Epigenetics on AnVIL: Nature vs Nurture

May 06, 2025

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# Overview

This activity is intended to serve as an introduction to the field of epigenetics, or the idea of “nature versus nurture”. The first activity, [Explore the Epigenome](explore-the-epigenome#launch-the-genome-browser-gateway) leverages the UCSC Genome Browser - a powerful tool for visualizing genomic differences. This book is part of a series of books for the Genomic Data Science Analysis, Visualization, and Informatics Lab-space (AnVIL) of the National Human Genome Research Institute (NHGRI).

## Skills Level

*Genetics*  
**Beginner**: minimal prior knowledge/skill helpful

*Programming skills*  
**Novice**: no programming experience needed

## Learning Objectives

Learning objectives for this activity come from the [Genetics Core Competencies](https://genetics-gsa.org/education/genetics-learning-framework/):

* Discuss how DNA is packaged in the chromosomes in terms of histones, nucleosomes, and chromatin.
* Defend how most cells can have the same genetic content and yet have different functions in the body.
* Contrast the packaging of DNA into euchromatin versus heterochromatin in the context of histone modification, and DNA modification (where applicable).
* Discuss the potential roles of DNA modification, histone modification, and non-coding RNA in epigenetic inheritance, both somatic and germline.
* Discuss environmental impacts on epigenetic systems.
* Describe how differential histone modification modulates gene activity and is utilized in developmental progression.

### AnVIL Collection

Additional guides are provided to help you with Workspaces, launch interactive tools, and start working with data. Learn more about AnVIL by visiting <https://anvilproject.org> or reading the [article in Cell Genomics](https://www.sciencedirect.com/science/article/pii/S2666979X21001063).

Please check out our full collection of AnVIL and related resources: <https://hutchdatascience.org/AnVIL_Collection/>

# 1 Student Guide

## 1.1 Activity One

Many of the AnVIL books that are designed for teaching a class or workshop contain information aimed at the instructor.

You might want to create a “student guide” that contains a different subset of Rmd files from your book, or renders to a different output format (e.g. word document). You can specify the output and Rmd files that will be used for the student guide using the \_output.yml and \_bookdown.yml files in the student-guide directory.

By default, repositories based on AnVIL\_Template create a docx file containing this chapter as an example. Once you have adjusted student-guide/bookdown.yml to include the chapters you want in your student guide, you can link to it by replacing {repo-name} in the following URL:

https://github.com/jhudsl/{repo-name}/raw/main/student-guide/docs/Student\_Guide.docx

When someone clicks this link, they will download the docx file. For example, here is the link for the student guide from AnVIL\_Template:

<https://github.com/jhudsl/AnVIL_Template/raw/main/student-guide/docs/Student_Guide.docx>

## 1.2 Activity Two

Steps of the guide could go here.

# About the Authors

These credits are based on our [course contributors table guidelines](https://github.com/jhudsl/OTTR_Template/wiki/How-to-give-credits).

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| Package Developers ([ottrpal](https://github.com/jhudsl/ottrpal)) | [John Muschelli](https://johnmuschelli.com/), [Candace Savonen](https://www.cansavvy.com/), [Carrie Wright](https://carriewright11.github.io/) |
| **Funding** |  |
| Funder | [National Human Genome Research Institute (NHGRI)] #5U24HG010263 |
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## ─ Session info ───────────────────────────────────────────────────────────────  
## setting value  
## version R version 4.3.2 (2023-10-31)  
## os Ubuntu 22.04.4 LTS  
## system x86\_64, linux-gnu  
## ui X11  
## language (EN)  
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## tz Etc/UTC  
## date 2025-05-06  
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## devtools 2.4.5 2022-10-11 [1] RSPM (R 4.3.0)  
## digest 0.6.34 2024-01-11 [1] RSPM (R 4.3.0)  
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## stringr 1.5.1 2023-11-14 [1] RSPM (R 4.3.0)  
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## vctrs 0.6.5 2023-12-01 [1] RSPM (R 4.3.0)  
## xfun 0.48 2024-10-03 [1] CRAN (R 4.3.2)  
## xtable 1.8-4 2019-04-21 [1] RSPM (R 4.3.0)  
## yaml 2.3.8 2023-12-11 [1] RSPM (R 4.3.0)  
##   
## [1] /usr/local/lib/R/site-library  
## [2] /usr/local/lib/R/library  
##   
## ──────────────────────────────────────────────────────────────────────────────

# 2 References