University of Calgary
Arts and Science Honours Academy

ASHA 421 (L01): Invention: Discovery and Innovation throughout History

Winter 2021: January 11 – April 15, 2021 (excluding Feb 14-20, 2021)

Lecture (via Zoom): Tuesdays/Thursdays 9:30 to 10:45 AM

Instructor:	Peter Kusalik
Email:	pkusalik@ucalgary.ca
Email Policy	Please note that all course communications must occur through your @ucalgary email, and I will respond to emails sent via student's @ucalgary emails within 48 hours.
Office Hours	Online; by appointment (Tues., Thurs. preferred)
Office Phone	(403)-220-6244 (messages left here will be forwarded to me)
Web Page:	D2L: ASHA 421 L01 - (Winter 2021) – Invention

Course Description
From the slingshot to steam power to intellectual property, from prophets to scientists to novelists; the theory and practice of invention looms large in human history and its importance continues into the present age. This course will examine the nature and development of conceptual and technological invention, which we will broadly label as "discovery" and "innovation", respectively. The desire and ability to discover and innovate seems fundamental to humanity and appears to have taken place throughout its history. We will identify discovery and innovation as key components (i.e. the basis) of the innately human activity "science". This course will look at science through a historical lens and will consider discovery and innovation across various times and places, with a particular emphasis on ancient civilizations. This class will consider how opportunity and need are both crucial aspects that help to drive discovery and innovation, and it will examine important factors (e.g. communication and environmental, cultural and historical contexts) and how they have influenced and guided discovery and innovation.

Additional Information
A summary of topics to be covered, along with any associated readings, is given at the end of this outline and on D2L. Students are responsible for reading and following all course and university policies discussed in this outline.

This course will take place **online** via Zoom and Desire2Learn (D2L). To best succeed in the course, students are encouraged to participate in the synchronous Zoom sessions and asynchronous learning tasks using the D2L learning environment**.** Synchronous real-time sessions will be held on Zoom during each regularly schedule class session, unless otherwise previously announced on D2L. All zoom presentations and class discussions (either as led by the instructor or as part of research project presentations) will be recorded and later posted on D2L. If unable to participate live in any synchronous Zoom session due to a time difference or unforeseen circumstances, inform the instructor in advance, and propose an alternative participation activity (e.g., for a session involving a presentation and class discussion: watch the recording and then submit a brief reflection; for a session involving group project discussion: actively contribute to a follow-up online discussion with the group).

Guidelines for Zoom sessions

Zoom is a video conferencing program that will allow us to meet at specific times for a "live" video conference, so that we can have the opportunity to meet each other virtually and to share materials and discuss relevant course topics as a learning community.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

The use of video conferencing programs relies on participants to act ethically, honestly and with integrity; and in accordance with the principles of fairness, good faith, and respect (as per the Code of Conduct). When entering Zoom (or any other video conferencing sessions), you play a role in helping create an effective, safe and respectful learning environment. Please be mindful of how your behaviour in these sessions may affect others. Participants are required to use names officially associated with their UCID (legal or preferred names listed in the Student Centre) when engaging in these activities. Instructors/moderators can remove those whose names do not appear on class rosters. Non-compliance may be investigated under relevant University of Calgary conduct policies (e.g. Student Non-Academic Misconduct Policy). If participants have difficulties complying with this requirement, they should email the instructor of the class explaining why, so the instructor may consider whether to grant an exception, and on what terms. For more information on how to get the most out of your zoom sessions visit: https://elearn.ucalgary.ca/guidelines-for-zoom/ .

If you are unable to attend a Zoom session, please contact your instructor to arrange an alternative activity for the missed session (e.g., to review a recorded session). Please be prepared, as best as you are able, to join class in a quiet space that will allow you to be fully present and engaged in Zoom sessions. Students will be advised by their instructor when they are expected to turn on their webcam (for group work and presentations, during discussions when asking or responding to a question, etc.).

The instructor may record online Zoom class sessions for the purposes of supporting student learning in this class – such as noted above. Students will be advised before the instructor initiates a recording of a Zoom session. These recordings will be used to support student learning only, will only be made available on the class D2L site, and will not be shared or used for any other purpose.

Objectives of the Course

The objectives of the course are to …

- Examine how discovery and innovation occurred within various historical contexts.
- Allow students to investigate and analyze the nature of science within a particular time and place.
- Explore the complex cultural, environmental and contextual factors that have supported or influenced discovery and innovation.
- Develop a greater understanding of how the context of particular times and places can guide and influence discovery and innovation.
- Examine how early scientists and their discoveries and innovations have served as foundations for modern science.
- Encourage a greater appreciation of early scientists, as well as a critical re-assessment of one's own ideas and conceptions of what science is and how it has developed historically.
- Analyze and discuss some essential elements of science (e.g. communication and measurement).
- Review and describe the difference between causality and correlation.
- Support the development of constructive teams and teamwork.

Learning Resources

There are no required or recommended textbooks. A weekly schedule of topics and any required readings, such as articles or possibly book chapters, will be maintained and posted (with any links as appropriate) on D2L (using the Reading List). Assigned readings will posted at least one week in advance of being discussed in class. We will typically have a single specific reading each week, where these will occur predominantly during the first 4 weeks of class, however during the week of March 8 - 12 students will have the Science in Antiquity overviews and summaries (see below) from the other groups to review. In some class sessions, there will be short texts introduced as part of that session. Reading in support of the Science in Antiquity and Discovery and Innovation projects will otherwise constitute the major component of reading for this course.

Learning Technologies and Requirements

There is a D2L site for this course which contains required readings and other relevant class resources and materials (see d2L.ucalgary.ca).

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:
- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Broadband internet connection.

Most current laptops will have a built-in webcam, speaker and microphone.

Assignments and Evaluation

There are two major project assignments in the course, along with in-class exercises. Descriptions of these components are provided below. All assigned items and exercises will be uploaded to the appropriate Dropbox on D2L unless otherwise explicitly indicated. For written assignments, it will be *primarily the quality of the discussion, rather than the quantity*, that will be important.

Weight	Assessed Components	Due
40%	*Science in Antiquity* **project.** Consists of the following components:	
4%	Initial outline and bibliography (individual)	Feb. 5
13%	*Science in Antiquity* project overview and summary (group)	Mar. 5
13%	*Science and Innovation in Antiquity* project report (individual)	Mar. 12
10%	*Science and Innovation in Antiquity* project presentation (group; "in class")	Mar. 11 & 16
25%	*Discovery and Innovation* **project.** Consists of the following components:	
15%	*Discovery and Innovation* project final report (individual)	Apr. 9
10%	*Discovery and Innovation* project final presentation (individual; "in class")	Apr. 8 & 13
20%	**In-class exercises (likely 7 or 8):** typically individual but may be group; most will be completed "in class".	
15%	**Participation**	

Science in Antiquity project: The Science in Antiquity project will involve small groups of students investigating discovery and innovation within a particular civilization in the distant historical past, specifically for societies that had attained at least an agrarian-urban stage of development within the time period 3000 BCE to 1000 CE. It will consist of four components.

- The *initial outline and bibliography* (maximum 100 words plus bibliography) will identify the time and place that the group has chosen to examine and will provide a brief description of the specific focused area the individual will investigate, along with a list of the literature sources they have identified and a one-sentence statement summarizing the information provided by each source.
- The *project overview* is a 2000-word document submitted by the group. This will provide an overview of science within a particular time and place, with a specific focus on describing the context (e.g. key cultural or environmental factors) in which discovery and innovation have taken place. It will also introduce each of the specific focused areas group members will have investigated.
- The *project report* is a 1500-word document from each student that will describe the nature and extent of science within the specific area they have investigated, as well as discuss in some detail the nature of the evidence upon which their description is based.
- The *project presentation* is a 20-minute presentation by the group that aims to provide the class (who will have read their overview document) a picture or demonstration of science within the context of the particular time and place they have investigated. These presentations will be evaluated by the instructor with input from the remainder of the class.

Discovery and Innovation project: The Discovery and Innovation project will build upon the Science in Antiquity project by having the student groups now discover and/or innovate within the particular civilization they had previously examined. The appropriateness, impact, and originality of the discovery and/or innovation within its context will be important here.

- The *project final report* is a 1250-word document that describes a discovery and/or innovation, and how need and opportunity in that particular time and place have helped to drive the advance. The project final report is likely to refer heavily to the context provided in the project report and project overview from the Science in Antiquity project.
- The *project final presentation* is a 6-minute presentation by each member of a group that aims to showcase to the class their discoveries and/or innovations, where the context should be clearly highlighted. These presentations will again be evaluated by the instructor with input from the remainder of the class.

Further details about these projects and their evaluation will be discussed in class and posted on D2L. Several blocks of class time will be set aside through the term for groups to discuss and work on their projects and to obtain ideas and support from the instructor.

Participation: There will be considerable opportunity for participation and discussion during classes. Participation is not measured solely by how often you speak up. Informed, thoughtful contributions can be more important than frequent contributions to discussions. For example, listening and asking thoughtful questions can be as important as providing responses and commentary. A crucial aspect is the ability to demonstrate familiarity and engagement with the topic and any associated readings. Note also that attentiveness and respect are also important – for example, students who interrupt others, distract their classmates, or use electronic devices in class in a way that is disruptive will see an impact on their participation grade. Active engagement with your project group members during the allotted class time will be taken into consideration for your participation grade. Students are invited to contact the instructor directly if they feel that there are factors which may limit their ability to contribute in class.

Registrar-scheduled Final Examination: No

Note: You must complete all components of the "Science in Antiquity" and "Discovery and Innovation" projects or a course grade of F may be assigned at the discretion of the instructor. Any in-class exercises not completed may be assigned a grade of F at the discretion of the instructor.
If you miss a required course component, please contact your instructor as soon as possible and no later than 2 days from when it is due or completed in class.

Submission of Assignments
Please include your name and ID number on all assignments and project work. These will be uploaded to D2L dropbox unless otherwise explicitly indicated. **Note:** It is your responsibility to keep a copy of each submitted assignment and to ensure that you submit the proper version.

Private information related to individual students is treated with the utmost regard by University of Calgary faculty. Student assignments will be accessible only by the authorized course faculty, and personal information is collected in accordance with the *Freedom of Information and Protection of Privacy (FOIP) Act*. Please note that instructors may use audio or video recorded for lesson capture, assessment of student learning, and self-assessment of teaching practices.

Policy for Late Assignments
If students miss a required component of the course, i.e. assignment and project work, they must contact the instructor in writing within 48 hours to discuss options to submit and/or make-up for that component. Assignments submitted after the deadline may be penalized with the loss of 5% or a partial letter grade (e.g.: A- to B+) for each day late. Late assignments will not normally be accepted more the 5 days beyond the due date. Extenuating circumstances may be accommodated at the instructor's discretion.

Student Accommodations
Students seeking an accommodation based on disability or medical concerns should contact Student Accessibility Services (SAS); SAS will process the request and issue letters of accommodation to instructors. For information on support services and accommodations for students with disabilities, visit www.ucalgary.ca/access/. Students who require an accommodation based on a protected ground other than disability should communicate this need in writing to their Instructor. The full policy on Student Accommodations is available at http://www.ucalgary.ca/policies/files/policies/student-accommodation-policy.pdf.

Students seeking accommodation for transient illnesses (e.g., the flu) or another legitimate reason should contact their instructors. Whenever possible, students should provide supporting documentation to support their request; however, instructors may not require that a medical note be presented. For the policy on supporting documentation the use of a statutory declaration, see Section M.1 of the *University Calendar*: https://www.ucalgary.ca/pubs/calendar/current/m-1.html. Also see FAQs for Students: https://www.ucalgary.ca/registrar/registration/appeals/student-faq

Expectations for Writing
Department policy directs that all written assignments and, to a lesser extent, written exam responses be assessed at least partly on writing skills. Writing skills include not only surface correctness (grammar, punctuation, sentence structure, etc.) but also general clarity and organization and proper documentation of research sources. For further information, please refer to the *University of Calgary Calendar* section on writing across the curriculum:
   http://www.ucalgary.ca/pubs/calendar/current/e-2.html

Arts and Science Honours Academy Grade Scale
The following table outlines the grade scale percentage equivalents used in for the Arts and Science Honours Academy. Final grades are reported as letter grades. For components graded using percentages or numerical scores, those values will be used directly in calculating the final course grade, while for components graded using letter grades, the letter grades will be converted to the midpoint values in calculating the final course grade.

In this course, all project work, exercises and participation will be evaluated with letter grades.

	Grading Scale
A+	96-100
A	90-95.99
A -	85-89.99
B+	80-84.99
B	75-79.99
B-	70-74.99
C+	65-69.99
C	60-64.99
C-	55-59.99
D+	53-54.99
D	50-52.99
F	0-49

Plagiarism

Using any source whatsoever without clearly documenting it is a serious academic offense. Consequences include failure on the assignment, failure in the course and possibly suspension or expulsion from the university. These requirements apply to all assignments and sources, including those in non-traditional formats such as Web pages or visual media.

You must document not only direct quotations but also paraphrases and ideas where they appear in your text. A reference list at the end is insufficient by itself. **In-text citations must be provided, and readers must be able to tell exactly where your words and ideas end and other people's words and ideas begin**. Wording taken directly from a source must be enclosed within quotation marks (or, for long quotations, presented in the format prescribed by the documentation style you are using). Paraphrased information must not follow the original wording and sentence structure with only slight word substitutions here and there.

For information on citation and documentation styles (MLA, APA, Chicago, IEEE, etc.), visit the Student Success Centre resource links at https://ucalgary.ca/student-services/student-success/writing-support or the Purdue Online Writing Lab (OWL) Research and Citation Resources at https://owl.purdue.edu/owl/research_and_citation/resources.html

If you need help with your writing or have questions about citing sources, please consult your instructor or visit the Student Success Centre, 3rd floor, Taylor Family Digital Library. To book an appointment, go to https://ucalgary.ca/student-services/ student-success?utm_source=ssc&utm_medium=redirect&utm_campaign=redirect

Instructor Intellectual Property & Copyright Legislation

Course materials created by the instructor (including course outlines, presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the instructor. These materials may NOT be reproduced, redistributed or copied without the explicit consent of the instructor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the same course section and term may be allowed under fair dealing. Check with the instructor if you have any questions about sharing materials with classmates.

All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright (www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf) and requirements of the copyright act (https://laws-lois.justice.gc.ca/eng/acts/C-

[42/index.html](#)) to ensure they are aware of the consequences of unauthorized sharing of course materials (including instructor notes, electronic versions of textbooks etc.). Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy.

Academic Misconduct
For information on academic misconduct and its consequences, please see the *University of Calgary Calendar* at http://www.ucalgary.ca/pubs/calendar/current/k.html

Research Ethics
Whenever you perform research with human participants, including surveys, interviews, or observations as part of your university studies, you are responsible for obtaining research ethics approval and for following university research ethics guidelines. In some cases, your instructors may apply for course-based research ethics approval for certain assignments, and in those cases, they must review and approve your research plans and supervise your research. For more information about your research ethics responsibilities, please see https://arts.ucalgary.ca/research/arts-researchers/resources-researchers-and-instructors/ethics

Deferrals of Course Work and Requests for Reappraisal
For university regulations and procedures related to deferrals of exams and course work, requests for reappraisals, and other matters, please see the relevant sections in the *University Calendar:* https://www.ucalgary.ca/pubs/calendar/current/academic-regs.html

Student Support Services and Resources
Please visit https://www.ucalgary.ca/registrar/registration/course-outlines for information about student support services and resources, including Wellness and Mental Health Resources, Student Success programs and services, the Student Ombuds Office, the Student Union, and Safewalk.

For resources on D2L, visit http://elearn.ucalgary.ca/desire2learn/home/students. IT support is available at itsupport@ucalgary.ca.

Schedule of Lecture Topics and Readings
A weekly schedule of topics and any assigned readings will be posted on D2L. In addition to material related to the Science in Antiquity and Discovery and Innovation projects, the topics to be covered in class will include the following:
- Exploration of what is science, and the nature of (modern) science
- Examination of some key elements that underpin science and their origins in antiquity, including
  - communication (with a particular focus on numbers)
  - measurement (with a focus on mass, length, time)
- Causality versus correlation
- Science of water

Note: all course activities will be synchronous (i.e., real-time on Zoom) during scheduled class times.

Important Dates:
- Jan. 12: first class
- Feb. 5: *Science in Antiquity* project outline and bibliography due
- Feb. 15-19: reading break
- Mar. 5: *Science in Antiquity* project overview and summary due
- Mar. 11 & 16: Science in Antiquity project presentations

- Mar. 12: *Science in Antiquity* project report due
- Apr. 2: Good Friday holiday
- Apr. 5: Easter Monday, no classes
- Apr. 8 & 13: *Discovery and Innovation* project final presentation
- Apr. 9: *Discovery and Innovation* project final report
- Apr. 15: final class