

## *Nanosilver Linings*

You will be participating in a role play in a hypothetical scenario based upon real science, technology, and human behavior. The scene is set in the fictitious city of East Falls, Indiana. You will play the role of one of six or seven characters who are stakeholders in the outcome of collective decision making. Each of the characters has a distinct role in the community, with differing educational backgrounds, motivations, and personal influences; but all will attempt to interact productively around a potential reality—the location of a food packaging business incorporating nanosilver, and perhaps other emerging nanotechnologies relevant to food packaging—to their home city, East Falls.

East Falls is a city located in northwestern Indiana. For years, the city's economy has thrived on jobs created by the local steel mill and related businesses. A year ago, the steel company officially closed, succumbing to international competition.

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*Welcome to*  
**EAST FALLS**

Unemployment in East Falls has reached 10% and the pressure on government officials to find a solution is very high. One victory in restoring economic viability to the city has been recently announced: there will be a Great Lakes Shore Nature Preserve and STEM Education Center opening in an abandoned building on the lakeshore. It represents a public-private partnership involving the city of East Falls, Lakeshore University (Professor Brown, Principal Investigator), and the National Science Foundation. Although the number of jobs directly created is modest, many in town hope that the Great Lakes Shore Center will draw visitors, stimulating the local economy with tourism revenue.

NanoPackaging Solutions, a company specializing in functionalized food packaging, wishes to move into East Falls and build research and development laboratories as well as factories to produce their finished products. Their initial line of finished products will feature nanosilver, which offers potent antimicrobial action. Their R&D plans to partner with the scientists and engineers at Lakeshore University to stay on the leading edge of advances in materials science and nanotechnology relevant to food packaging so that the company can deliver even more features and functions in future product lines. NanoPackaging Solutions thinks that East Falls is a viable location because of its proximity to Midwestern agriculture and the markets of Chicago, Indianapolis, Cleveland, Columbus, and Cincinnati. The move into East Falls would create a multitude of jobs ideal for the blue collar populace of East Falls, as well as graduates and postdocs from the university.

NanoPackaging's first product line, for which they already have a contract with a major US food conglomerate, will include three product types containing nanosilver: resealable bags, waxy coatings for fruits and cheeses, and lined plastic storage containers. The waxy coating contains nanoparticles between 5nm-10nm in size; the resealable bags use AgNPs around 40nm in size, and the plastic storage containers contain AgNP between 10-20nm. The nanoparticles for each product are

engineered to maximize the efficacy of the antimicrobial properties of the respective product. Shelf lives of products are markedly longer than their counterparts without nanosilver; peer-reviewed research and extensive product testing supports these claims.

Nanosilver is known for its antimicrobial properties and is used in many commercial

products. While many of the benefits of nanosilver are known, knowledge of the risks of nanosilver is limited due to lack of information and research. Citizens are anxious about getting back to work, but a few inhabitants of East Falls are concerned about occupational and environmental hazards of nanosilver. One major opponent of NanoSilver Packaging Solutions is The Eco Footprint Foundation.

The Eco Footprint Foundation is an Environmental NGO which works extensively in states adjacent to Lake Michigan, primarily Indiana, Michigan, Wisconsin, and the Chicago area. Much of their work encompasses environmental campaigns against aquatic pollution of Lake Michigan due to industrial wastes. They have worked extensively with pollution control in Chicago as well as kickstarted a Lakefront Cleanup initiative along the coast of Wisconsin. The Indiana division of the Eco Footprint Foundation works primarily with pollution and environmental beautification of the southeastern reaches of the greater Chicago area. They also look into effects of pollutants on soil, particularly as it applies to the rich farmlands of Indiana and Illinois. The Eco Footprint Foundation is strongly opposed to the introduction of NanoPacking Solutions into East Falls because the long-term effects of nanosilver waste products on the environment is not understood, and the evidence on acute aquatic, biomedical, and soil toxicity is suggestive but mixed. They do not want another environmental mishap, such as the DDT saga, to unravel



again, and they doubt that the regulatory structure in place now is sufficient to prevent one.



A town meeting has been called because city law requires an open forum deliberation when changes or exceptions to tax policy are in question. NanoPackaging Solutions has been offered a set of abatements by another candidate location, and has made it clear to the Mayor that their location to East Falls hinges on offering of a competitive set of abatements. The decision on whether these tax abatements are granted is, in effect, a decision about whether NanoPackaging will establish itself in East Falls or the competing candidate city. Today, citizens will hear expert testimony from the academic, business, government, and NGO sectors on why or why not the food packaging company should be offered tax deferral incentives to establish itself in East Falls, and, if it does move into town, what regulatory measures would protect occupational safety, public health, and environmental well-being. As befitting a democracy, individual citizens will also have the opportunity to voice their positions and concerns.

## **Meet the Characters**

Each character is an adult citizen of East Falls, a prominent member of the community known to others as a leader of a particular organization or group of stakeholders, and may be female or male. None are related to one another by blood.

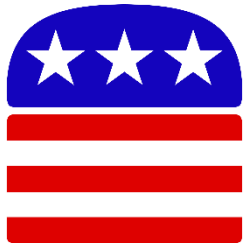


## **Hansen: Industry Executive**

Public Information: Hansen is a shrewd and savvy businessperson known for toeing ethical lines when profit is involved. Before moving to NanoPackaging, Hansen worked

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with for a hydrofracking firm and helped them move into a city where many citizens voiced opposition and concerns about the environmental impact. Hansen sees the benefits of free market capitalism more than its downsides, holding that: citizens and businesses should concern themselves with the present time and economic viability; long-term problems can't be foreseen and other problems (with workers, wildlife, etc.) should be dealt with as they arise; it is unwise and unfair for some to 'borrow trouble' at the expense of real, tangible benefits for others. Hansen was born and raised in East Falls, but hasn't lived in the Midwest as an adult until a few months ago. NanoPackaging's need for an executive presence in East Falls coincided with a worsening family health situation requiring in-person attention.



## Thompson: Mayor of East Falls

Public Information: Thompson is approaching the end of the second term as mayor and is hoping for re-election, but the current unemployment rates have dropped approval ratings considerably. Although not personally at fault for the closing of the steel mill, as time passes without new employment opportunities in the city, the citizens are taking some frustration out on the mayor. The location of NanoPackaging to East Falls would greatly increase approval ratings amongst the blue-collar middle class, who vote in droves through the organized efforts of the Unions. However, Mayor Thompson risks losing the approval of many advisors, the intellectual and financial elite of the community, many of whom represent power and influence that could define the future of Mayor Thompson's political career.



## **Professor Brown: University Researcher and Instructor**

Public Information: Within academic circles, Brown is a well-respected researcher with a doctorate from an Ivy League institution. In the community, Brown is known for outreach work, such as judging the science fair, and now for bringing the Great Lakes Shore Nature Preserve and STEM Education Center to town. Brown is articulate and grants interviews with the press. Nanotechnology has sparked the interest of journalists, so Brown has been trying to keep up in general, and not just in one limited area of expertise, with respect to the forefront of nanoparticle research. Professor Brown is convinced of the potential for positive applications incorporating nanomaterials but has also read research papers that give cause for thoughtful concern, and at least a modicum of restraint in action. Professor Brown feels pressure to give simple answers where the reality behind the questions is actually quite complex and partially unknown.



## **Green: Environmental NGO Representative**

Public Information: An established environmentalist, Green worked as an ecologist studying the effects of industrial waste on aquatic environments in Lake Michigan. Green openly opposes NanoPackaging moving into town because of the unknown environmental risks of silver nanoparticles on the environment. Green refers frequently to the Precautionary Principle, saying that we should be nearly certain of safety before we introduce this new technology into society and the environment. The food dimension of this enterprise disturbs Green as well. Green is active in organic community gardening and the local foods

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movement—chemically enabling increased shelf life for processed food is counter to this movement, which is seen to promote public health (with respect to epidemic levels of obesity and nutritionally deficient ‘food deserts’) as well as ecological health.



## Jones: Skilled worker

Public Information: Nearly everyone in town has heard the ‘American Dream’ story of Jones, since it was featured by CNN interviews as a human interest dimension of the news coverage when the steel mill announced its closure of the East Falls plant. The story starts with grandparents who changed their name to Jones upon immigrating to the United States, because they wanted to give their children and grandchildren every possible opportunity to fit in as Americans. The newly-American family ran a small ethnic grocery below the flat where they lived, guaranteeing food and shelter, though money for other things was sometimes very tight. The parents of Jones met in the public Chicago high school they attended, married at age 19, and worked tirelessly to modernize the family grocery, eventually opening a second location in East Falls with some tables for restaurant service. The steel mill employees were regular customers there, and when Jones was sixteen years old and rebelliously seeking a summer job separate from the family business, a patron saw to it that a production worker position was offered. After high school graduation, Jones continued as a production worker full time and was promoted to a production supervisor position after ten years on the job. Functioning so well as a line manager, Jones was promoted again after eight more years, to an operations manager position overseeing multiple production lines. Now Jones is still unemployed and eager to resume professional life.



## **Reed: Investigative journalist**

Public Information: Reed is a well-known investigative journalist who has been involved in unravelling numerous scandals, including unethical business practices, in the greater Chicago area. Reed is not formally educated in science, engineering, or business. However, Reed does all of the homework necessary to pursue journalism at an elite level. For this story, Reed has conversed with enough experts and read/understood enough about nanoscience to have a much better grasp of the material than the average citizen. Reed intends to ask pointed, detailed questions about the size of nanosilver particles being used, the migration rates of silver ions or nanoparticles into foods from NanoPackaging containers, and the environmental fate and persistence of silver from packaging after end-of-life disposal.



**Carlson: Concerned parent** (Included if there are seven participants in the workshop. If only six participants are available, this character may be omitted.)

Public Information: Carlson is known as an active parent in the community's public schools, sometimes working as a substitute elementary school teacher, as well as in community affairs. Carlson has recently recovered from melanoma, and this health scare has led Carlson to conduct internet research into the efficacy of different sunscreens. There are numerous articles about the presence of metal nanoparticles in sunscreens, which led Carlson to discover information, misinformation, and hype about nanotechnology in general.



## **Guidelines for Role Play**

### **1. Once in character, stay in character**

It can be tempting to remark in your own voice (e.g. “Based on everything I know, I’m having a really hard time deciding what my character would say...”) but please resist any urge to break character until notified by the workshop leader.

### **2. Maintain consistency with character**

If the character you were assigned seems quite dissimilar to you, it may be challenging to refrain from displaying your own knowledge and values in the guise of your character. Please do your best to put yourself in the shoes of this character and act accordingly. Remember that you will have the opportunity to reveal your own thoughts and feelings, and how they differ from those of your character, during the discussion phase.

### **3. Make choices and be creative without hesitation**

As the characters have been defined, there are many different emphases and tactics consistent with each one. There is no one ‘right’ way to play a given character. You will make choices as you go, and all are valid as long as you maintain consistency with the character as defined.

### **4. Relax, enjoy, and learn**

Rigidity, self-consciousness and self-critical inner dialogue may be habits of mind you’ve adopted because they propel you toward excellence in many academic tasks...but in this case, they will be counter-productive, for both your own learning and for the learning of other participants.

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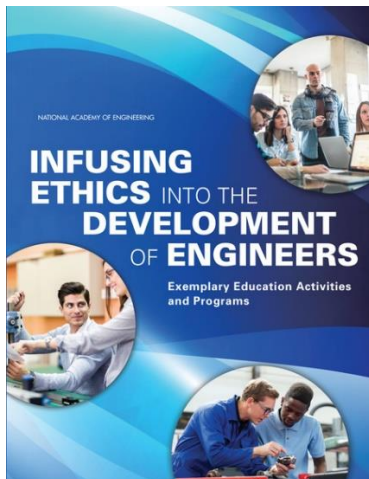
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The *Nanosilver Linings* case with its accompanying workshop, *Ethics when Biocomplexity meets Human Complexity*, has been honored by the National Academy of Engineering as one of 25 exemplary resources nationwide.

This resource is freely available online at the Ethics CORE (Collaborative Online Resource Environment) site of the National Center for Professional & Research Ethics (<https://nationaleticcenter.org/resources/7811>).

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