

**BIOETHICS AND HISTORY AND
PHILOSOPHY OF SCIENCE
PAPER ABSTRACTS**

THE ROLE OF CREATIVITY IN SCIENCE. SARAH MCGHEE AND DENNIS SANSOM, SAMFORD UNIVERSITY.

Drawing on Nobel Prize laureate and polymath Herbert Simon's conception of creativity, this paper explores the role of creative thinking within scientific inquiry. Past philosophers of science, such as Robert Perry, Karl Popper, Imre Lakatos, Thomas Kuhn, and Paul Feyerabend, have formed contrasting definitions of science in their quests to distinguish science from pseudoscience. It is through careful consideration and comparison of these seminal scholars that the paper delineates five unique forms of scientific creativity. Recognizing these different forms of creativity in science is an essential step toward promoting progress and discovery in the scientific field. By embracing and encouraging alternate creative modalities, a student of science is granted the courage to question without fear, the mindfulness to experiment thoroughly, and the curiosity to explore where others have not yet imagined.

ENHANCING CASUAL LEARNING OF SCIENCE WITH GRAPHIC DESIGN. DAVID SMITH, AUBURN UNIVERSITY.

Should scientist be interested in casual learning when what they do requires a formal education and exacting adherence to research methods and documentation? The National Science Foundation seems to think so, as they are offering grants for the Advancement of Informal STEM Learning (AISL). A simple Internet search will reveal that there are many individuals and organizations interested in informal learning of scientific content. There are occasions when it is more effective to educate through casual learning means. This is usually driven by the desire to share scientific content with an audience that is not formally trained in scientific disciplines.

Casual learning is typically kick-started by a person's existing interest in a subject. Finding a connection between shared interests and using common language (limited scientific jargon) will make the content more accessible to an untrained audience. Utilizing graphic design to further enhance this educational experience can help open pathways to learning and retaining content, help clarify difficult concepts, and visualize complex information.

Three examples will demonstrate how graphic design was used as a tool to enhance the accessibility of scientific content for a non-scientific audience. First a print project sponsored by a local governmental institution, next a video based project sponsored by a university, and last an interactive self-initiated project.

THE SEARCH FOR KNOWLEDGE: A MATTER OF PERSPECTIVE AND TIME. *BRIAN LAHAIE*, UNIVERSITY OF GEORGIA, COLLEGE OF ENVIRONMENT AND DESIGN. CLARK LUNDELL, AUBURN UNIVERSITY.

Knowledge is a function of perception. We know based on our ability to know. Mankind is the measure of all things so says the Greek philosopher Protagoras. This paper presentation will explore examples of knowledge driven by sensory perception and perspective. From a simple beam of light to our furthest cast space satellite, we seek new perspectives and new vantage points to better understand our physical world and our place in it. Modern tools in medical technology allow us to see the human body in ways we had never imagined, until we imagined it. The classic children's book "Horton Hears a Who!" is paired with Steven Hawking's "A Brief History of Time" to express a light-hearted and hopeful view of that which is not quite visible, or perceptual. Science is our best hope for discovering meaning in a world which we have just begun to perceive.

THE TECHNOLOGICAL IMPERATIVE AND MEDICINE. *DENNIS SANSOM*, SAMFORD UNIVERSITY.

The success of technology in medicine has created a dilemma for its continual use and improvement. Technology has greatly improved medicine's diagnostic and therapeutic capabilities, but to do so, it has to objectify patients into organism that follow machine-like laws. The more technology succeeds, the more the patient's personal identity as a temporal, relational, and spiritual being is diminished. Furthermore, technology's success also creates an imperative to continue to use and improve it. The essence of technology is mastery and control over the present moment, regardless of final aims. However, it must be guided by ethical considerations. Preferential utilitarianism cannot provide this guidance, because it can only react to the results of technology; it cannot define an aim for these results. Also, because of its latent individualistic elitism, Kantianism cannot fully control the technological imperative. Medicine needs a teleological ethic that selects and uses technology to reach a human purpose greater than the successful use of technology.

GLOBAL MIGRATION: HISTORY, NECESSITY, ETHOS. *KENNETH NUSBAUM*, AUBURN UNIVERSITY. CLARK LUNDELL, AUBURN.

Since the Garden of Eden, people have been forced out of home and moved to places that seemed more favorable. Conditions of politics, economics, and environment have forced tens of millions of people to move across the planet with disruption of life patterns as migrants find a place to stay. While migrants generally produce favorable outcomes for individuals and nations, economic and social patterns may be changing. Discussion will address stopping migration, controlling migration, and paying for migration.

ECONOMIC CLIMATE AND CONTEMPORARY WATERS. CLARK LUNDELL, AUBURN UNIVERSITY.

The vitality of an economy drives the levels of consumption and aspiration of a society and is manifested in circumstantial systems and product outcomes. Often these systems and outcomes have unanticipated consequences. Design paradigms developed over the past 125 years reflect both the impact of the industrial revolution and its unintended outcomes.

This presentation will review four 20th century design personalities / theories / paradigms (The Bauhaus, Norman Bel Geddes, The Ulm School of Design, and Luigi Coloni) and identify unintended outcomes of these design philosophies. These outcomes present challenges to 21st century life that are manifest in worldwide Population (8 Billion), Alienation (Virtual Reality) and Pollution (Ocean Gyres).

The resolution of these challenges can be achieved by development of a paradigm that emphasizes an attitude of being aware of and existing in a present which reflects on the full consequence of our action upon the future.

**BIOETHICS AND HISTORY AND
PHILOSOPHY OF SCIENCE
POSTER ABSTRACTS**

METHOD FOR THE DEVELOPMENT OF ALTERNATIVE AGRICULTURE. *JUSTIN MURPHY*, AUBURN UNIVERSITY.

An exponentially increasing world population necessitates an increase in global food output. Meeting this demand using modern agricultural techniques will result in an increase in unsustainable practices known to be damaging to both humans and the environment. The importance of developing economically sound alternative agricultural models to mitigate these damages is therefore becoming increasingly important.

Aeroponics is an alternative agricultural model that uses a nutrient rich mist to grow plants in a controlled environment without the use of soil or an aggregate media. Research has demonstrated that aeroponic systems can increase crop yield with less water, less fertilizer, and no pesticides. Due to these promising implications, more research is needed to determine whether an aeroponic model could be a viable system for solving the alarming problems associated with safely increasing food production.

The paucity of research in applied environmental stressors to alternative agricultural models like aeroponics presents an opportunity for the discovery of fundamental knowledge that could be used in the development of economically viable risk mitigating agricultural models.

This researcher is conducting research on the effects of an induced environmental stressor in the form of sound waves on lettuce grown in a high-pressure aeroponic system. Data from previous studies demonstrating the positive effects of sound waves on field grown crops will be applied to this alternative model expecting comparable results. If successful, this experiment will result in a fully functioning prototype using acoustic technology to increase the efficiency of a high pressure-aeroponic system.

BIOETHICAL CONSEQUENCES AND IMPLICATIONS OF CRISPR-CAS9 TECHNOLOGY. *SHUNTELE BURNS*, ALABAMA STATE UNIVERSITY.

CRISPR-Cas9 is a gene-editing technique that has garnered much attention because of its relative speed, ease, and low cost. CRISPR stands for Clustered Regularly Interspaced Short Palindromic Repeats; Cas9 refers to the system's associated nuclease that cuts segments of DNA. CRISPR-Cas9 holds great promise for treating many diseases. However, this technology also gives rise to vexing ethical questions regarding its current and potential applications.

CRISPR-Cas9 is adapted from an endogenous bacterial defense system. A bacterium accrues pieces of DNA from invading viruses and stores them in its own genome as CRISPR arrays. The bacterium produces complementary RNA sequences from these CRISPR arrays and uses them to identify previous invaders. The recognition of a returning virus causes the Cas9

enzyme to cut the viral DNA, thereby disabling the virus. Researchers have discovered that this natural mechanism can be tailored to edit DNA of choice—e.g., the DNA of cancerous cells.

Despite the many conceivable benefits of CRISPR-Cas9, some of its possible applications raise serious ethical issues. For example, altering the genome of plant and animal pests may have unintended negative consequences for the overall environment. Another especially troubling ethical challenge involves germline manipulation in humans, which could lead to requests for “designer” children. Moreover, if germline editing is permitted, will it be available only to the wealthy? These and other ethical concerns need to be considered as we become increasingly aware of the benefits and potential dangers of gene editing.