HABWORLDS

Release Notes: May 2019

The team behind HabWorlds – Arizona State University's Prof. Ariel Anbar and his team at the Center for Education through eXploration (ETX) – are excited to be releasing a new version of the course to the Inspark Teaching Network.

Highlights

There are a few major improvements to highlight for HabWorlds instructors:

- The course is now free from Flash technology. This should make it significantly easier for students to use the course and for you to support them.
- The course is now much more cohesive and thorough after a moderate restructure - some units have been combined with lessons rewritten. Please see the detailed notes for updates on specific units and lessons.
- Application lessons have been updated (now called Assessments) or were removed.
- New and improved simulations: they all have a consistent user interface now, making it faster for students to explore and learn topics as they are introduced. A few simulations have been removed completely.

Try it now as a student!

If you already have an account, sign in to try HabWorlds, or you can create your free account by signing up here first.

Detailed Release Notes from ASU's ETX Center

Changes to Course Structure

All of the lessons have been updated to have a new layout, style, and user interface. The course total is now 962 points.

Intro

The Intro unit has been modified. It now contains 8 lessons instead of 6 lessons. In addition to more lessons, the content and order of those lessons has changed. New Intro Unit:

- Intro 1: Preconceptions (similar to predecessor)
- Intro 2: Mindscapes (similar to predecessor)
- Intro 3: Science (similar to predecessor, called The Scientific Process)
- Intro 4: Tools of the Trade (new lesson)
- Intro 5: Space (similar to predecessor)
- Intro 6: Time (similar to predecessor)
- Intro 7: Matter and Energy (new lesson)
- Intro 8: Astrobiology (revised and updated)

Stars

The structure of the Stars unit remains unchanged, however, the one big change content wise in this unit is that we are now using flux to teach luminosity instead of absolute and apparent magnitude. New Stars Unit:

- R* 1: Distance to Stars (similar to predecessor)
- R* 2: Brightness (revised and updated to use flux to teach luminosity)
- R* 3: Color (similar to predecessor)
- R* 4: H-R Diagram (similar to predecessor)
- R* 5: Stellar Life Cycles (similar to predecessor)
- R* 6: Elements (similar to predecessor)

The application lessons in this unit have been adjusted to reflect the change from magnitude to flux. In addition, these lessons are now called "assessments" instead of "applications".

Planets

In the Planets unit, several changes have been made. The first two lessons are the same, but the old fp 3 and fp 4 lessons have been combined into one lesson (fp 3), a new fp 4 lesson has been added. New Planets Unit:

- fp 1: Transits (similar to predecessor)
- fp 2: Radial Velocity (similar to predecessor)
- fp 3: Planet Composition (merger lessons Planet Composition and Atmosphere)
- fp 4: Sources of Heat (new lesson)

The application lessons in this unit have been revised to coincide with changes made to the lessons. In addition, the lessons are now called "assessments" instead of "applications".

Habitability

The Energy and Habitability units have now been combined into one. A few lessons have been removed: The Climate, Planetary Evolution, Age Dating, and Ancient Climates lessons. New Habitability Unit:

- ne 1: Energy Balance (similar to predecessor, now first in sequence)
- ne 2: Water (similar to predecessor, now second in sequence)
- ne 3: Gases (similar to predecessor)
- ne 4: Greenhouse Effect (similar to predecessor)
- ne 5: Inorganic Carbon Cycle (revised and updated)
- ne 6: Habitable Zone (similar to predecessor)

The application lessons in this unit have been revised to coincide with changes made to the lessons. In addition, the lessons are now called "assessments" instead of "applications".

Life

The Life unit has been completely revamped. It now combines both the fl and fi terms and focuses on utilizing virtual field trips to show how scientists have pieced together the history of life on Earth so we can use it as an example to guide us in the search for habitable planets. All of the previous lessons have been replaced with the four lessons. New Life Unit:

- fl/fi 1: Written in Stone (new lesson)
- fl/fi 2: End of an Era (new lesson)
- fl/fi 3: Rise of the Animals (new lesson)
- fl/fi 4: First Signatures of Life (new lesson)

The application lessons have been removed completely from this unit.

Conclusion

The Conclusion unit has also been completely revamped. It has been renamed Survival and combines the fc and L terms of the Drake equation. This unit focuses on the concept that civilizations arise late in a planet's history and on the question "How long do they survive?" All of the previous lessons have been replaced with the six lessons from Dino Doom VFT and the Designer Planet lesson from BioBeyond. New Survival Unit:

- fc/L 1: Fate of the Forams (new lesson)
- fc/L 2: A Telltale Trace (new lesson)
- fc/L 3: A Matter of Size (new lesson)
- fc/L 4: Crash and Splash (new lesson)
- fc/L 5: Dinosaur Doom (new lesson)
- fc/L 6: Life Finds a Way (new lesson)
- fc/L 7: Designer Planet (new lesson)

The application lessons have been removed completely from this unit.

The Star Project

Students' answers to the written portion can now be graded by you through the Smart Sparrow workspace. You can read about how to do this in our Instructors' Guide (see bottom of page).

Changes to Simulations

All of the simulations have been updated to have a consistent user interface that includes a left panel with object controls and a right panel with a graphical display. Global sim controls are now all located at the top of the simulation.

Timeline

- Time scale extended from a 12 billion year range to a 30 billion year range.
- Addition of more than a dozen astronomical events.
- Added range indicators to events that have uncertainty in their date of occurrence.
- Improved zoom functionality with the ability to zoom via mouse-scroll.
- Explore this simulation now

Drake Equation

- Updated colors of variables so they are distinguishable to the most common forms of color-blindness.
- New graphical representation of the variables.
- Removed galaxy map which, upon clicking, had changed the stars that appeared in the visualization field.
- Explore this simulation now
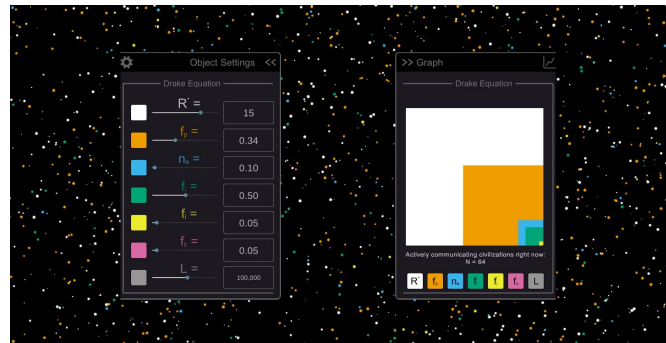
Super Star System
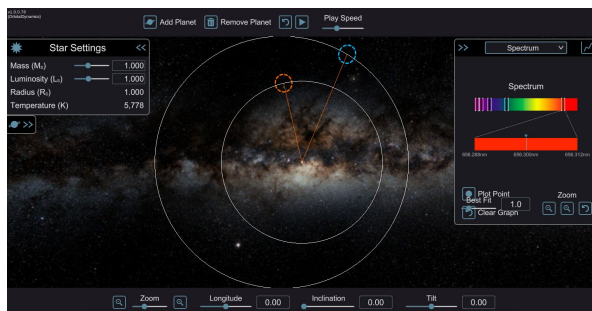
Explore this simulation now

- The following four sims (Star System, Kepler's 3rd Law, Orbital Dynamics, Energy Balance) have been unified into one code base with four different modes that control graph features and analytics specific to each mode.
- Every UI component, star variable, and planet variable can be shown/hidden or enabled/disabled in every mode.

Star System

- Click-and-drag probe has been replaced with a click-and-drag planet.
- Distance can now be set by clicking-and-dragging on the planet, by using a slider, or by typing a number directly into a number field.
- Solar system planets and "alien" planets have been removed from visualization.
- "Solar," "Alien," and "Evaluation" tabs have been removed from the screen.

Kepler's 3rd Law

- Other than the UI (planet and star properties within panels instead of at top of screen or in pop-ups), there are no significant changes in this mode.

Orbital Dynamics

- Zooming in on "points" in the light curve where a brightness dip has occurred now shows an actual dip in the curve.

Energy Balance

- Other than the UI, there are no significant changes in this mode.

Planck

- The mini-map that was used to zoom has been replaced with number fields to set min/max x-axis and y-axis values.
- The hover-over readout on the curve for the percentage for each color has been replaced with a table in the "Star Appearance" tab.
- With the consolidation of all controls in the star settings panel, temperature, luminosity, peak wavelength, flux, and radius are now all visible simultaneously.
- [Explore this simulation now](#)

Planck Mini

- The temperature slider has been removed. Temperature was determined by the instructional designer.
- An interactive graph feature has been added:
- In plot mode, students can click on the graph to plot the relative brightness at each wavelength. A guideline does indicate the x-axis position for the wavelength the slider is currently set at.

- In observe mode, a planck curve is over-layed on the graph.
  - The maximum wavelength to be displayed on the graph was determined by the instructional designer.
- Explore this simulation now

Stellar Nursery

- Instead of a fixed grid, stars can be created in any location within a 3D space.
- Maximum number of stars is now 50 instead of 6.
- Stars are now created via click-and-drag to set the mass of the star. The mass can be fine-tuned via slider/text box in the planet settings panel.
- Timeline will switch to specific star when the star is zoomed in on and includes labels for when important events occur (enters main sequence, supernova, etc)
- Ability to reverse time has been added.
- On screen pop-ups indicate when each star reaches an important event. The pop-up can be clicked to select that star.
- Explore this simulation now

Build-a-Planet Composition

- There are now two modes for different scales - one scale for gas giants and one for small terrestrials.
- Added the ability to control the amount of material by entering a number directly into a field for mass (in addition to the slider control).
- Explore this simulation now
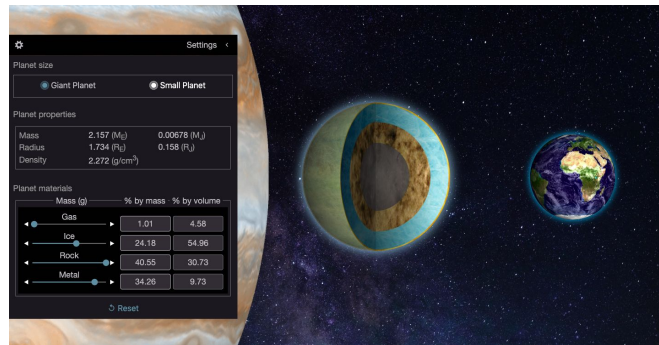
Build-a-Planet Atmosphere

- Number of gases available has been expanded to 21.
- Addition of a microview which shows how individual gas molecules move in the atmosphere. The molecules in the microview are accurate depictions of the gases selected, move at different speeds based on mass, and adjust speed with changes in temperature.
- Explore this simulation now

Phases of Matter

- 2D maps have been replaced with 3D globes. Globes can be fully rotated so that samples can be dropped at any location.
- Carbon dioxide and methane have been added as substances.
- Addition of an interactive graph which allows students to draw polygons around collected data for each phase to indicate the regions where each occurs.
- Pressure-temperature chamber visualization has been changed from water, steam and ice to a symbol that indicates whether the substance is in the solid, liquid or gas phase. The symbol changes directly with the phases the substance goes through (e.g. if the substance goes directly from a solid to a gas, the symbol changes directly from solid to gas. If the substance goes from solid to liquid to gas, the symbol will show the liquid phase before changing to gas.)
- The ability to change pressure units (atmospheres, bars, Pascals) has been added.
- Explore this simulation now
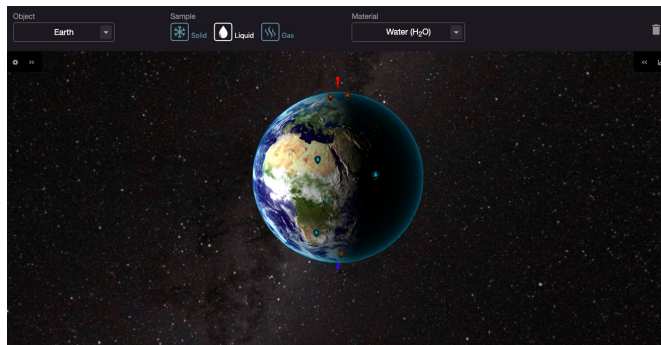
Atmospheric Chamber

- Removed the light (and the need to turn it on) to activate transmission or absorption spectra. If a gas is selected, the graph populates with the spectra.
- Removed ability to add multiple gases at once. Graph displays spectra for only one gas at a time now.
- Explore this simulation now
- The Atmospheric Chamber Quiz sim has been created as a complement to Atmospheric Chamber. This sim has two spectra displays - one which displays the spectrum for a gas, the other is for the student to select gases to match the spectrum.
  - Explore the quiz simulation

Greenhouse Effect

- Removed the rainbow arrow visualization.
- Replaced drop-down gas selection menu with button menu so all gas options remain visible and it's easy to see which ones have been selected.
- [Explore this simulation now](#)
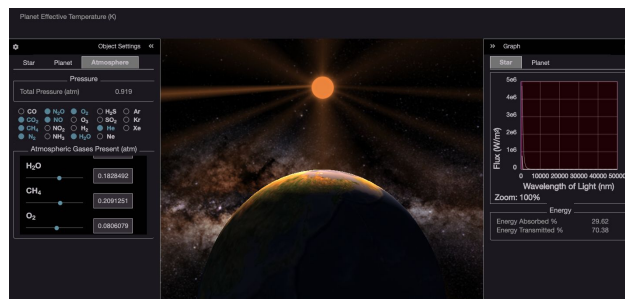
Carbon Cycle (now Geochemical World)

- Added interactivity so that students link-up the carbon cycle and adjust the rate of carbon flow between reservoirs instead of watching animations.
- Increased number of mechanisms that release/absorb carbon that the students can adjust.
- [Explore this simulation now](#)

Project

- A switch has been added for apparent magnitude and flux data. The instructor can now utilize apparent magnitude or flux.
- [Explore this simulation now](#)

Radiometric Clock, Redox and Bioplanet

These simulation has been removed from the course.

Thank you!

Every semester we receive suggestions on how we could improve our questions, text, images, feedback, etc. This release contains a small flock of fixes suggested by you. Please let us know when you see something that you think could be improved. Contact us at: team@inspark.education