make DNA from strawberries

# Social life

We organise social events for the genetics MSc classes, which in the past have included international lunches, awaydays, ten-pin bowling, country walks.



# Award-winning teaching

The Medical Genetics teaching team are committed to providing our students with a high quality and enjoyable experience, and have been recipients of several teaching awards.



We have not let the current COVID lockdown compromise the quality of our students' experience. In the words of James from the 2019-20 class "Delivery of the course has been very strong, both before the lockdown, and also during the lockdown. Video lectures during lockdown have felt well organised and enjoyable, and I think that the friendliness of the staff and the positive working relationships have helped with this. Supervisor video meetings have also been effective, my supervisor has been extremely helpful and provided lots of useful suggestions, and video conferencing makes it quite easy for us to share information quickly."

# Our graduates



Our MSc in Medical Genetics & Genomics prepares our graduates for a numbers of different careers, and you can read testimonials from several of them on our website at <https://www.gla.ac.uk/postgraduate/taught/medicalgeneticsandgenomics/#tab=career,whatourstudentsay,whatourstudentsay>

Many of our graduates undertake PhDs and develop careers in research; other graduates embark on careers in genetic diagnostics, becoming Clinical Scientists in the NHS or other health services; some gain posts in various biotechnology industries. Some of our alumni are now running research and diagnostic labs around the world, including Malaysia, Taiwan and Cambridge (UK).

Our graduates become a part of our Medical Genetics Alumni group, which now has hundreds of members across the globe.

The teaching of the MSc in Medical Genetics & Genomics and MSc in Clinical Genetics is enhanced by teaching sessions with clinical scientists, doctors and counsellors from the West of Scotland Genetics Service. <https://www.nhsggc.org.uk/about-us/professional-support-sites/west-of-scotland-genetic-services/#>

The University staff who lead the teaching have generated many educational resources for international use. For example Prof Edward Tobias has developed an educational genomics website (<https://www.EuroGEMS.org>), which is now used in over 100 countries, and also his new internationally-popular smartphone apps for students, are now prominently featured by the European Society of Human Genetics (ESHG) on their own Genetic Education web-page at <https://www.eshg.org/index.php?id=education>. Links to these free apps, which are used by students and professionals around the world are provided at: <http://www.genomicsapps.org>.

Two recent review articles on the Genetic Basis of Disease have been authored by members of the Medical Genetics teaching team (<https://doi.org/10.1042/EBC20170053> and <https://doi.org/10.1002/9780470015902.a0028790>), and Prof Edward Tobias is co-author of the widely used textbook [Essential Medical Genetics, 6th Ed.](#)

Prof Tobias is a Principal Investigator highly involved in the Rare Disease Research programme of a major whole genome sequencing (WGS) clinical research study named the Scottish Genomes Partnership (SGP). More details are available at this page:

<https://www.scottishgenomespartnership.org/sgp-rare-disease-research-studies>.

Some of Prof Tobias' research was published very recently (in 2020) in a top international genetics journal, Genetics in Medicine (the official journal of the American College of Medical Genetics and Genomics):

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7056646/>.