

## ZAMM Poster Abstracts

**Title:** *Zombification in the womb: Do fetal interests drive maternal food choices, pregnancy sickness, and microbiome changes?*

**Authors:** Jessica Daphne Ayers, Athena Aktipis, Corrie Whisner

**Abstract:** The physiology of pregnancy, parturition, and lactation is often interpreted as a symbiotic and cooperative endeavor between the maternal and fetal bodies. However, recent research has cast doubt on this assumption by highlighting aspects of conflict between the maternal and fetal bodies. For example, placental development an example of maternal-fetal conflict (Haig 1993; Fowden and Moore 2012) as it is in the fetus's best interest to extract more nutrients from its mother than is the maternal optimum, as the mother will benefit by optimizing allocation of her resources across all potential offspring. This conflict continues throughout pregnancy (Ananth and Vintzileos 2006), parturition (McLean and Smith 2001), and even after birth via fetal microchimerism (Boddy et al. 2015). Here we suggest that maternal eating behavior during pregnancy is another area of behavior characterized by maternal-fetal conflict. Specifically, we hypothesize that maternal cravings for certain foods (i.e., sweets, fruits) are primarily driven by fetal interests because the fetus can more easily extract the nutrients from these foods compared to other foods (i.e., meats, vegetables). Here, we present preliminary evidence from a large sample of women documenting the foods craved by during pregnancy and the ease of nutrient accessibility from these foods for the fetus.

**Title:** *The Will and Lessons of the Dead and the Construction and Defense of One's Interest*

**Authors:** Indra Gesink

**Abstract:** We are adapted in and to the past. A priori we are carriers of the fitness of the dead. We are sets of evolved solutions to problems in the past. How to prevent that we become solutions to problems of the past? What can help us persist through an Apocalypse in which the Lessons of the Dead may no longer serve us? With the discontinuity between the problems of the past and future in such a situation, rationality may no longer be expected and our adaptedness may be lost. The clash between conflicting and nonconflicting interests will be important, as they have always been in our evolutionary history, and especially the interests of conspecifics. Understanding their dynamic interplay is key and the survival value of this is precisely what attracts us to movies of a Zombie Apocalypse, where often the threat lies not primarily with the zombies but with our fellow human beings. This poster explores the nature of one's interest, problems and solutions related to inter-individual interactions, both inter- and intra-generationally, and problems and solutions related to intra-individual interactions. Let's upgrade our survival toolkit!

**Title:** *"I will break you and harvest your fear": How chronic disease stigma overtake our body and mind*

**Authors:** Peter Nagy

**Abstract:** Dating back to the Ancient Greeks, who marked people's skin in order to punish lawbreakers, stigma has been used to indicate that some group of people are inferior to others. Viewed as outcasts, stigmatized people consistently devalue themselves because they believe that society rejects them. Feeling detached from "normal people", stigmatized individuals are

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likely to see others as sources of painful and unpleasant experiences. In this proposal, we will use the example of chronic diseases (e.g. diabetes, arthritis) to illustrate how the stigma associated with these medical conditions may “overtake” people’s physical and mental lives. Given that people with chronic diseases require permanent medical attention and treatment, their disability influences how they think and feel about their physical lives in two ways. First: the fear of physical pain and decline may fuel their concerns and anxieties about their current and future health. And second: the medicines that they take to manage their diseases may have mild or serious side effects creating additional challenges for people with chronic conditions. From a social perspective, people with chronic disease stigma may also believe that others will devalue and reject them, hindering their attempts to effectively manage their lives. Even if they try to engage with others, stigmatized people often experience frustration because no matter how hard they try to tell their friends or colleagues what their chronic condition is about, their arguments are likely to fall flat.

**Title:** *Future super humans by Microbiome manipulation*

**Authors:** Mario Rui Dias Abrantes, Athena Aktipis

**Abstract:** "The microbiota and its microbiome is not only responsible for speeding the adaptation of the immune system to new symbiotic relationships, but it is important for providing nutrients and helping in the food digestion. The in vivo mouse model tests with probiotics give us an insight of “improvements / enhancements” that if we can reproduce in humans, it would give us super human abilities thought only to be possible in comic books and in science fiction. For long, scientist have pursued studies only with the more prevalent microbiota of the host, ignoring the small percentage microbiota species. All species could play a role in the host and even the small number microbiota need to be paid more attention to. Imagine if we could discover a microorganism inside one of the most amazing people in the world, enclosing a special gift, and we could pass that special enhancement into all humans."

**Title:** *When is it better to be a lemur? A life history strategy card game*

**Authors:** Valerie Harris, Amy Boddy, Marc Tollis, Pamela Winfrey, Carlo Maley

**Abstract:** Dinosaurs living downtown? Whales in space? Naked mole rats in the desert? Just how many offspring should you have in an unstable and unpredictable environment? A simple roll of the dice can transform you into a mouse, scurrying through a post-apocalyptic wasteland, pouncing on the first crumb you’ve seen in days. Or, perhaps a lemur, bounding from tree to tree, hurriedly escaping potential predators. Learn about diverse evolutionary life history strategies and environmental mismatch in this multi-player, battle-style card game designed for K-6 students! Quick to play and easily employable for large-scale outreach events, this card game explains the basic concept of fast versus slow life history and helps players match the correct life history strategy to the environment it is best suited for. Will an elephant outcompete a mouse on a stormy desert island? Find out during a game of “Animal Battle!”

**Title: *Resisting the zombie invasion: Can kombucha microbes prevent contamination by human-associated microbes?***

**Authors:** Shrinath Narayanan, Alexander May, Athena Aktipis

**Abstract:** Kombucha is a tea which is fermented by a symbiotic community of acetic acid bacteria and ethanol-fermenting yeast which typically are introduced through a adding small starter culture of kombucha and microbial biofilm (called a SCOBY, for Symbiotic Community Of Bacteria and Yeast) which is placed on the surface of the tea. Historically and cross-culturally, fermentation has been used to preserve foods, enhance food safety and maintain nutrients in foods by making foods less vulnerable to contamination by pathogens and other harmful microbes. We therefore performed a study to determine if the microbes and fermented products associated with kombucha are able to inhibit the growth of common human hand microbes. We collected microbes from the hands of participants on cotton swabs as part of a citizen science experiment at Arizona State University during the 'Night of the Open Door' events in 2016 and 2017. We then put these cotton swabs in containers containing either sweet tea or 80% sweet tea and 20% kombucha (a typical starting concentration for brewing kombucha). We then observed these containers for 30 days for evidence of contamination. We also sequenced the tea/kombucha liquid using 16s and ITS, to assess the change in bacteria and yeast populations, respectively. We found that the composition of the kombucha community remained stable over the course of 30 days after inoculation with human-associated bacteria and yeast. This suggests that the microbial community underlying kombucha may possess mechanisms that help keep the community stable and to prevent invasion from other microbes. The alpha diversity of the kombucha community remained stable as well, with *Komagataeibacter* and *Dekkera* found to be the dominating bacteria and yeast genera, respectively. This is in contrast to the sweet tea community, which started out as very high in alpha diversity initially but became lower in diversity by the end of 30 days. Visual inspection of the kombucha versus sweet tea.

**Title: *Plastic Apocalypse: A SCOBY Solution***

**Authors:** Mahad Alam, Shrinath Narayanan, Athena Aktipis

**Abstract:** Every year, over 100 million marine animals are killed each year due to plastic debris in the ocean. Moreover, there are over 200,000 pounds of floating debris on the ocean. Although the implementation of recycling has lowered the amount of plastic debris entering the ocean, this amount is miniscule compared to the overall burden of plastics in the ocean. As of now, many companies have sought to create biodegradable plastic bags in hopes to diminish the amount of plastic that accumulates in our oceans. However, the problem is that this "biodegradable" plastic is actually not compatible with the plastic waste that we dispose because it will not actually biodegrade in the presence of other plastics. As a result, a new method of reducing plastic waste must be adopted. One potential solution is to create a truly biodegradable bag using the biofilms that are associated with kombucha. Kombucha is a fermented tea that produces a cellulose layer during fermentation known as a SCOBY (Symbiotic Community Of Bacteria and Yeast). This layer is very flexible and has a leathery texture to it. Many kombucha tea companies disregard this layer and treat it as waste, only reusing a small portion of it to create another batch of tea. Because cellulose is structurally similar to plastic, these biofilms may be a viable substitute for plastic bags.

**Title:** *Extrusion and gene expression analysis after X-ray exposure in Trichoplax adhaerens*

**Authors:** Angelo Fortunato, Arathi Kulkarni, Avalon Yi, Athena Aktipis and Carlo C. Maley

**Abstract:** Different organisms have different susceptibilities to DNA damage and cancer development. There are some invertebrate phyla for which there have been no reports of cancer despite presumably being susceptible: invertebrates can have long lifespans and sometimes lack specialized immune cells. We exposed *T. adhaerens* (Placozoa) to up to 240 Gy of radiation. We observed morphological and behavioral changes after X-ray exposure of *T. adhaerens*, including cellular aggregates with different morphology emerging after high dose exposure (80-240 Gy). These morphological changes can be reversible and the animals can completely recover from X-ray exposure. They appear to rise from the dead and to be similar to the animals that were not exposed to X-rays. Notably, the animals were observed to extrude abnormal cells. Extrusion of damaged cells could preserve the animal's integrity and is part of the reproductive behavioral repertoire (fission and budding) of *T. adhaerens*. Extrusion could be a tissue-level anticancer strategy. Moreover, we investigated the gene expression of *T. adhaerens* after treatment with X-rays using RNA-seq analysis. We determined that exposition to X-rays causes significant changes in genetic expression. In particular, many genes involved in mechanisms tied to DNA repair, signaling transduction, and apoptosis are deregulated. We concentrated our attention on two genes: P53 (TriadG64021) and its main negative regulator MDM2 (TriadG54791), whose functions in the process of apoptosis and oncogenesis is well known. We found that MDM2 is overexpressed, while the expression of P53 is similar to the one in controls.

**Title:** *This is your brain on prevotella: Nicotine Self-Administration is Associated with Changes in Gut Microbiota and Accumbens Pro-Inflammatory Signaling*

**Authors:** Mark Namba, Shrinath Narayanan, Athena Aktipis, Cassandra Gipson-Reichardt

**Abstract:** An emerging field of study indicates a potential relationship between gut microbiota and exposure to drugs of abuse. The gut microbiome could induce behavioral changes and influence inclination towards specific drugs. Nicotine addiction produces long lasting changes along the mesocorticolimbic reward pathway, including the nucleus accumbens core (NAcore). However, it is unknown if changes in gut microbiota occur due to nicotine self-administration, and if these changes are associated with neuroinflammation within the NAcore. Rats were trained to self-administer nicotine (with conditioned cues) or were administered non-contingent saline infusions. Rats were then placed into extinction, followed by cue-induced reinstatement. Fecal samples were collected prior to behavior, as well as immediately following their last self-administration session, on the first day of extinction (early withdrawal), and on the last day of extinction (late withdrawal). Samples were then analyzed for microbiome composition using 16S RNA sequencing. Following nicotine self-administration and during each withdrawal timepoint, the gut microbe *Prevotellaceae* was present. However, this microbe was rarely present in saline-administered animals (Post-Saline 0.005% vs Post-Nicotine 7.5%, relative frequency,  $p < 0.05$ ). As well, frequency of *Prevotellaceae* in saline and nicotine animals positively correlated with NAcore TNF $\alpha$  protein expression immediately following self-administration and at early withdrawal. These results show that nicotine self-administration is associated with colonization

of Prevotellaceae, a gut microbe associated with chronic inflammatory conditions such as inflammatory bowel disease. This suggests that the prevalence of Prevotellaceae in the gut could potentially contribute to expression of brain pro-inflammatory cytokines which may lead to increased nicotine relapse vulnerability.

**Title: *Zombification of the competition: How the presence of others controls competitive strategies***

**Authors:** Nicole Hudson, Jessica D. Ayers and Athena Aktipis

**Abstract:** Previous literature has outlined males as direct competitors and females as covert competitors during intrasexual competition due to differences in costs and projected benefits of these strategies (Campbell, 1999). However, no research has investigated if these differences are attributable to the accessibility of resources. We hypothesize that accessibility of a resource and the means through which individuals can attain the resource will influence the use of competitive strategies. When the resource is only attainable through another individual, we expect more use of covert tactics. When the resources can be obtained directly, we expect more direct tactics will be used. In this study, participants will be given vignettes that describe a summer internship with direct access (position granted based on merit) or indirect access (position granted by manager) for one post-internship job and answer questions to assess the use of overt and covert strategies. We expect to replicate traditional sex differences where women will use more covert tactics when access to resources is indirect and men will use more overt tactics when access to resources is direct. We expect our manipulation to produce sex-reversed tactics such that women will use more direct tactics when access to resources is direct and men will use more covert tactics when access to resources is indirect. These results would imply that traditional sex differences might be partially attributable to the accessibility of resources, have implications for mitigating intrasexual competition, and potentially provide important insights into how to reduce zombification in the workplace.

**Title: *Cheater Detection During the Zombie Apocalypse***

**Authors:** Andres Munoz, Athena Aktipis

**Abstract:** Need-based transfers involve giving a resource, based on the need of the recipient, without an expectation of repayment. Need-based transfers are likely to be common during a zombie apocalypse scenario given high levels of unpredictability and numerous instances of dire need. Need-based transfers are vulnerable to cheating in two ways. First, a person can be greedy by asking when not in need. Second, a person with a surplus of resources can be stingy by not giving to someone in need. Therefore, under typical circumstances, people will engage in stinginess and greediness detection to avoid exploitation. However, fitness interdependence, or the degree to which people influence each other's success in replicating their genes, is likely to be extremely high among survivors of a zombie apocalypse. Therefore, wrongfully accusing someone of being greedy or stingy during a zombie apocalypse could lead to losing essential relationships. In addition, being greedy or stingy is unlikely to pay off since a person would be better off making sure that their partners have enough resources to survive rather than trying to

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exploit them given high interdependence and low social mobility in a zombie apocalypse scenario. Thus, it is likely that people would avoid using greediness and stinginess detection mechanisms and instead rely on an estimation of fitness interdependence to make decisions about resource transfers during a zombie apocalypse.

**Title:** *Social Anxiety in a Postapocalyptic World: how the anti-zombie vaccine selected against altruism-inducing gut-microbiome and the breakdown of cooperation*

**Authors:** Diego Guevara Beltran, Cecile A. Perret

**Title:** *Morbid Curiosity: An Evolutionary Perspective of Morose Fascination*

**Authors:** Maya Schatzki-Lumpkin, Athena Aktipis

**Abstract:** I aim to investigate the evolutionary development and purpose of what is commonly called morbid curiosity. Morbid curiosity can be understood as a cross-cultural phenomenon manifested as behaviors or attitudes displaying interest with morbid things. The Information-Gap Hypothesis and Threat Attention Hypothesis suggest that morbid curiosity is motivated by a drive to learn information about things which are threatening in our environment in order to take have protective mechanisms. The Handicap Principle suggests that engaging in morbid curiosity behaviors may signal to potential mates that an individual has valuable traits such as proper immune function. Sensation-Seeking Hypothesis focuses on the correlation between attention to morbid events and high scores on an SS Scale, suggesting that morbid curiosity is motivated by the drive to stimulate rewarding neural activity. The Microbial Manipulation Hypothesis proposes that morbid curiosity may serve a fitness advantage to a microbial species which has the ability to influence human behavior. Finally, I will discuss the contemporary societal implications of morbid curiosity and mass media news reports.

**Title:** *Will deterministic world views bring on the zombie apocalypse?*

**Authors:** Candace J. Black, Rafael A. Garcia, Ethan Gilmore, W. Jake Jacobs, and Sally J. Stevens

**Abstract:** Determinism is the idea that all events are products of a specific set of conditions and that, given those conditions, the event will necessarily occur. Many branches of science are founded on the idea of causal determinism, with the goal of identifying cause-and-effect relationships in order to predict and control events of interest. A corollary of the deterministic model is that it precludes the idea of free will and that all behavior is a product of previous events.

Previous studies have shown that priming participants with deterministic statements produces a variety of effects:

- Increases in cheating behavior in students (Vohs & Schooler, 2008)
- Increases aggression and reduces the willingness to help others (Baumeister, Masicampo, & DeWall, 2009)

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- Reduces learning from emotional experiences (Stillman & Baumeister, 2010)
- Decreases readiness potentials preceding voluntary movements (Rigoni, Kuhn, Sartori, & Brass, 2011)
- Decreases intentional inhibition and perceived self-control (Rigoni, Kuhn, Gaudino, Sartori, & Brass, 2012)
- Increases conformity (Alquist, Ainsworth, & Baumeister, 2012)

Drawing on these conclusions has led some to conclude that deterministic ideas constitute a threat to the apparently delicate fabric of society. One review reports, "...given the societal repercussions of convincing people that they lack genuine control of their behavior, it seems that caution is warranted when making assertions regarding free will outside of the ivory tower" (Shariff, Schooler, & Vohs, 2008). So, is it true? Can we just not handle the truth?