

**BioDramatics - Crossroads in Science & Theater in the Creation of  
*Luminesce: A BioDramatic Fiction***

By

Wally Alexander Benjamin A. Napier

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**Thesis Advisors:**

Professor Barbara Wallace Grossman — Department of Drama & Dance  
Professor Michael L. Romero — Department of Biology  
Professor Julie Dobrow — Department of Film & Media Studies

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# Abstract

*Biology*, being the study of life, and *Drama*, being the study of human interaction, are intimately connected at their cores. Our biology determines our being, and our humanity sculpts biology in its study, practice, and form. Our politics, economy, and daily social interactions are all impacted to some degree by biological research in fields such as genetics, gender, cloning and medicine. Our understandings and feelings concerning biological issues such as genetically modified organisms, gender, abortion, stem cells, etc. are in part determined not just by what factual information is known, but also by how these issues are communicated in media, art, and culture. These points of intersection between Biology, Theater, and Media/Communications cumulatively form a discipline of academic study I have identified as — ***BioDramatics***.

The nature of ***BioDramatics*** is fivefold: Dramaturgical, Communicative, SocioPolitical, Scientific and Theatrical. Through the one lens of ***BioDramatics***, however, one is able to grasp the interconnectivity of these subjects in their entirety. Unfortunately, this unique union — the relationship between Science and Art — is often taken for granted, or ignored entirely as the byproduct of three apparently separate academic entities; Biology, Drama, and Communications. We instead form the illusions that audiences and actors don't care about science, and that scientific research is free from emotion and humanity. Such beliefs are seriously damaging to these fields of work because such separation of academic study inhibits cross-discipline discussion, and obscures the profound and practical insights that rest along the line where the biological meets with the artistic. Further, these damaging beliefs are propagated when biological science is either poorly or inaccurately communicated.

The following paper is supported with documentation from scientific literature, quotes from dramatic works, and notes from personal experiences playwriting and directing, including my writing and staging of my thesis production *Luminesce: A BioDramatic Fiction*, **with the hope of outlining the concepts and nature of *BioDramatics* and describing how it remedies the disconnects recognized above.**

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## **Introduction: What is BioDramatics?**

In the broadest vision of the label, **BioDramatics** encompasses all intersections of the science of Biology and the stagecraft of Theater or Drama. The nature of *BioDramatics* is fivefold: Dramaturgical, Communicative, SocioPolitical, Scientific and Theatrical. Through the one lens of *BioDramatics*, an audience member is able to comprehend the interconnectivity of the interdisciplinary subject matter in its entirety. However, for the context of this reflection on my thesis production of *Luminesce: A BioDramatic Fiction*, the label of BioDramatics specifically describes both a distinct genre (described here), and a theatrical aesthetic or artistic process (outlined in my reflection on page 11). Together, these two components of genre and aesthetic illustrate my definition of BioDramatics as a theatrical communication of biology.

The differences between the genre of *Science Fiction* (Sci-Fi) and *BioDramatics* are very distinct, but can be muddied by both being creatively dependent on engaging with the realm of science. In Sci-Fi, science is used as a blanket-explanation for what cannot be explained in order to create the premise of an otherwise impossible reality. With the explanation of “science”, the audience of a work of Science Fiction is able to willingly suspend their disbelief of the dramatic premise and focus on the struggles of characters within an unusual world. For example, in the 1962 Sci-Fi horror film *The Brain That Wouldn't Die* by Joseph Green, the mad scientist Dr. Bill Cortner reveals the gruesome display of his wife's severed head brought back to life on a pan by an unusual machine. When questioned about the impossibility of the head's consciousness being restored without lungs or a heart, Dr. Bill Cortner simply responds, “It is the work...of science!”. (*The Brain That Wouldn't Die*, 1962) Science Fiction has great artistic value, and has many merits in helping audiences to grapple with moral and ethical dilemmas. This is especially so when the standard frame of reality is too narrow to grasp the full scope of the issues being explored in the artistic work.

However, there are also numerous dramatic works that attempt to present to audiences true biological science, or which explore a moral or ethical issue connected to biology, while remaining within the scope of reality. It is this collection of works that can be labeled as being *BioDramatic*. These plays also do not fall under the genre of *Documentary* because they are not

simply explanations of history or fact, but have strong elements of character, action, and relationship. Additionally, documentaries addressing social issues usually have a clear bias toward one perspective, whereas a BioDramatic work can thrive with no obligation to any one scientific perspective. Therefore, the genre of **BioDramatics** can be defined specifically as any play, film, or dramatic work which attempts to honestly present the science of biology as the driving element of narrative experienced by the work's characters. Plays such as *Inherit the Wind* by Jerome Lawrence, and Robert Edwin Lee or *Photograph 51* by Anna Ziegler are both distinctly BioDramatic in their dedication to the presentation of accurate biology as the driving component of the narrative and relationships performed by the characters. Similarly, films like *GATTACA* (1998) by Andrew Niccol, or *Puncture* (2011) by Adam and Mark Kassen could both be labeled with the genre of BioDramatics. In all of these works the science of biology is not warped or distorted to support a dramatic premise, but instead they use the reality of accurate facts to inform the creative work — ultimately producing a captivating performance that can educate the audience about true and relevant science, while still being entertaining and emotionally engaging.

## **Reflections:**

### **BioDramatics & Writing The Play *Luminesce***

The writing process that shaped *Luminesce: A BioDramatic Fiction* can be broken down into three creative phases — Inception, Revision and Expansion, and Editing.

#### **Inception**

Before starting to write any words of the play, I knew that I wanted the material of the play to somehow dramatically interpret a side of biological science that was both fascinating and controversial. I began researching several potential topics — loss of species and biodiversity, pregnancy and embryonic research, genetic engineering, neuroscience experiments, rehabilitation of amputees, and many more. I had the opportunities to study these topics by taking a carefully selected mix of interdisciplinary courses at Tufts and abroad. While I was exploring the scientific details of all of these fields of research, however, one artistic stage image stuck with me: a glowing arena lit beautifully by the science of bioluminescence.

After compiling the majority of scientific information into several folders in my Sophomore year, I embarked on a truly incredible year abroad to the Royal Holloway, University of England where I would be take two, year-long courses in Playwriting and Directing. While in England I scouted out a wide variety of science-theater performances, and had the opportunity to visit some of the most inspirational and historic scientific sites. These included the home of the iconic Charles Darwin, and the Old Operating Theater where centuries ago young British doctors would watch their instructors teach medicine and perform educational operations. Each of these locations held their own mysteries and dramatic stories, but none conformed with my vision of a glowing, bioluminescent stage.

The opportunity to begin writing what would eventually become *Luminesce: A BioDramatic Fiction* came towards the end of my playwriting course, where the final assignment was to use the cumulation of my knowledge to write a 30-page minimum full-length play. I saw this assignment as a wonderful opportunity to get a detailed review of my

BioDramatic work from the brilliant lecturer/playwright who was teaching the course — Michael Punter, the author of the plays *Darker Shores*, and *Bunker Girls*.

Still wedded to my vision of using bioluminescence on stage, I submitted the first germination of *Luminesce* which was a draft of a play un-inspiringly titled *Glow*. This script used bioluminescence in an abstract way to focus the audience on scientific concerns with cancer research, and the mysterious carcinogens which can trigger the onset of the often fatal illness. In *Glow*, the main plot focused on a young scientist named Tom who was experimenting with the creation of a naturally glowing, bioluminescent tattoo, but his experiments upon himself had induced cancer in his body. Additionally, the play grappled with a love affair between Tom and a journalist named Susan, as well as conflict between a lawyer character and a businessman.

As my final assignment, *Glow* received a good mark. However, the script still suffered from the impact of several challenges that both my professors and I agreed upon:

- 1) **Complexity** - The play was too scattered, and while the characters were rich and experienced dramatic conflict, it was too challenging for an audience member (or reader of the play) to follow both the complex scientific narratives and the unique dramatic narratives at the same time. While the two components of science and story did support each other, there was a disconnect between them such that the play could have easily stood on its own with only one of the two components.
- 2) **Character** - When it came to the scientific material presented by the characters on stage, the actors reading the play lost a lot of their character-work. The challenge was to create instances where an actor's main actions or secondary focuses could yield further insight into either the scientific information or their relationship to the material they were presenting.
- 3) **Truth** - The main plot of the play — that a researcher experiments on himself to create a glowing tattoo — while captivating, seemed too improbable and therefore conflicted with the play's focus on realism and cancer research. Though there are companies like *BioLume* in North Carolina that are working to create such products as bioluminescent foods and tattoos, the premise was so wondrous that readers didn't care about the science behind the story, but only the story itself. This would be fine for a work of science fiction, but not for my vision of a BioDramatic play which would attempt to truly honor scientific material on stage.

I would leave England still pondering how to resolve these three challenges. I noticed that my play was not alone. Many of the plays I had collected that honestly explored biological science or scientific material also struggled with these challenges.

## Revision & Expansion

Now knowing precisely what challenges confronted a BioDramatic play, I would spend the next year attempting to edit and expand my play *Glow*. In talking about the work with my professors both at Tufts and abroad, I found several possible structures that could support the play in its development of character and presentation of complex truths. I also found a completely new premise for the play — the controversy surrounding genetically modified organisms, or GMOs — which I felt would resolve the issue of the play breaching into the genre of science fiction.

In the summer of 2013 I donated funds to a *Kickstarter* project called *The Glowing Plant Project* to independently fund the creation of a genetically modified glowing plant. As both a bioluminescence and genetic engineering enthusiast I contributed to the project and enjoyed following its progress. Unfortunately, the project was delayed when the FBI started investigating the project, claiming that the group had not gone through the necessary legal steps to allow for their scientific research to be completed. Additionally, there were also legal concerns with genetic research being publicly funded, but not reviewed by any higher public or private establishment. *The Glowing Plant Project* is still working on their invention at the time of this reflective writing, but they anticipate having a completed product within a year.

While I was disappointed by the delay of *The Glowing Plant Project*, the controversy over their research led me to research the topic of Genetically Modified Organisms and GMO foods — a topic which had been touched upon in some of my college courses, but which I had not focused on explicitly. The science of genetic modification had grown for several decades, but due to the complexity of its research the science rarely reached mainstream media. In his book *The GMO Deception*, Dr. Sheldon Krimsky details how, “in the 1980s when agricultural biotechnology was born, there was already a skepticism building among consumers and food activists”, but these groups would not contribute to public discourse until much later. (Krimsky) Products such as *The Arctic Apple* (a non-browning apple) and *Golden Rice* (a nutrient enhanced rice) were slowly slipping into the global market, and in turn the public eye. It has only been



within this decade that GMO foods and the science of genetic engineering have captured the attention of politicians, the American public, and the mainstream media.

This “futuristic science” of Genetic Engineering and the creation of Genetically Modified Organisms was the perfect premise for a BioDrama because it allowed for the play to engage with human wonder and creativity through solid and true scientific research. In other words, GMOs could be explored dramatically without slipping into the realm of science fiction. The premise was also exciting because it was both incredibly relevant and timely. There was real research being conducted into the biology of bioluminescence that could become a focal point of the play. Now re-inspired, I changed the title of the play to *Luminesce* (meaning light emitting, and a derivative of the term bioluminescent) and began re-writing the play to tackle the complicated science of Genetically Modified Foods and Organisms. Some elements of *Glow* remained, for example the characters of a researcher named Tom and a corporate media-woman named Susan are present in both plays, but beyond this the two plays are indistinguishable.

During this process of revision and expansion, I also attempted to solve the challenges of Complexity and Character under the framework of my new GMO narrative. The problem of there being both complex scientific material and a complex plot line could be easily solved by tipping the balance of the two components in favor of either one. Many BioDramatic works attempt to focus on the characters’ narrative, for it is the relationship between individuals that is historically the most compelling element of theater. In doing so, however, the play will sacrifice the depth of the scientific material to allow the audience to focus on the characters’ actions. For my BioDramatic thesis’ play, however, I wanted to experiment with tipping the balance towards the side of science by presenting the highest level of biological fact that I dramatically could without sacrificing character, narrative, or any of the traditional elements of a successful piece of theater.

To achieve these goals, the focus of the play would not rely on the relationships of the characters alone as expressed through their actions, but rather the play would stage their individual relationships to the biological information. The script of the play would have to capture the characters’ emotional connection to the science of GMOs, and present their

relationship to the biology as though the facts themselves were additional characters in the play. This idea — of biological science living through the characters’ collective consciousness as another element to be aware of on stage — is perhaps the defining element of what separates BioDramatic work from traditional theater. David Mamet writes that, “we go to the theatre to see action — we want to see what the characters *do*.” (Mamet, 36), but in our era of readily available information audiences are increasingly seeking not just to witness action on stage, but also to experience what the characters *think*. Whenever a character in *Luminesce* discusses factual information, their character’s psychology and personality always has room to shine through in their presentation, emotional relationship to the material, and motivation for communicating these facts either with the audience or another character on the stage with them.

Giving the characters room to express themselves in unison with the biology presented in the play meant the script had to be significantly expanded. In collaboration with some of my musically inclined friends from abroad, I began to turn *Luminesce* into a musical by drafting several songs (such as *A Neural Pathway to Love*). These songs would allow the characters the freedom to engage with science *outside* of reality and truly show both the depth of their character and their emotional connection to the facts they would sing. Further, I selected a series of projections which would accompany the performance and, in a Brechtian manner, pull the audience from the reality of the play to the important scientific details being performed. It was this revised and expanded script that formed *Luminesce Draft #1.0*, which would be the basis for all future drafts up to *Luminesce: A BioDramatic Fiction Draft #5.0* which was ultimately performed as the culmination of all of my thesis work on December 7th and 8th, 2015.

## **Editing & Reduction**

The final writing phase of the thesis-draft of the play was to edit and reduce the play in order to find and perform only its true theatrical strengths. This process began by selectively removing scenes from the play to avoid the issues of *complexity* as described in the previous sections. The original draft of the script had several scenes which elaborated upon the characters’ relationships away from a scientific context, and while these were dramatically interesting they detracted from the focus on the biology of GMOs. For example, a scene between Jessica and

Robbert was an interesting interlude, but did nothing to further the scientific narrative of GMO research which was the true through-line of the play - and so the scene was removed. The strongest scenes in the play from the perspective of BioDramatics were those where Biology fueled the characters' conversations and relationships.

In the process of finalizing the script for the thesis performances, it also became clear that the songs which had been written would not be able to be completed with a musical score by the deadline. Therefore, the essence of the songs was re-written into what I have labeled *Science Soliloquies*, which allow the BioDrama to function like a musical without music. Several times through the theatrical journey of *Luminesce*, a character will break from the reality of space and time to confide in the audience their deeper relationship and emotions to the biology they discuss. For example, early in the play Robbert slams down his cell phone, shattering the world of the play and stepping into a void where he is able to tell the audience about the glorious success of saving the world's papaya supply through genetic modification. I still believe these *Science Soliloquies* would be even more captivating and dramatic if performed in their musical state, but they remained powerful soliloquies for the December 7th and 8th productions.

Finally, the script would also be edited to find the realistic vernacular of our year 2015. In the process of rehearsing with the actors, we would find certain lines sounded bizarre or too complex for regular dialogue. Some scenes had also been written in ways that inhibited finding the truth of the scene I desired to stage. A brief moment in Act 1, Scene 2 between Robbert and Susan, for example, was changed so that her exit to the bathroom was instead to find a vending machine, which made for a more obvious presentation of the conflict in the Robbert-Susan relationship as well as the context of the scene. It is my hope to continue editing the script even beyond its performed state; to continue to find the strongest dialogue possible.

## **BioDramatics & Directing The Play *Luminesce***

In order to have my thesis performances truly represent *BioDramatics*, the staging of *Luminesce* had to be developed from a groundwork in biology at every level of production. After the extensive editing process I had no doubt that the script of *Luminesce* would meet the criteria of a BioDramatic work, but the script was only one component of the final theatrical production. Biology can not only inform the content of the script, but also the work of the actor and the very presentation of a piece of theater. The label of BioDramatics can accurately describe these instances where biological science and the staging of a play intersect. In order to assure that these intersections beyond the script were also honored in my production of *Luminesce*, I chose to direct the production as well. In this way, my work with BioDramatics reaches beyond simply the genre of the script's content, and ascends into the show's aesthetic and its rehearsal process.

Biology was incorporated into even the earliest of rehearsals, including the audition process where auditioning actors were handed a section of a biology textbook and asked to cold-read the portion of scientific literature as they felt was most appropriate. It was remarkable how diverse the readings of the actors auditioning were — some read the text with compassion and emotion, while others struggled with the difficult technical language, or they would simply read the text with a dry disinterest. Also interesting was the heavy correlation between actors who had taken high-level science courses and performances of emotionally compelling cold-readings. The simple test made it very obvious which actors would both honor the scientific language and attempt to present it in a captivating form.

My final cast consisted entirely of Freshman and Sophomore actors, several of whom admitted they had not had extensive actor training beyond ensemble roles in High School. In order to open up the actors to their amazing potential which I had uncovered in auditions, I devised a series of biologically-informed actor-training exercises to incorporate into the rehearsal process. We collectively looked at human anatomy in rehearsals, and warmed-up with acting exercises that focused on finding one's center of gravity and using their weight to move about the space. We also practiced some of famed director Anne Bogart's *Viewpoints* exercises as described in her publication *The Viewpoints Book: A Practical Guide to Viewpoints and*

*Composition*, as well as a few exercises devised by British director Katie Mitchell to explore the emotions underlying the play's text. The exercises we borrowed from Katie Mitchell in rehearsals had been devised expressly from a foundation in the biology of emotions, as she describes in the passage below:

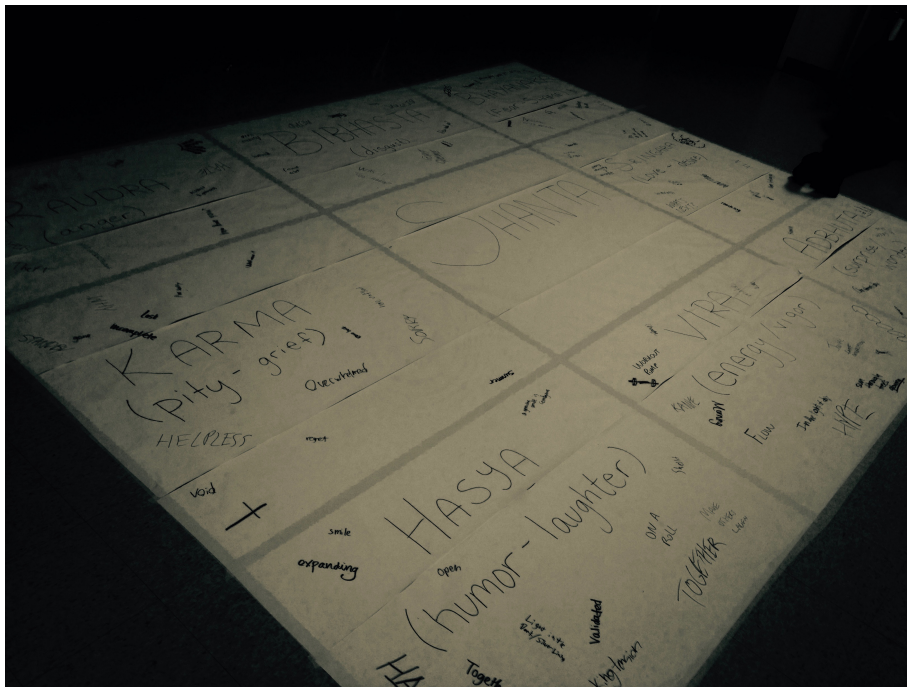
“I was complaining about my ignorance of biology over fish soup at a friend's house when the name Antonio Damasio came up and a big book with a blue cover hit the dining room table. Damasio is a Portuguese-American neuroscientist and his book *The Feeling of What Happens* (1999) uses emotions as a gateway to understanding consciousness. ... Damasio argues that an emotion consists primarily of a visible change in the body. This change is legible in our facial expressions, tone of voice, posture and even our internal bodily processes. There is a gap of about half a second between the stimulus - seeing the bear in the forest - and becoming conscious of the emotion - fear - and by the time we are conscious of what is happening we would naturally have run several metres away from the bear. All this seems a far cry from theatre until you start to apply it, which is what I promptly did in a workshop with five actors, supported by a Nesta Fellowship.”

(*Acting Out*, Katie Mitchell, 2004)

These exercises developed by Katie Mitchell in response to the scientific research of Antonio Damasio are a wonderful example of BioDramatics occurring in professional theater. I felt the exercises really helped the actors to find authentic emotional presentation both in rehearsals and in the final performances of *Luminesce*.

My cast and I experimented with another warm-up exercise: the biologically-informed Rasa Box exercise devised by *Tisch School of the Arts* professor Dr. Richard Schechner. A Rasa Box uses a large sheet of paper divided into nine sections, where each represents a basic human emotion. The actors then engage with each of the boxed emotions through a structured exercise process. In a publication titled *The Actor as Athlete of the Emotions: The Rasaboxes Exercise* by Michele Minnick and Paula Murray Cole, they describe how neuroscience supports the constructs of the Rasa Box exercise — and how the elements of theater and biology, “are concerned with the same thing: a theory of a circular, rather than a binary relationship between emotion and the body, inside and outside, which focuses on a visceral, gut-based mode of perception, rather than a solely visual-auditory one”. (Minnick & Cole, Potter) A Rasa Box begins with writing down anything the actors free-associate with the emotions written in the

boxes, and ending with them embodying the emotion through sound, gesture, and interactions with each other. The exercise helps an actor's brain to develop a synaptic connection between the concept of an emotion and a physical performance of the emotion. After performing this BioDramatic theater exercise twice with the cast, I believe it helped all of the actors to bond, to pay attention to their interactions on stage, and primarily to find the true emotional presentation of the science and characters in the text of the play.



**Figure 1.** A photograph of the completed Rasa Box on the floor of the rehearsal space from the second rehearsal with the exercise on November 2<sup>nd</sup>, 2015. The Rasa Box maintains the positions of emotions as recorded from Richard Schechner's original Rasa Box, with each box containing one of the nine Sanskrit words and their corresponding emotions, the neutral Shanta space in the center, and finally the words and images written by the cast during the free-association portion of the exercise. Actors then proceeded to perform the rest of the exercise atop this Rasa Box which they had created.

While editing the first draft of the script of *Luminesce*, I was also simultaneously assistant directing the Tufts University Drama Department's production of *From Orchids to Octopi*, a play by Melinda Lopez. This play staged the history and science of the discovery of Evolution juxtaposed with the story of a young female painter who struggles to create a commissioned mural while handling responsibilities to her pregnancy and marital relationship. I had previously identified *From Orchids to Octopi* as a BioDramatic work because it attempted

to accurately present scientific information inside a dramatic narrative, and I was thrilled to have the opportunity to observe and assist with the production.

While serving as the Assistant Director, I observed many useful details from the show's director, Dr. Natalya Baldyga. In a discussion with her about the show, Dr. Baldyga outlined how she wanted the show to be, "a celebration of science" that stirred the audience into an appreciation for biologists' research and their discoveries. (*Personal Communications*, 2014)

One of the most challenging scenes that *Orchids to Octopi* included was a humorous presentation by a Siamese Cow that explained how humans have evolved to tolerate lactose in milk. The dialogue delivered by the two-headed cow was perhaps the most blatant and challenging scientific dialogue in the script, and so it posed several challenges for the two actors who were performing it. The first challenge was making sure the actors understood the science they were presenting, for how could an actor deliver the lines with authenticity if they did not themselves understand what was being described in the dialogue? The second observation of Dr. Baldyga was that the Cow only expressed itself through factual scientific information. The actors therefore had a hard time finding the true character of the Cow — and additional conversations had to occur between the director and the actors to find the Cow's true identity.

The third and most daunting challenge was helping the actors to present the lines containing biological facts in a clear and understandable manner. The actors' first impression was that the Cow character was excited by the science, and so they would present the lines with a speedy enthusiasm. As a result, the first few times the actors attempted the lines, they would speed through them with such energy that the audience would not be able to fully understand the science they were discussing. The dialogue was further complicated by the cow-based moo-ing puns that were scattered throughout the scene. Because understanding the science was also essential to the humorous jokes in this portion of dialogue, if the science was not communicated clearly and memorably the humorous moments of the scene would fail as well.

My cast also struggled with the pacing of scientific lines in the script of *Luminesce*, often delivering the lines with a "passion" that was too fast for a listener to comprehend the material. What was incredibly bizarre was that actors in *Luminesce* rehearsals would often perform more

trivial lines (or interactions) slowly and with great confidence, but then rush through all the lines which grappled with Biology. This unfortunate contrast between science material and character interactions made it feel as though the characters were disconnected from the true emotional magnitude of the biological facts they were presenting. Therefore, it was necessary to work with the actors to develop a unique technique purely for the performance of scientific material and character. They were instructed to slow down and clearly enunciate sections of biological dialogue — especially in the Science Soliloquies — so that the audiences would be able to both hear and understand the Biology in the play, as well as appreciate the emotional connection of what the facts meant to the character presenting them.

### **Challenges: The Unexpected & Unforeseen**

Throughout the rehearsal process, there were also challenges that required difficult decisions in order to simultaneously communicate both the Biology and Drama of *Luminesce*. The largest challenge was being informed the week before the performance that the projections component of my production would no longer be feasible due to the theater's limitations. As both our staging and the actors' performance had been rehearsed under the premise that a projector would be made available to display the images I had created, suddenly not having projections available in any capacity for the final performances required significant directional changes. The best solution was ultimately to use Sound to present the vocals of video clips that would have been projected — however, many of the guest speakers and audience members who attended our talk-back panel discussion the evening of the first performance expressed that projected material would have significantly strengthened the objectives of the performance. The importance of projected media to the success of a BioDramatic play is outlined in detail in the following section on page 17, titled *Communicating Complex Scientific Issues on Stage*.

Finding the appropriate technical support for the show was also challenging overall, as it was often difficult to communicate the vision of *Luminesce* and BioDramatics to designers. Thankfully, I was able to find brilliant Sound, Stage, and Lighting, and Costume Designers (Gabriel Terracciano, Irem Bugdayci, Jonathan Rooney, and James Williamson & Kevin Lombard respectively) who were all able to embrace the objectives of BioDramatics and



created brilliant designs to accompany the first ever production of *Luminesce*! However, in trying to support my designers I realized there were also a number of challenges that the scientific material presented in regards to the show's technical components as well. For example, the available stock of props was very devoid of scientific and biological research apparatuses. Thankfully, we were able to borrow a variety of authentic laboratory devices, such as microscopes and chemical glassware, from the Tufts University *Department of Chemical and Biological Engineering* to embellish our laboratory scenes.

There were also a number of challenges that arose simply from staging the script. As food was one of the dominant themes of the production, I wanted foods to be present in as many scenes as possible to passively comment on how essential sustenance is to our daily interactions, scientific or otherwise. However, as my primary thesis advisor, Dr. Barbara Wallace Grossman observed, having actors eating on stage in a dialogue-heavy production made it difficult to hear the actors' voices. It also posed a health hazard to the actors who could possibly choke on the smaller foods (such as popcorn kernels) while delivering their lines. To resolve this issue it was necessary to direct the actors with clear blocking instructions of when to eat on stage (if at all!). As the Director, I also made a number of cuts to the script only for this December's thesis production. In my opinion as the Playwright the scenes and dialogues which we cut were still significant, but seeing them staged in rehearsals made it apparent that they could be omitted in my student thesis production. For example, Tom's *Science Soliloquy* (provided in the Appendix at the conclusion of the script) was not staged in my thesis production. Both the cast and I felt that the ending which we found in rehearsals was far more powerful if left as the final moment of the play. Ultimately, I could not have been happier with the technical components of the show during its first two performances, and I am incredibly thankful to all of my cast and crew for making the production such an overwhelming success!

## **Communicating Complex Scientific Issues On Stage**

Effectively communicating complex and layered scientific issues to an audience demands making the intangible tangible. This is a common struggle not just for science on stage, but for scientists and companies working with science in general. The character of Susan relays this issue in Act 1, Scene 2 when she pleads with Robbert and Tom for the creation of some kind of visual aid for their upcoming television interview. Ultimately, her request is satisfied by Tom's creation of the glowing plant, which creates a tangible representation of a GMO not only for the characters in the play, but also for the audience of *Luminesce*.

Because the scale of cutting-edge issues in biology (like the controversy over GMO foods) is so broad and detailed, it is essential to provide the audience with ways to visualize both the “micro” and the “macro” — to engage not only with the minute details of the science and the issue, but also to be able to connect how these small details shape human interactions in society and with nature. A comprehensive script and powerful performances by actors are both essential to achieving this goal. However, the limits of an actor's performance art can sometimes make the presentation of the microscopic or macroscopic very difficult, and screen-projected material is a wonderful way to provide an audience with a visualization of these realms so significant to the presentation of Biology.

In lectures, a set of slides with graphics of data or tables make intangible concepts more “digestible” because they provide a visual map which can guide a student or layperson through the narrative of an experiment's research data. But a dramatic performance is not a lecture, and in the theater the narrative of the characters can often dominate that of the scientific material. Because character is the dominant vehicle of information on stage, projected materials must enhance the character's performance or else they are meaningless to the viewing audience. Instead of graphs or tables of data which would not be understood without explanation, the most powerful visuals are those which, when juxtaposed with the emotional dialogue of the character, inform a viewer of the context in which the science being described by the characters' rests. In this way, even if an audience member has missed a detail of factual information in the show, if they are able to form an emotional connection with the science then the show's success has been in shaping their feelings towards the issue to inform them on an even deeper level.

While I did not have projections in my thesis production of *Luminesce* due to the technical limitations of the Balch Arena Theater for the December showings, I did always have the intentions to include them in the production — even writing clearly into the script where projections would occur. For example, in Act 1, Scene 1 the show opens with a “media storm” where projected clips showing the sensationalist spectacle of GMOs in mainstream news media acts as the catalyst for the tensions spanning the plot of the show. As in Brecht’s scripts from his explorations with his self-titled *Epic Theater*, the stage directions calling for projections in *Luminesce* make the images, “embedded in the text to which they relate, but [still] they neither simply complement nor illustrate the text.” (Thompson & Sacks, 302) Instead, the projected film clips of a failed interview on the safety of Glyphosate, or the projected clips from mainstream news channels provide a juxtaposition to the material being acted in order to provoke an emotional response from the viewers.

Projections would also have played a major role in providing another layer of visual and emotional context during the *Science Soliloquies* of *Luminesce*, where characters expand biology lessons to present how they feel about the “hard science”, or how it personally impacted their lives. In Robbert’s *Science Soliloquy* in Act 1, Scene 2, for example, if projecting material had been possible then a series of projected images would have accompanied Robbert’s soliloquy. In his soliloquy, Robbert tells the true history of how genetic engineering saved the Papaya fruit from a struggle against an infectious ring-spot virus which threatened to eradicate the species from the face of the Earth! In writing his soliloquy, I made sure not to include dense scientific data or citations to the real studies which were conducted — as doing so would be providing an audience far too many intangibles and complicated conceptual material. Instead, Robbert summarizes the main *narrative* of the biology: that genetic engineering saved the papaya from extinction. This summary is juxtaposed against Robbert’s emotional state in order to both captivate the audience, and provide them with an understanding of the gravity of the issue being discussed. To illustrate the narrative, projected images of papaya fruits infected with the ring-spot virus, farming families suffering after a crop shortage, and the new GMO papayas would have been displayed.

It should be noted that the degree of scientific complexity found in the *Science Soliloquies* of *Luminesce*, (or in any other such medium of science-driven presentation) is dependent on many factors — including narrative, character, intention, and the age and education level of the intended viewing audience. In his book *Seriously Silly*, magician David “Silly Billy” Kayo provides a table of children’s comprehension and retention of comedic illusions as they age from 3-13 and older in order to prove how younger audiences react differently to pun, physical comedy, bright colors, etc. compared to audiences consisting mainly of older children. Though a BioDramatic performance is not likely to be a comedic children’s magic show, the concepts of audience comprehension and retention are very significant to the way the science should be presented. Much like the pun or language sections of Silly Billy’s table, a child in elementary school benefits most from entertainment and education in a performance that details only one or two scientific concepts explained in a variety of ways. Older audiences consisting of adults with some science education, however, will be attracted to shows with a higher level of scientific and social sophistication. In theater of any type — be it a comedic magic show or a BioDramatic play, the age and background of the audience is very influential to a show’s success.

Such knowledge of audiences informs the answer to the question of what audience was intended for *Luminesce: A BioDramatic Fiction*? As I wrote the play planning for it to be staged at Tufts University as part of this thesis, it was assumed that the majority of the persons in the audience viewing *Luminesce* would primarily consist of college students and mildly science-literate adults. Assuming a college educated audience also implied that the audience would generally have some knowledge or familiarity with important modern concepts in Biology, such as those of DNA and genetics. It was not assumed that all of the audience would be incredibly informed about such science, but that with some familiarity, the information in the play could be one step above introductory level biology. For example, the audience attending *Luminesce* would not benefit from an explanation answering the question of, “what is a gene?” as doing so only reiterates information they are already familiar with, and the time dedicated to the question would detract from the larger goals and narrative of the play.

If an audience member is unfamiliar with one of the biology concepts presented in the play (such as DNA or evolution) the play provides both contextual background on these concepts, as well as an emotional representation of the concepts in order for audience members to follow the narrative of the play. The best example of this is perhaps in Act 1, Scene 4, where Tom attempts to explain the detailed creation of Bt Corn products to his daughter Jessica. In the dialogue, Tom explains:

**Tom:** Okay, the thing that everyone is talking about is our Bt Corn. Your Dad helped Avantos make Bt Corn, and yes it is a corn with a pesticide in it.

**Jessica:** You're not off to a great start....

**Tom:** But! But, do you know what Bt is?

**Jessica:** You just said it was a pesticide.

**Tom:** Well, see Bt stands for *Bacillus thuringiensis*, which is a special type of bacteria found in soil, or dirt in gardens.

**Jessica:** So you made corn with bacteria in it?

**Tom:** No. There is no bacteria in Bt corn. The Bt bacteria produces a special type of protein that's toxic to some insects. That protein is called Bt delta endotoxin.

**Jessica:** So this bacteria is what produces the pesticide and...

**Tom:** And, the trick that your Dad helped with was to get that gene that makes the bacteria produce pesticide out of the bacteria, and put that gene into a corn plant. Because the corn has that special gene from the bacteria, it starts producing the chemical inside the plant's cells. And when the plant is making the pesticide itself you don't have to spray the plant with something else to scare the bugs away.

**Jessica:** That sounds good.

**Tom:** That's exactly why we did it! It just makes the plant such a more efficient fighter against the big mean bugs that are coming to munch on it. Do you think you understand?

*(Luminesce, Act 1, Scene 4)*

Here, Tom walks both his daughter and the audience through the main principles of genetic engineering — essentially that a change in a gene changes the proteins a cell will produce, thereby changing something significant about the organism. Communicating this message is the primary goal of Tom's dialogue. In their chapter of *Communicating Science*, Dominique

Brossard and Bruce V. Lewenstein break “public understanding of science” projects (or PUOS’s) into three categories of either improving public knowledge, explaining a specific concept, or providing the social context of science. While I believe there are moments in *Luminesce* which accomplish each of these three categories, Tom’s dialogue above focuses on clearly communicating only the one scientific concept. It is not essential that the audience retain the name of the bacteria, for example, but what is communicated is the process of pesticide being created in the corn plants from a gene found in a species of bacteria. This process is a larger concept in the genetic engineering of many modern agricultural products, and therefore is the significant biology important for the audience to understand.

However, it can also be noted that Tom’s dialogue with Jessica achieves the goal of communicating this basic biology principle without providing any difficult or detailed data (graphs, charts, mathematics, or diagrams). The conversation avoids unessential information or scientific language that is often used in higher-level biology courses to describe the concept (such as details about *ribosomes* or the *transcription* of DNA into actual proteins from various amino acids). Instead, Tom provides to his daughter a brief and accurate summary of process and benefits of genetically engineered corn products, and then reiterates them with a metaphor about a camera to ensure that the audience comprehends the scientific process. Again, had projections also been available for my thesis production of the show, projected images of the microscopic processes described by Tom as well as images of Bt Corn would have accompanied the dialogue to give yet another layer of context and perspective for the audience.

Additionally, the structure of the scene provides a broader emotional context for the scientific facts simply in staging the relationship of Tom and Jessica. The juxtaposition of the

strained father-daughter relationship and the relationship of the known and the unknown provokes emotional reactions of fear, mistrust, frustration, and appreciation — all of which are significant to understanding the issues facing the field of modern genetics. These emotions serve not only as creators of engaging dramatic tension underneath the scientific dialogue, but also force a viewer to form an emotional connection to the science being discussed. The viewer can connect with Tom's frustration in comforting Jessica, or with Jessica's frustration with the limits of her comprehension of the biology Tom attempts to explain. Through these connections, the viewer will hopefully realize that our current knowledge of biology also has its limitations and that this can be frustrating even for scientists in developing branches of biological study like genetics. Ultimately, the juxtaposition of theatrical elements like dialogue, repetition, character, and screen-projected material are what make the communication of science in BioDramatic productions effective and entertaining for audiences.

## Choosing Impartiality and Accuracy over Bias and Misinformation

Biologists have worked for decades to create a unique and detailed vocabulary to describe our natural world. To attempt to find other language to communicate the same concepts detracts from the specificity of the language the scientific community has worked to establish. But how then, can someone new to this difficult scientific language effectively learn and understand the words and their related concepts in the short span of a play? It would seem impossible to expand the audience's thinking beyond the concepts and have them think about the social context of the science if so much time must be dedicated to the explanation of the science itself.

It is sometimes argued that researchers communicating their findings should do so by avoiding any “technical language”. Instead, it is argued that, “scientists must strategically ‘frame’ their communications in a manner that connects with diverse audiences”. (Kahlor & Stout) This belief is most often interpreted by finding physical representations of a scientist's work, or by presenting tangible and practical examples of how the science effects the daily lives of a layperson. By avoiding technicality, complicated scientific findings will become more accessible. The concept of avoiding language is not foreign to the theater, and is even rather essential to actor training where communication is learned through expressions in a character's actions. In his book *Theater*, David Mamet claims that much of traditional acting technique demands that, “all the actor need do [is] treat the words as if they were gibberish and react truly in the moment to the other actors.” (Mamet) However, in rehearsals for *Luminesce* we found this ideology cannot function for actors engaging with scientific material — for if actors do not both understand and embrace the meaning of the facts they present in their lines they will never be able to “react truly in the moment” as Mamet had described.

For example, in testing the concept of treating the words as gibberish, and also to inspire my cast of actors to present the science of *Luminesce* as accessibly as possible, I selected a series of obscure theater exercises to begin several of our rehearsals. After a rehearsal had been spent roughly blocking a scene (ie. when the actors had learned the general flow of the dialogue, their characters' relationships in the scene, and the actions they would be performing) we would begin the next rehearsal with an exercise I created based on Mamet's philosophy which I called a



*Gibberish-Run*. In this exercise the actors would run the scene speaking only in provided nonsense words, but still attempting to communicate as much of the science of the dialogue as possible through their *actions* instead of their words. These *Gibberish-Runs* were incredibly effective at getting the actors out of the mental exercise of speaking the scientific language of the scene, and forcing them into engaging with one another. The exercise also led to our discoveries of some of the most captivating or educating actions in the scenes — such as Mark’s lifting of two glasses to describe the difference between GMO foods and organics in Act 2, Scene 2 or Tom’s playing with his dinner to describe the potential of genetic engineering technology in the flashback to the 80s in Act 1, Scene 3.

After these *Gibberish-Runs* were concluded, I would always check-in with the actors afterwards and ask them how they felt about the exercise. While they almost always enjoyed the *Gibberish-Runs*, they would also lament how difficult it was to speak in gibberish, and that ultimately they felt it was impossible to have a meaningful interaction about the science with the other characters on stage without the use of scientific language. Avoiding accurate scientific language led to miscommunications and confusion. The exercise raised the question: “Is it really possible to have informed discussions about science without addressing the true details and nature of the science being discussed?”

For both my cast and myself, our ultimate answer to this question was no — an audience could not have an informed discussion about the science of GMOs after the show if the only messages communicated to them were “practical metaphors” and the like. A BioDramatic performance like *Luminesce* does not have the goal of turning laypersons into scientists, but it should leave the viewers with a clear understanding of the main scientific arguments held by all the characters in the show. To do this, the technical scientific language of genetic engineering could not be ignored. Instead, it needed to be the focus — explained by juxtaposing the language with emotional performances and character interactions.

However, the director and the actors can only be as creative in their performance choices as the writing of the play allows. Throughout the first three weeks of our rehearsals for *Luminesce* I made many edits to the script’s scientific dialogue to make sure it was both clear and captivating. The most valuable lesson I learned in the writing of *Luminesce* was

unintentionally taught to me by my playwriting professors. The lesson was about audience curiosity; that audiences enjoy figuring out *why* a character feels a certain way in a scene, and will listen to a character intensely for clues detailing their emotional state. If an actor presented a strong emotional reaction to a series of scientific facts, the audience would attempt to understand those facts to find insight into the character's psychology and world view. For example, if Tom presents authentic love, compassion, and enthusiasm for GMO technology, the audience will listen to his impassioned explanations of the technology and try to connect the explanation with his emotional state. In the writing and staging of *Luminesce*, we found that an entertaining and captivating performance of the *emotional context* surrounding biological science is the most effective way of framing and communicating the necessary complex scientific concepts to a diverse audience in the theater.

One of my initially proposed goals during the creation of my major in BioDramatics was to critically analyze plays, theatrical performance works, and films or media that presented true biology through their artistic mediums. In the case of BioDramatics, as the presence of scientific information from the study of Biology and its related fields of health, the environment, etc. becomes more present in daily life, there is not only a demand for more science-based arts to help the public understand this complex new information, but also a need for persons with broad interdisciplinary backgrounds to comprehend, create, or validate the biology. Sometimes artistic works grappling with communicating biology can, either intentionally or accidentally, abuse the creative liberties of their art and make pseudoscientific claims in their narratives solidifying scientific myths or inaccuracies in the minds of the viewing public. Both of these issues — of communicating science and of avoiding pseudoscientific claims, are expressed by authors LeeAnn Kahlor and Patricia Stout in their preface to their book *Communicating Science: New Agendas in Communication* where they write:

“The National Science Foundation reported in 2006 that ‘although Americans express strong support for science and technology, most are not very well informed about these subjects. The public’s lack of knowledge about basic scientific facts and the scientific process can have far reaching implications’. Such implications include the inability to evaluate scientific (and pseudoscientific) information that is presented daily by politicians, public health and environmental agencies,

pharmaceutical companies, energy companies, journalists, bloggers, and medical practitioners. Science topics *du jour* — all rife with myriad health and policy implications — include alternative fuel development, stem-cell research, biotechnology, pharmaceutical risks, nanotechnology, climate change, and science education mandates legislated by state governments.”

(*Communicating Science*, Kahlor & Stout, 2010)

While Kahlor and Stout detail the many places where the public is exposed to scientific information, they neglect to mention science portrayed in films, theater, television, and other artistic mediums of popular culture which are increasingly being produced. My aspirations for BioDramatics and the play *Luminesce* included creating works that would help the public in their science literacy and evaluation of biological facts and arguments by writing a play where the information is accurate, precise, and unbiased while still remaining entertaining, engaging, and artistic.

As discussed previously in this thesis, when the writer of Science-Fiction (Sci-Fi) uses science in their story it is to justify otherwise impossible premises (cars that fly, a zombie virus, radiation causing mutant growth are all justified by “science”). Therefore, in the case of Sci-Fi, the author has no responsibility to honor scientific fact or impartiality because the intent is not to inform, communicate real science issues, or educate, but simply to entertain. While my outline of the genre of BioDramatics still aims to entertain, it also has the goals of communicating real science, and providing audiences with the confidence that the material being presented is not pseudoscientific, but an authentic reflection of true biological research and study in the real world. Therefore, in a BioDramatic work where true and real biology is being communicated on stage, the author has a responsibility to present accurate and unbiased science to the audience.

However, the playwriting process is a *selective* process, in that the specifics of what scientific material ultimately is presented in the play is *chosen* by the playwright. The playwright’s choice to address biological issues and factual material in their writing means they are also making the choice to create their BioDramatic work under the same guiding principles of a scientist pursuing the scientific method in the search for accurate and objective truth. If the playwright instead chooses to “take a side” among the arguments, their BioDramatic play would be much like an argumentative thesis — for it is possible that even if all of the scientific

information in the play is accurate, it could still be biased or misleading based on which facts are chosen to be presented and ultimately swaying the audience towards their specific opinion. This is another component of the larger problem of communicating biology in the theater, because a playwright's focus on narrative and character can sometimes force the choice of what is most *interesting*, and therefore ignoring or obscuring that which is most *true*. It is the responsibility of the playwright of a BioDramatic work to ensure that the piece is both accurate and impartial in its presentation of biology. As the playwright of *Luminesce: A BioDramatic Fiction*, I took responsibility to ensure that all of the biology, history, and social context presented in the play was as accurate, authentic, and unbiased as possible without sacrificing character or plot.

Being impartial does not mean that there cannot be conflict, however, and in my writing of *Luminesce* I often found it to be quite the opposite. By presenting a scientific issue without bias towards any one agenda, the play can capture the realistic tensions and conflict of the issue in its dramatic narrative. Attempting to be impartial was the mindset which informed the writing of Act 2, Scene 2's intense argument between Robbert and Mark. Had *Luminesce* been written with a clear bias either in support of, or against genetically modified foods, the powerful conflict between the characters would have become completely one-sided and less captivating for an audience. Instead, by structuring scenes where characters were open to expressing their opposing, but still scientifically accurate, opinions, the production of *Luminesce* was able to remain unbiased in the debate over genetically modified foods and organisms to ultimately present the audience with compelling and fact-based arguments from which they could derive their own opinions. Just as scientific research is performed in the quest for objective truth, BioDramatics should also strive for the presentation of truth in its reflection of the reality of issues and research in the study of Biology and its related fields.

## **Discussion**

The inclusion of biology and biological findings in the text or technique of a play, film, or other performance of dramatic work is not new. In the theater specifically, elements of BioDramatics can be seen in the techniques and famous performances of those such as Brecht and Stanislavsky, as well as many others both before and after their eras, such as Katie Mitchell and Anne Bogart. What is new and novel about my major is the unification of all of these components where biology informs dramatic performance under one collective scholarly analysis — a new field of study which I have coined as **BioDramatics**. Never before have these elements of biology in performance art been collectively analyzed, or expanded upon specifically for the creation of new biology-based dramatic works. The study of BioDramatics demands a wide knowledge-base in the detailed science of **Biology** and its social implications, extensive experience in the **Dramatic Arts** of theater, acting, and performance theory and their relationship with the science of Biology, and finally a profound understanding of human **Communications** to ensure effective presentation of accurate and unbiased science to the public. Such an interdisciplinary pursuit is certainly challenging, but increasingly necessary in light of society's growing reliance on science to inform important current and future decisions.

Ultimately, I believe that *Luminesce: A BioDramatic Fiction* was a successful piece of experimental BioDramatic theater because it provided an opportunity for all involved — from actor to audience member — to understand and appreciate not only the science of the Biology of Genetic Engineering, but also the emotional truths held by the scientists, corporate workers, and concerned public citizens engaging with the cutting-edge science. In her book *What's The Story: Essays about art, theater, and storytelling* famed international director Anne Bogart argues that,

“More important than the facts of any life is the meaning and significance that we attribute to those facts” (Bogart, 3) — and this statement also holds true for facts from the science of Biology. For an audience of a BioDramatic play or film, it is not simply the scientific information that herbicides and pesticides can evolutionarily lead to the development of super-weeds and super-pests, but the complex layers behind our understanding of this science that are the most captivating and important. BioDramatics helps an audience to fully appreciate the significance behind the facts of Biology, but it also is not didactic, nor does it ever shy away from an honest presentation and communication of true scientific material.

Again, while the challenges of pursuing scientific truths and factually accurate biological information on both the stage and screen are many, it is vital that both artists and audiences attempt to overcome these obstacles. It has been well established that interdisciplinary creations which attempt to accurately honor both academic fields are essential to progress within each individual study. Poet and biologist Gary Paul Nabhan, in his book *Cross-Pollinations - The Marriage of Science and Poetry*, summarizes this essential connection by asserting that both, “artists and scientists also need cross-fertilization or else their isolated endeavors will atrophy, wither, or fall short of their aspirations.” (Nabhan, 13) I too believe that cross-pollinations are vitally important to both artists and scientists, especially in the fields of Theater and Biology. In a recent survey completed by America’s premiere scientific journal *Science* and published in *The Washington Post*, the journal found that, “Eight in 10 Americans believe science has made life better for most people, but they still don’t trust scientists — and/or aren’t aware of their consensus on many of the most important science-related issues of the day.” (Blake, 2015) If no attempt is made to share scientific information with the public in a captivating manner, the

disconnect will only grow larger and the public's trust in biologists (and in scientists in general) will continue to deteriorate. The call for a specific discipline focused on the dramatic communication of biological science, *BioDramatics*, is obvious and essential for the preservation of the public's trust and support of biology and scientific endeavors.

While the rehearsals and performances of *Luminesce* are only early experiments towards finding what components are essential to defining and creating a successful work of BioDramatics, the enthusiasm for the project is hopeful, promising, and inspiring! Creating *Luminesce: A BioDramatic Fiction* was an incredibly rewarding and educational process for not only myself, but also for both my cast and audiences who expressed to me after the show how much more they had learned about the biology of genetically modified foods and the scientists and corporate figures developing them. The show's cast and crew were incredibly talented and committed, and in only four 2-hour rehearsals a week for under two months we were able to stage a full-length piece of intricate BioDramatic theater. Again, I could not be more thankful for all of their hard work and for the incredible success of the production. I cannot wait to continue to grow *Luminesce*, as well as continue to analyze and create future BioDramatic artistic works!

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# LUMINESCE

A BioDramatic Fiction About Genetically Modified Organisms

By Wally Napier

Script As Performed in the Tufts University Balch Arena Theater  
December 7th & 8th, 2015

***For Rights Requests, please  
contact the author using the  
following contact information:***

**Wally A. Napier**

**Phone: 781-698-8993**

**Email: [wallynapier@me.com](mailto:wallynapier@me.com)**

**DRAMATIS PERSONAE:**

**Tom Hariford** - 53-years old. Divorced, now single. Has one daughter, Jessica. Tom is the Head Researcher for Avantos, a plant science and agricultural biotech corporation. (Nicknamed Harry, for Hariford.)

**Robbert Sleck** - 56-years old. Managing Director of Avantos Research facility in Ohio. Likes well sharpened pencils and green M&Ms. Irons his socks.

**Susan Orlov** - 35-year old. head of media relations for Avantos. Carries a clipboard with a pocket for her cell phone. Likes red pens.

**Jessica Hariford** - Tom's daughter. 17-years old. High school student. Discontented. Likes ripped jeans and almonds.

**Allen Reckwether** - 50-some-y.o. News Anchor for WONS, Ohio News. Likes doughnuts. Combs his hair neatly. Admires the news anchors of old.

**Mark Lance** - 21-years old. Favorite color is blue. College student. Rebel.

**GEOGRAPHIC LOCATION:** Cleveland, Ohio U.S.A

(\*\*Note: The Act 1, Scene 3 flashback is located in New York, New York)

**THE YEAR & SEASON:** 2015, or close enough... The season is spring. It is raining outside.

**Original Performing Cast — December 7th & 8th, 2015**

Tom Hariford -- Ben Fuligni

Robbert Sleck -- Ben Nissan

Susan Orlov -- Jennifer Sohn

Jessica Hariford -- Julia Bront

Allen Reckwether -- Orian Sneor

Mark Lance -- Harrison Downs

## ACT I

*[The world of the play is like that of a Petri dish full of cultures, and cluttered with the suffocating presence of natural plant life. This is reality, but it is presented from the perspective of the entire natural world — a human story remembered by an authority beyond human order. Its limits are obscured in darkness, and only details of strict importance are fully illuminated.]*

### Scene 1 - Opening Sequence

The Living Room of Tom's Home in Suburban Ohio /// WONS, The Ohio News Channel

*[**TOM HARIFORD** is asleep, alone, in the dark, on the couch in his living room. The room is rather bare, but heavily lived in. In another room, rests the glowing figure of a plant. Out of the dull quiet, Tom's cellphone rings obnoxiously from under the lamp on the side-table. Tom awakes roughly, and reaches sleepily for the phone. On the other end of the line is **ROBBERT SLECK**, who is head of operations at the Avantos research facility in Cleveland, Ohio.]*

**Tom:** Hello?

**Robbert:** Harry? Hello. It's Rob.

**Tom:** Robbert, hello.

**Robbert:** I apologize for the early call.

**Tom:** Oh, it's not a problem. I was... just getting ready to leave for the lab anyway. What's new?

**Robbert:** I wanted to let you know that there is going to be a morning news report on about us, and I was hoping you would be able to watch it before you came in.

**Tom:** Of course. Um, what channel? Local or National?

**Robbert:** Well... either.

**Tom:** What? What's going on?

**Robbert:** Look, I've got to go to an emergency shareholders meeting right now, Tom. Just watch the news program and we'll meet later when you get in. I'll see you soon.

**Tom:** The shareholders are meeting? At six in the morning? What's going on Rob!?

**Robbert:** It's just classic journalism. Weeds sprouting up in the garden. Nothing to worry about. They're grappling for a story, and we just happen to be in their crosshairs. We'll talk about it later. Come in right after that report though. We need all hands on deck! Goodbye, Tom.

**Tom:** Okay. Goodbye.

*[Tom replaces his cellphone on the side-table under the lamp. He takes his glasses and adjusts them. He digs in the couch cushions for the remote, finds it, and clicks on the television. While the news is playing, he continues to get dressed and eats a bowl of cereal. The scene's focus shifts across stage to **ALLEN RECKWETHER**, the news anchor for WONS, Ohio News. He is 51, has frosted black hair, a rigid posture and a soft intensity.]*

**Allen:** Good morning! I'm Allen Reckwether, and welcome to the *Morning Delivery* on WONS, Ohio News. Today's top story is a controversial new finding about genetically modified foods, and how some of them may in fact be carcinogenic.

**Tom:** Oh boy...here we go again.

**Allen:** A recent independent study that reviewed risks associated with Genetically Modified corn products developed by a Cleveland, Ohio company, *Avantos*, was recently re-published after the article had been controversially condemned and pulled from publication in a respected science journal last year.

*[Allen's report fades as clips from other news stations covering the same story appear. A media storm crashes across the stage. It is a wave of controversial reports and findings. Allen continues to narrate benefits and risks emphatically while the dissonant surge rises. Tom exits at some point during the storm.]*

**Allen:** Genetically modified foods grow better, promoting a higher yield of crops, and GM foods could eliminate the needs for excessive pesticide usage. Modifications could save crops from viruses and fungus. But are they worth the risks? Could Genetically Engineered foods cause cancer? Some studies report they cause the creation of so called "super-weeds", which could increase the use of herbicides, pesticides, and fertilizers. Consumers could enjoy groceries with a naturally longer shelf life! They could also trigger allergic reactions. Could they change the structure of your DNA? Seed contracts lock farmers into a racketeering cycle. Researchers argue that drought or flood resistant genetic modifications could save farming in developing nations!

*[Click.]*

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**Scene 2 - Growing Pains [or, The Assignment]**

Robbert's Office in the Avantos Building in Cleveland, Ohio.

*[SUSAN and Robbert stand in Robbert's office in front of a large TV screen watching the reports from the opening sequence. They are sullen and still. The office has three chairs, one larger and behind Robbert's desk. The desk is covered in papers, and has a pen cup, a bobble head and a photograph of his family roughly aligned along the edges. A waste bin, full of junk and crumpled paper sits beside the desk. It is a dull space, but clean and well lit.]*

**Robbert:** *[Squeezing a stress ball in one hand & clicking off the TV with the remote in the other]* So that's what they're saying about us, hum?

**Susan:** I'm afraid so.

**Robbert:** If my daughter were here, she'd look up from her phone and say: "That's pretty harsh!"

**Susan:** Um, yes. I suppose it is pretty harsh.

**Robbert:** And everybody's jumped on the bandwagon that's for sure. One station covers a story and you're left in the dust if you don't have something else on the subject to broadcast, I guess?

**Susan:** You got it. Something new will come up by tomorrow though. There's always more news.

**Robbert:** We can hope.

*[Beat.]*

**Robbert:** I know you wanted to review the footage to create a summary this morning, but I told the shareholders earlier we would sit everyone down for a strategic meeting by noon. I'll have my assistant send out the full building meeting notice and hopefully we can summarize what we've just watched as we go.

**Susan:** *[Engrossed in a message on her cellphone, which rests on her clipboard.]* Okay.

**Robbert:** Wait, Susan. Let's not do a full meeting. Not yet. Something smaller.

**Susan:** Okay.

**Robbert:** Let's do... how about we just call in Dr. Tom Hariford. Have you ever meet Tom? He's one of our best — our head researcher. I'd like to hear his thoughts first. Let's do just me, you, and Harry?

**Susan:** Okay.

*[Robbert shoots her a look, un-amused by her repetition of the word "okay". In the silence, Susan looks up from her materials.]*

Sorry.

It's just that I...haven't had anything to eat since the flight... Did I pass a vending machine on the second floor?

**Robbert:** Yes, there's one there.

**Susan:** Thanks. Wonderful. If I could just take a minute to run down and grab something, and after I can go bring this guy up to the meeting. His name is Harry?

**Robbert:** No, his name is Tom. But his last name is Harriford, so sometimes I call him Harry. Anyway, sure. Do what you need to do. It'll give me time to makes some calls.

*[Susan exits to fetch Tom. Robbert is alone. He moves to pick up the phone and dials a number.]*

Hello? Yes, this is Robbert calling from Cleveland. Could you connect me to Patrick? Yes... No... I realize it's a bad morning but — YES! I can hold!

*[The atmosphere shifts, and though Robbert is still on hold, we can now hear his subconscious thoughts while he is waiting — an insight from the higher order that is the reality of the play. This is a transition to the first Science Soliloquy.]*

### **ROBBEST SOLILOQUY [See Appendix A.]**

*[Transition out of the Soliloquy sequence.]*

Oh finally! ... Okay. Oh, he's already sent an email to Susan about that? Great. Thanks.

*[Robbert hangs up the phone, forcefully.]*

GOOD FREAKIN' GRIEF!

*[Robbert kicks his trash bin and scatters junk all over the room, just as **Tom and Susan enter**. Susan is eating something from the vending machine. They take a minute to let the tension of the room subside.]*

**Tom:** [*carefully*] Is everything okay?

**Robbert:** Yes, yes. Sorry. I ... spilled some...stuff. Rough morning, you know.

[*Tom attempts to pick up some of the trash.*]

No! No, just leave it. Please, sit down.

[*Tom and Susan sit in the guest chairs.*]

**Robbert:** [*To Tom.*] I apologize again for the early call this morning. I'm sure you were just gearing up for the day.

**Tom:** Don't worry about it. I probably wouldn't have caught the news if you hadn't called.

**Robbert:** Let's hope that's the case with the rest of America this morning, am I right? Anyway, this isn't really a formal meeting, but...it's an emergency meeting.

[*Beat.*]

Susan and I — I'm sure Susan introduced herself, our head of Media Relations — she just arrived today. Flew in and just got off a plane this morning, and the two of us just reviewed some of the news reports from right after she landed.

**Tom:** How did you know to fly in this morning before the reports aired?

**Susan:** The journal that republished the article sparking all this uproar contacted us before it went to print. We also have contacts with some of the broadcast stations, and they notified the corporate offices that a report would air today.

**Tom:** So you mean, we knew that this was coming? Why didn't you tell us earlier?

**Susan:** It's typically not worth while to notify all Avantos operations over something like this. The people who needed to know, legal teams, etcetera — they'd been working to control the situation since we first got word, but... Anyway, you're part of the conversation now.

**Robbert:** Of all the other companies that do transgenic research, they always pick on us. I suppose it's because we're the biggest and the oldest in the industry.

**Tom:** Maybe we should be flattered?

**Robbert:** I can assure you that's not how the shareholders feel. They think we've become oblivious to market demands. After several...difficult meetings this morning, I've been instructed that we should start taking some steps to resolve this head on. Soften the public concern.

**Tom:** Sure.

**Robbert:** They wanted me to call all our departments together to brainstorm a response, but I think bringing everyone to the table right away makes it look like we are actually at fault for something. But Avantos has never done anything wrong or illegal. And that's why you, Susan, and I are having this little meeting first. Spend some time pre-strategizing together to figure out where exactly the public was misled by all this television nonsense.

So with that premise, Susan, what is your plan.

*[Robbert sits.]*

**Susan:** Ah... right.

Well, thanks to our lobbyists on the ground, the three biggest news stations will be switching to some other story for the rest of the afternoon — which is good for us because it buys some time, but it meant I've had to schedule a local television interview for tomorrow.

**Robbert:** We don't usually address the press in person...

**Susan:** No, but a generic statement isn't enough this time. The public needs to see a real person speaking on behalf of the company. A friendly face. So instead, we'll be making a live statement and taking a couple questions to respond to accusations.

*[She produces a couple of documents and hands one to both Tom and Robbert.]*

I've prepared a list of some of the questions we'll likely receive, and Tom, I was hoping you could look over all of the biotechnology questions. See if there is anything you can add to make them clearer.

**Robbert:** So the plan is to shower them with facts about our safety?

**Susan:** Our focus group research shows that once the public's mind is made up about something like this they're hard pressed to change no matter how many facts we throw at them. Still, more information is a really valuable step to persuading the public of our products' safety.

What I really wish we had is some tangible way to show the public how safe our products truly are. We don't have anything like that, do we?

**Robbert:** Well, we don't really have any demonstrations, or anything. And, I don't really want to take time putting something like that together. But lord knows we can't just put up another one of your general PR people in front of a camera. The one from this morning with the glyphosate? Horrible...horrible...

**CUT TO: [Lobbyist Dr. Patrick Moore's  
Glyphosate Interview Clip from Canal+ TV.]**



**Susan:** That interview was a disaster, I won't deny it. That fumbling idiot set us back big-time this morning. But it's another reason I wish we had some kind of visual aide.

**Robbert:** No no...

[*Beat.*]

What if we... What if we introduced a new product?

**Susan:** A new product?

**Robbert:** Sure! If our old stuff is bothering people, and we can't convince them that it is safe, let's just show them something new that they can't argue with! Works great for software companies - the old operating system is buggy? Just forget about it and check out this new doohickey we got coming out in a couple of months!

**Susan:** A distraction? Well, sure, that could work if we actually had something like that. But you just dismissed developing a visual aide. How would we possibly come up with something like a new product in any reasonable amount of time.

**Robbert:** Oh, but see manufacturing biological advances is what Avantos does! We've been researching other potential markets since the start, right Tom? We must have something we've been working on that's been sitting in a file folder at the bottom of a cabinet somewhere. Something inspiring, like the papaya projects of the 90's?

**Tom:** Maybe. Um—

[*Susan's phone buzzes, she is receiving a call.*]

**Susan:** (*with disgust*) Not this again. I'm really sorry, but I have to take this. It's Patrick. But that plan, if we have a product, would be really, really great. New product and an interview, and we'd be golden. I'm going to take this, and it will be awhile. But I'll forward our progress up and swing by your lab later, okay Tom? See what you think of those prep-questions? We'll review things then.

[*She gets up and exits.*]

Okay, bye. So sorry again. —(*to phone*) Hello?

**Robbert:** That woman is obnoxious! She just arrives and thinks because she's handling our public image she can walk out of a meeting with me whenever she wants!? Takes calls straight from Patrick? Ridiculous! I'd bet there's something going on there...

At least I can be glad there's some kind of plan, and that she's putting most of it together. Look, since I thought up the new product idea, I'll sell the plan to the shareholders, but you'll have to find us our winning ticket, Tom. So tell me, what could we roll out right away to captivate the public's hearts and soothe the aggressive media?

**Tom:** Well, um, we have a whole bunch of new and hopeful social-impact products for 3rd World Farmers that we're still testing. We have some progress on drought-resistant

rice that seems really hopeful, and we've been brainstorming over this type of whitefly that attacks a whole variety of crops from America to Africa, and we were thinking —

**Robbert:** No no, no, Tom. This time, I don't want you and your team to come up with a change that will help the farmers or the industry or the supermarkets. I want you to work on something that will help *the people*.

**Tom:** "The people"?

**Robbert:** The consumers. You know, "the people". They're the ones who are judging us the hardest right now, and we need to show them that we're on their side. That we do all of this - the genetics, the marketing, the business - that we do all of this for *them*. That ultimately our products benefit *them*.

See, the public doesn't trust us with making their lunch when they don't know anything about what we do. And hell, I don't blame them! Would you not think twice about what was on your plate when the TV across from you is shouting at you not to eat it?!

**Tom:** Well surely that isn't our fault. Just misrepresentations from the news, for not accurately depicting the facts. The majority of the scientific community agrees that the DNA in Avantos foods are safe to eat — that genetically modified crops are safe.

**Robbert:** It's not just that. The point is people don't ask for more information or facts when they trust you, and right now we've lost the people's trust. They don't like our corn products because they think it might kill them. Why is that? I'll tell you why — its like if you go out for dinner on business, but you come home and your wife parades you around the house, shouting till her face is red, "Where have you *really* been? I bet you were out with what's-her-face from where-you-call-it?" She just won't believe you no matter how many facts you supply to her — that you were out with Bill from the office, the receipts, the records — they're all useless without trust.

**Tom:** Listen, I know we've been work-friendly a long time, but again, I'd really appreciate it if we didn't use any relationship metaphors while at work. I mean, you're my boss, and it's just kind of...unsettling...

**Robbert:** That's exactly right! The people are unsettled. We need to calm them down and show them that genetic modification isn't a scary, or deadly unspecific science. We need to show America — no, The World! — that we know what the hell we're doing. And that we're doing it for them.

**Tom:** So you want to start an education campaign? So let's call Susan back in, and —

**Robbert:** She could never clear a massive education campaign with the company. That's not a solution to this problem. And do you know what that would cost? Buying ad time to teach people genetics when we've already spent millions of dollars on the

research and the development of our seeds? No, that would never fly. We're good at innovating, not educating.

[*Beat.*]

I don't need you to teach your science, I need you to inspire! Inspire! That is your assignment, Tom. We've lost the people's trust, and I just need you to win them back!

**Tom:** Like with these whiteflies! If we just shut off this one little gene that relates to their ability to sexually reproduce we could reduce their population so significantly that —

[*Robbert begins packing up to leave.*]

**Robbert:** No! No, again! Flies without sex are scary! I can't tell my wife's friends over dinner that I work for a company making sterile bugs. That's not a headline winner, Tom. It's not sexy.

**Tom:** Well, then we really don't have anything else on the table right now. Susan is right. Creating anything from scratch would take a lot of time. I mean, our last corn project took over two years to conduct the research, grow the first generation of plants, analyze them, etcetera — and it's still not yet ready for any type of market release.

**Robbert:** We don't need a market release, we need something to make us look good! That's why I need you to innovate! Think ahead! Or better yet, think back. When we first met you were so... *inspired!* Maybe you had a great idea you threw away. Look, I've got to go to lunch with Bets—with an old best friend. I'll be back at three and I want to hear some fresh ideas. That or the waste of resources that's public news journalism will hang us all. I'll see you then!

[*Robbert exits.*]

**Tom:** Wait!! I still don't know what I'm doing here! This is genetic science, you can't just expect a miracle over night!

[*sighs.*]

Good ideas I threw away...things from the back burner...  
Help "The People"... Well...

[*Lights shift to the dreamy glow of memory and nostalgia. Nature has provided transcendence through time. A memory within a memory. This is the shift into the Scene 3 flashback. Tom wheels his chair across the stage into his place in the memory.*]

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### **Scene 3 - The Roots**

Flashback - A Restaurant in New York City - A year in the 1980s

[*Flash-Back. A fancy restaurant-bar-and-grill in the city of New York. The space is romantically lit, but the*

*air is thick with tension. In one corner, a young Robbert sits at the bar drinking and intoxicated with an open barstool next to him. He is trying poorly to convince passing women to sit with him. At the other end sits a memory-younger Tom next to a beautiful young woman (his fiancé?) The couple is eating and sits across from the invisible parents of said young beautiful woman. A dinner date.]*

**Robbert:** Refill! Please! Hello? You know, if I knew working in the pesticide business would scare all the women away as well as the bugs I would have let my Father keep his failing company and take my chemical knowledge to the perfume industry instead. That would get me places for sure, if you know what I mean. HAHA! [*He drinks.*]

**Tom:** Mhmm, yes it's delicious. This is the best celebration dinner. Thank you so much!

**Robbert:** Yeah, that's right. Beautiful. I've inherited the freaking-failing-nightmare of a million dollar pesticide corporation. I'm a 29-year-old CEO who might lose it all as fast as I was handed it. Only in America, right? (No, not your type? Whatever.)

**Tom:** What do I want to do? Well, um lots of things, haha. Well, I really want to work with something like corn. A food, a crop, you know. I want to make the food we eat even better!

**Robbert:** You know what really was the bullet that started all these problems back in the day? DDT. That dichlorodiphenyltrichloroethanewhatever. That famous old pesticide people used to spray around like deodorant. That was the stuff. Killed all the pests - mosquitos, worms, grubs, whateveryagot. Got the job done and the people cheered. DDT IS GOOD FOR ME! Yay!

**Tom:** Right now, as of 1980, there's more than four billion people in the world. Four billion!! You know how many people there will be by the year 2000? Almost double!! That's billions of more people!! Billions more mouths to feed!!

**Robbert:** Then the 1970s roll around and people say, wait a minute? Why are the birds' egg shells thinning? How many other things is this super-pesticide killing?

**Tom:** How are we going to feed all those people? Sure it might not be a problem for us with our grocery stores and The Breadbasket of America, but we're going to have to find ways to make the foods we eat grow more abundantly, and nutritiously too.

**Robbert:** And then they're all like oooh, Bio-accumulation. The poison can build up in my fat tissue? I don't want that! I don't want to die!

**Tom:** But right now, I'll tell you, I went to visit this tiny village in Southern Asia. The people there are suffering from hunger like crazy. People who are living off barely any calories and even fewer vitamins and nutrients.

**Robbert:** And that was the tip of the iceberg. People hear about that and then it's Chloroflourocarbons, and lead in the paint and asbestos in the walls. Who in their right minds wants better living through SCIENCE, am I right? Looks like we have no firkin' idea what we're doing. Or that we simply don't care. Maybe we don't...

**Tom:** It's not that they're not trying. They grow a lot of rice, but come on. How many nutrients are there in rice? How long can you live off that alone?

**Robbert:** Now nobody wants to be in the chemical business. We were the unsupervised saviors, now we're just disgraced incompetents.

**Tom:** And then, finally, if they do get some rice growing. BAM! It's flood season and the river bursts and suddenly their crop is under water that's far too deep for maybe a week and all the rice just dies off. Or maybe it doesn't rain at all and you have the opposite problem.

**Robbert:** But ya know what? Farmers are still buying pesticide. Gotta get rid of them insects! People are still buying oil, and herbicides, and whointheworldknowswhatelse. But it's not to late for those! So instead we're trying to make those things better day in and day out.

**Tom:** And I think genetics has the answers. Sure we don't know everything yet — there's always more research, more questions. But the potential! We could change the genetic make-up of their rice so it's more nutritious, or better at surviving droughts and floods. We could make food better. People's lives better.

**Robbert:** And I think there's still hope. There's still so much room for redemption. So many new things for us to create and change. And that's why they're giving me this CEO position. That's why you're seeing so many chemical companies merging or buying each other out. Because they all know — like I know, that if we just hang in there a little while longer we'll figure it all out. We're not gonna quit. We'll work together and we'll figure it all out...

**Tom:** And it doesn't just end there! With genetic science we could make foods that don't mold as easily, or crops safe from viral infections. We could even make plants that glow in the dark, like jellyfish do at the bottom of the ocean! Use them as street lights along the river bank.

Anyway, I'll leave you with that parting image. I really need to use the bathroom, so if you could just excuse me for a moment. But don't worry, I'll be right back for dessert!

*[Both Robbert and Tom are now heading for the bathroom. Robbert gets there first and leans woozy on the sink edge. Tom enters behind him awkwardly and starts to wash his hand in the adjacent sink. Robbert looks sick.]*

**Tom:** Woah, woah. You okay there?

**Robbert:** Yeah. Yeah I'm fine. Just a rough night, you know?

**Tom:** Sure. Sure.  
Can I help you at all? Get you a taxi home or something?

**Robbert:** Probably for the best. Good time to call it a night.

**Tom:** Here, let me help you to the front door.

**Robbert:** Did I suddenly leave New York or something? Why in God's name are you so interested in a stranger? You're not weird are you? Why are you being so helpful?

**Tom:** Well, I'm from Ohio. I guess we're a little softer around the edges out there when we see someone washed up.

**Robbert:** Aw shit. I'm outta cash. Look at me Ohio, a broke businessman in New York. Looks like there's nothing for you to rob even if that's what you were thinking...

**Tom:** [*Giving Robbert some cash.*] Here, take this. It'll cover your cab if you're not going far.

**Robbert:** Aw wow, thanks. You're too kind. Way too good. We need more people like you in the world. Business. What did you say your name is again?

**Tom:** My name is Tom. I'm Tom Hariford.

**Robbert:** Harry from Ford. Got it. Here. Here take this. That's my personal phone number on there, okay? No one else around here wants my number, but...not implying you should think of this in the wrong way or anything, but you need a favor back, you give me a call. Have a great night Ohio.

[*Robbert exits.*]

**Tom:** Thanks! Sure. I will. Have a good night.

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#### **Scene 4 - Symbiosis**

The Living Room of Tom's Home

[*The living room of Tom's Home, exactly as it was in the beginning of the play. Tom's daughter, **JESSICA** is on the couch hanging out. She is 17-years-old and is maybe dressed a bit punk. Maybe she is eating a snack. Things are quiet and settled. Suddenly Tom bursts in, puts down some things and rushes towards the basement door. He passes right by Jessica, but then pauses, and turns to her.*]

**Jessica:** Hey Dad.

**Tom:** Jess, oh my god. I am — today is Thursday! I am — I am so, so sorry honey. Something happened at work today and —

**Jessica:** Tell me about it. You're company is all over the news, the internet, everywhere.

**Tom:** Oh, of course...

**Jessica:** Did you not get any of my text messages? I've been trying to reach you literally, all day?

**Tom:** No, I —my phone...

*[Tom checks his pockets for his phone, then shifts focus to the side table with the lamp next to the couch. His phone is still there.]*

Oh no... I'm so sorry Jess, I left my phone here.

*[He goes to the side table to pick up the phone.]*

**Jessica:** Well that's honestly not a surprise. Looks like you forgot about everything important today.

**Tom:** I had a note that you were coming today, but I saved it in my calendar... in the... phone...

**Jessica:** Look, it's not a big deal. At least I'm old enough to drive myself here. It would've been miserable waiting for you today with everyone talking and all.

**Tom:** Talking?

**Jessica:** Yeah. About you.

Because Avantos is all over the news, like, all day I suddenly become the resident Ms.GMO-Know-it-all even though I know literally nothing at all.

Everyone was asking things like: "Is it true? Is your Dad scamming farmers into abusive no-seed-saving contracts?"

or: "Hey, thanks for putting pesticide in like, all our vegetables ever."

Even Kateline:

"Hey, your Dad works for Avantos right? Like, do you think he'll move back in with your Mom if he loses his job?"

So really, don't worry. You messed up today long before you left me here alone for two hours. Everything is perfectly fine.

**Tom:** Jessica...

**Jessica:** And it's like they all think they can just blame me for whatever headline so-and-so retweeted. I don't know what to say to these people! Not like I know all the secrets about what you really do at work. So I'm just like, "Yeah, sure, my Dad is bringing on the Franken-food apocalypse"!

**Tom:** Come on...You didn't really say that.

**Jessica:** So you know what? You forgot that you have me for this weekend, don't worry about it. I'm old enough now that I can handle it. If you don't show up I guess I can just drive on back to Mom's.

**Tom:** Please!

Jessica...please!

Sit down!

I understand that you had a hard day at school, but please, it's not like my day was any easier.

Yes, the people in my office are scrambling right now. Yes, there are a lot of people angry with Avantos, with me, and apparently with you too, but that doesn't mean we should be angry with each other.

[*Beat.*]

[*Jessica sits back down.*]

[*Beat.*]

[*Tom sits down on the other end of the couch.*]

I'm sorry. I'm sorry, again, that I was late today. It really was a hard day.

But, I'm not going to lose my job. We're not in any trouble. In fact, there are even some things to be excited about! All that happened today was that some people started wondering about what we do at Avantos, and they're not sure what they think yet.

**Jessica:** I'd say they're pretty sure they know what they think. You're working for a company helping them put pesticide in corn, Dad. Literally poison in corn! It doesn't take much thinking to figure out that it sounds pretty bad!

**Tom:** It's not like that, Jess. I know Kateline and everyone might have heard a lot of things, and no, and no one should just ignore their concerns, but maybe if you give your Dad a chance to explain a bit of what he does maybe you'll have something better to say to them tomorrow.

[*Beat.*]

**Jessica:** Okay, well? What is it that Dr. Frankenstein does all day on Mount Doom?



**Tom:** Okay, the thing that everyone is talking about is our Bt Corn. Your Dad helped Avantos make Bt Corn, and yes it is a corn with a pesticide in it.

**Jessica:** You're not off to a great start....

**Tom:** But! But, do you know what Bt is?

**Jessica:** You just said it was a pesticide.

**Tom:** Well, see Bt stands for *Bacillus thuringiensis*, which is a special type of bacteria found in soil, or dirt in gardens.

**Jessica:** So you made corn with bacteria in it?

**Tom:** No. There is no bacteria in Bt corn. The Bt bacteria produces a special type of protein that's toxic to some insects. That protein is called Bt delta endotoxin.

**Jessica:** So this bacteria is what produces the pesticide and...

**Tom:** And, the trick that your Dad helped with was to get that gene that makes the bacteria produce pesticide out of the bacteria, and put that gene into a corn plant. Because the corn has that special gene from the bacteria, it starts producing the chemical inside the plant's cells. And when the plant is making the pesticide itself you don't have to spray the plant with something else to scare the bugs away.

**Jessica:** That sounds good.

**Tom:** That's exactly why we did it! It just makes the plant such a more efficient fighter against the big mean bugs that are coming to munch on it. Do you think you understand?

**Jessica:** Um, yeah, I think so...

**Tom:** See, genetics isn't really all that hard.

**Jessica:** But, the corn is still producing that whatch-a-toxin, right?

**Tom:** Yes, but that chemical isn't toxic to humans. It only kills off worms and insects where their gut is susceptible to the toxin-protein. In fact, it's been sprayed on crops as a pesticide since the 1960s, so people have been working with it and eating it for a long time without problems.

**Jessica:** But even if it's safe for people, is the pesticide still okay for the environment? People complaining to me today were worried about other insects, like butterflies, and also concerned that this Bt Corn would create...what was it... "Super-Pests", and stuff?

**Tom:** Well, those two worries have been around long before we made Bt corn. People have always been worried that pesticides will kill off other insects, some of which might be helpful to crops or plants in a garden.

**Jessica:** And the “Super-Pests”?

**Tom:** Well, they’re not from Mt. Doom, but they are troublesome for farmers. See insects have children much faster than humans, and so they are better at fighting threats to their species. A pesticide like Bt corn will kill off most of the insects threatening the corn, but the ones that survive will have children and their children will have children and — well, eventually the population of bugs threatening the corn will have evolved and the Bt pesticide just won’t work anymore. The ones that don’t die to pesticide, well, those are the “Super-Pests”, and they can be pretty hard to get rid of, even on a big farm.

**Jessica:** So those are like, real things to be worried about?

**Tom:** Yes. Yes, they are.

**Jessica:** But then why would you even make Bt Corn? Isn’t everyone right for worrying about these risks?

**Tom:** Well, such side effects don’t just happen over night. As long as everyone is growing genetically modified foods responsibly things should be okay. The fact that people are a little worried means they can

[*Beat.*]

But also, the risks just don’t outweigh the benefits — A corn crop gets a couple more generations grown without having to worry about attacks from mean hungry bugs, like the Corn Borer. For farmers it’s simpler and safer to plant a corn plant that makes its own pesticide, rather than having to spray chemical pesticides themselves. For a few years we could wind up growing more corn. Avantos and your Dad have made a revolutionary new product! And, also, well, it also means your Dad has a job!

[*Beat.*]

We use a lot of corn. We use it for food, but we also use it for sweeteners, livestock feed, ethanol, bioplastics... Here’s a fun fact, 80 million acres of land are used to plant corn in the USA each year. 80 million! The amount of individual corn plants that get grown are almost unimaginable, and yet all of them are out there. Photosynthesizing...

**Jessica:** Did I ever tell you that you’re the weirdest Dad ever...

**Tom:** Each one of those plants, every one of them is fighting to survive and —

Here, imagine you knew of a camera that was even better than the one you have right now because it does something really amazing.

**Jessica:** I don't need to imagine that, Dad, it's something I literally told you about yesterday. I want a Cannon P70X with 1080p.

**Tom:** Right, right. So you want that new camera because it has a 1080p-whatever. But let's say that new one is completely incompatible with any of the other technology you have right now. You have the camera you have, and it just doesn't have that same feature as the camera you wish you had.

**Jessica:** What does this have to do with corn?

**Tom:** Well, if I told you that I knew a way to get that 1080p feature into your camera without you having to go out and buy the new camera, wouldn't you jump at that opportunity?

**Jessica:** Yeah, sure. I'd have the highest resolution photos in school.

**Tom:** Well, the corn plants are the same way! They're just looking for a better camera!

**Jessica:** I highly doubt that a plant needs a camera.

**Tom:** My point is that corn plants are constantly fighting to survive! They can't speak or write or shout to us, but they have problems too. They're constantly battling weather, attack from bugs and fungus and trying to grow with just what they find in the ground.

We eat corn, but we've also taken on the responsibility to grow it. Those corn plants need us. They rely on us, for water and sunlight and protection.

Maybe modifying their DNA doesn't sound like respecting the plants, but I've always thought of it as our helping them along. Making them better, living a little longer and making it easier for them to do what they do. In return they give us sweet, juicy corn.

**Jessica:** You're ridiculous, Dad.

**Tom:** [*chuckles.*] So if people start unloading their fears on you tomorrow, just say your Dad is only trying to help plants do their job, and make that the end of it. Will that work?

**Jessica:** Maybe.

**Tom:** Well, I'm glad you're feeling better. Hey, I know I just got home, but I need to go back in to work for a few more hours. Will you be okay here until I get home for dinner?

**Jessica:** Yeah, I guess.

**Tom:** Great. Great. I just need to get some stuff from downstairs and I'll be off.

**Jessica:** Downstairs?

**Tom:** Yup. Some of my old research equipment and...

**Jessica:** I thought you said you threw everything down there away?

**Tom:** Did I say that?

**Jessica:** Um, yes, yes you did! You even told those inspection people that you were stopping whatever research you were doing downstairs.

**Tom:** Well that was true, I did stop working on all the projects I had going on downstairs. But now I have an opportunity to tinker with some of them again! The company is finally interested in something more fun than pesticides and herbicides.

**Jessica:** More fun?

**Tom:** Yup!

Say, would it make it up to you at all if I — if you went along with me to work for the rest of the evening?

**Jessica:** Hang out at your lab?

**Tom:** Yeah, sure! I have to go back, and you haven't been in a really long time. You could check out our corn crops and see what you think! Do you have plans tonight?

**Jessica:** Well, not yet, but...

**Tom:** Come on! Look, if you come with me tonight, I'll give you a cash advance on the money you need for that new camera?

**Jessica:** Whatever...

**Tom:** Perfect! Meet me in the garage, okay? You can drive, but I'll need your help with the trunk when I get a couple things from downstairs.

*[Jessica exits. Tom starts to head for downstairs. He pauses, and turns around to look at the disheveled room. He spots the phone still under the lamp, runs back and grabs it and puts it in his pocket. Then he rushes downstairs to grab his supplies.]*

**[END ACT ONE]**

## ACT II

### Scene 1 - [In Which Susan Explains Things To Jessica, and Tom Explains Things To Susan, and Many Questions Are Answered.]

Tom's Laboratory in the Avantos Labs & Research Building

*[A laboratory space. Maybe there is much equipment, or at least there is the aesthetic of organized equipment. Off to one side is a large white covered box with a lightbulb atop. The shadow of a plant can be seen inside. In an isolated corner of the lab, TOM is working alone, diligently.]*

*[JESSICA enters the stage, with SUSAN following behind her. They are far enough away from Tom's corner of the lab to not hear one another. Jessica explores some of the equipment dully. While Jessica is captivated, Susan gives her Science Soliloquy here, with the typical shifts into and out of the moment. When Susan is done, she becomes buried in her clipboard/iphone/work.]*

**Jessica:** So...you work with my Dad?

**Susan:** *[Distracted.]* Yeah. Sort of. We only just met this morning.

**Jessica:** Oh. So you've just recently been hired?

**Susan:** What? No, no. I've been with Avantos for almost six years now. Oh god... um, Your Dad and I just do different things for the company, and I usually work in our corporate offices in New York.

**Jessica:** Oh. That's cool.

*[Beat.]*

**Jessica:** And when you're there, you're like a...?

**Susan:** I'm in charge of all Avantos communications with the press, our product media, generally the face of the company and things like that. I'm sorry, could you just like, give me a couple minutes here? *[She returns to her text messages.]*

**Jessica:** *[Under her breath, with disdain and sarcasm.]* Avantos — always here for you.

**Susan:** Excuse me?

**Jessica:** Sorry. I just...I just figured I would be spending this time with my Dad, you know?

**Susan:** You and me both. He was supposed to be free to review something important with me, but when I get here all I'm told is to watch you until he's free.

**Jessica:** Um, excuse you. I just turned seventeen, and I don't need a babysitter.

**Susan:** Sorry, that's not what I meant. It's just today has been a really difficult day. I guess I'm just a little wound up.

**Jessica:** Not the first time I've heard that today.

[*Beat.*]

My Dad is also really stressed. I think that's why he brought me with him tonight, but, I guess he just needs some time alone to set up so...here we are.

**Susan:** [*In agreement*] Mhmm...Okay. I've finished. You can ask me anything you like now.

**Jessica:** Well, like I said, I haven't seen my Dad so worked up in a while. Couldn't you have, like, told him to start working on this stuff sooner?

**Susan:** Oh no, this wasn't my idea. The assignment came from one of the jerks — [*catching herself*] The idea came from a brainstorming session of some people important in the company.

**Jessica:** You don't really like working for Avantos that much, do you?

**Susan:** [*authentically*] Oh, no Avantos is a really amazing company. I love my job! It's just... the way things work here in Ohio are very... different compared with New York.

**Jessica:** Not enough of a city here for you?

**Susan:** Well, I don't know if it's that...maybe...It's just...

I've always thought of Avantos as a... "traditional" and conservative company, but in New York you're constantly doing business with all kinds of diverse people and... well, being here you see a different side of how our company works.

**Jessica:** I guess a research lab isn't that exciting, so...

**Susan:** I actually loved taking science in college. I could have even gotten my degree in biology if it hadn't been for —

See, I thought working for Avantos would be a great way to keep up with modern research, working close to their labs, and things like that...

Between you and me, I don't like the management here. That's what's really ticking me off.

**Jessica:** Well, if they haven't been friendly it could be the stress like you said.

**Susan:** Even if your stressed, that doesn't excuse discrimination. I've only been here a day, and already I've been encountering unnecessary resistance which I can only explain as prejudice.

**Jessica:** Not my Dad, right? I know he doesn't get along well with my Mom, but I know he'd be kind to a woman he works with.

**Susan:** Oh, your Dad is great! No, he's not the problem. It's some of the executive staff that I've been meeting with earlier today, and I've got to say, I probably will report some of them when I get back to New York. They do not know who their dealing with.

**Jessica:** I didn't know it was still that bad. I mean, I remember my Dad telling me someone got suspended a long time ago for mistreating his female lab assistant. This guy kept breathing down her neck, and stuff, while she was doing lab work, and it was really creepy. But then that guy got fired and my Dad got the head researcher position.

**Susan:** Hmm, that must have been way before I was hired.

**Jessica:** Yeah, it was a long time ago.

**Susan:** But clearly this company has some faults that we don't publicize which haven't changed since then. Too bad this isn't an ideal time to work on such issues.

**Jessica:** [*Sarcastic*] There's a wrong time to expect decency?

[*Tom, satisfied with what he was working on, moves to find Susan and Jessica.*]

**Tom:** Ah, there you two are. Well, I've finished setting up. Susan, I can go over some things with you quickly now if you like.

**Susan:** Yes, we're already behind schedule here.

**Jessica:** Wait, Dad. You said we would take a break for dinner together after you finished?

**Tom:** Oh. Um, could we have dinner after I meet with Susan? She's been waiting a long time, and we should only be a few minutes.

**Jessica:** But I'm hungry.

**Susan:** There's a vending machine on the second floor? You could grab a quick snack?

**Tom:** Of course! [*Giving Jessica a few dollars from his pocket.*] Here, take this and grab something just to tide you over for a bit. They have these chocolate things that are this big, with cream filling inside! [*Playfully.*] But you can't tell your mom if you have one of those!

**Jessica:** Okay. I'll be right back.

[*Jessica exits.*]

**Tom:** Well! If all our problems were that easy to fix, this whole thing will be over in no time.

**Susan:** Don't get too excited. We can't celebrate until I've reviewed your progress.

**Tom:** Ah, right. [*Beat.*] Right! Follow me.

*[He guides her around the lab benches.]*

You know, for someone in public relations, you sort of have a pessimistic attitude.

**Susan:** Well, when the company's in as much trouble as it is right now, I don't feel we have the time for pleasantries. If we all wind up being laid off over night no one will care what attitude we're leaving with anyway.

**Tom:** I guess you have a point there.

**Susan:** Did you look over those questions I gave you this morning?

**Tom:** Oh, uh. No. Not yet. I was focusing on figuring out the new project side of things.

**Susan:** Robbert did mention to me that you remembered some project you started a long time ago and were setting it up in the lab. So where is this miracle plant?

**Tom:** *[Chuckles]* Well, don't get too hyped up yet. Remember, this little guy is just the first, but he is pretty miraculous. *[He pauses in front of a lit box.]* May I present to you, subject C14! *[Removes the screen.]* Ta-Da!

*[Beat.]*

Eh, eh? Beautiful, right?

**Susan:** All I see is a leafy green.

**Tom:** Oh, right, right. Well, that's because the lights are on. Hold on...hooold on...

*[He runs over and dims the lights, the plant glows a soft greenish-yellow. They are mesmerized.]*

**Susan:** Wow...okay. Well, I have to hand it to you! It's glowing.

**Tom:** Thanks.

*[Beat.]*

**Susan:** Can I touch it?

**Tom:** Oh, sure. It's totally safe. Just like any other common houseplant.

**Susan:** I figured when Robbert said you would roll out something new it would be a different type of corn plant or something just a bit different from the other agricultural products you produce, but this is really different!

**Tom:** That was the idea, right?



**Susan:** How did you grow a mature plant so quickly. Doesn't something like this take months to work out and stuff?

**Tom:** Well, the science behind him isn't at all new... and also I've had him growing in my basement for a year or two actually. It was a side project I was doing for fun, but you're not really supposed to do genetic science in your basement. Plus my wife hated it and told me to stop, so I threw a bunch of stuff away. After we got divorced I just kind of forgot about the work, but I would still go and water the plant every now and then. At first when Robbert said to come up with something new over night I was horrified, but then I remembered this little guy and, well, here we are now.

[*Beat.*]

Well, we shouldn't keep this fella glowing too long. I technically shouldn't have him off of his light cycle for research and data reasons, controlled factors and all that.

**Susan:** Sure.

[*Tom carefully adjusts the lights back on and the screen-cover back over the plant.*]

**Tom:** So... What do you think?

**Susan:** Well, this might just do it! As a conversation piece, it has definitely got a lot going for it.

**Tom:** That's wonderful to hear. Really, really wonderful. [*He sinks into his wheel-y chair.*] Thank God!

**Susan:** It's only one test plant though. We have the facilities to grow a lot of test plants pretty quickly, but I'm guessing even if we brought pictures to the interview you would still be months away from getting this out to people?

**Tom:** You really want to roll this out in the interview tomorrow?

**Susan:** Of course. Interview and a new product. They're a force together, not apart. Why? Is it not ready to be moved? Or is there something you're worried about?

**Tom:** Well, usually we don't just publicly introduce something a day after inception.

**Susan:** Scientists unveil new discoveries and breakthroughs all the time, no matter what stage they're in. The plant is glowing — what more needs to be done?

**Tom:** It's just there's a process we go through before we announce something like this.

**Susan:** Do you mean from a regulation side? Is it that we need a few months to run this by the EPA or FDA or something?

**Tom:** Well, nobody would be eating these plants, so it's not really the FDA's sector. I don't think there's any risk a houseplant would become an invasive species or cause problems for local insects, but I suppose that might be something to look into.

**Susan:** I don't like the sound of that Tom.

**Tom:** Hey, regulation on GE things is certainly out there, but lots of things get changed in nature without anyone asking questions.

**Susan:** Okay, well than what's the problem?

**Tom:** Well, maybe nothing? I guess this is something with a lot of potential. Yes, there might be hurdles to jump, but I feel more excited about this than I have with any of the other crop work we've done. This plant is fun. It's exciting!

*[He turns back to moving some tools around. Susan observes Tom's passion, enthusiasm, and discontent for a short, silent moment.]*

**Susan:** So, how'd you do it?

**Tom:** Do what?

**Susan:** Make it glow, of course.

**Tom:** Oh, it's easy. Let me explain. Basically it works just like any other GM plant we produce here. We take the plant we want to modify, in this instance just this little fella right here, and we place some of his tissue under our Gene Gun.

**Susan:** A "Gene Gun"?

**Tom:** Yup! I know it sounds like something straight out of a science fiction movie, but people have been using it for a couple decades now. Actually, it was invented at Cornell University in the 80's! Anyway, we place him under just like so and shoot the DNA sequence, in this case gene CF419 —

**Susan:** Hold on. You use a device called a "Gene Gun" to blast DNA into the plant? That seems...I don't know. It's just that you call it a gun, and that has major negative connotations in today's political climate. Is it, dangerous?

**Tom:** It's really just air and DNA. There's nothing particularly dangerous about it. Human cells don't take up new DNA easily. A Gene Gun is just what it's called because it, well, "shoots" DNA at plant tissues. It doesn't even look like a gun. Just a couple boxes really.

**Susan:** I suppose we can call it a “high tech device” or something, but that seems like a stretch for something that shoots air at a plant.

**Tom:** Well, there is some precision involved, you have to take measurements and apply the air pressure just right, things like that. The term for the method is often referred to as, “High Speed Particle Bombardment”. Would that be better?

**Susan:** Maybe. I don’t think people will be too jazzed to know that their food was bombed with particles at a high speed.

**Tom:** Bombarded, not...bombed, but yeah, maybe. Also, I only used the Gene Gun because that was what I had available back when I started the research. There are some newer second generation techniques for genetic manipulation that are far more controlled. There’s recombinant DNA techniques, agrobacterium, some start piecing DNA together almost from scratch. We could use whatever is most effective.

**Susan:** Second generation techniques? Using bacteria to change the DNA of a plant? Look, Tom, Nobody knows there was a first generation of Genetic Engineering. And I’m certainly not going to spend time backtracking, but whatever we say we’re doing it has to be very clear that it is always the same method. Anyway, you put it in the gun. Great. And the gun injects it with stuff that makes it glow?

**Tom:** Well, not exactly. See the Gene Gun injects the plant cells with DNA, but that DNA we added codes for special protein. Once the plant cell accepts the DNA it starts to manufacture the protein in its cells, and the protein is what makes it glow.

**Susan:** Okay.

**Tom:** Are you sure you shouldn’t be, taking notes, or something?

**Susan:** [*sarcastically.*] Oh, is there a quiz at the end of class?

**Tom:** No, no. I just figured if you hadn’t seen this stuff before you might...I don’t know...

**Susan:** What?

**Tom:** Forget it. Forget it. Anyway, the proteins. Gene gun. Similar technique to what we do with the Bt corn with a protein called Bt Delta Endotoxin. But for this plant we use a different protein. Jellyfish, and glow-worms, and other bioluminescent creatures that have developed bioluminescence have this really special gene. It’s called the CF419 gene, and it codes for this amazing, amazing protein called Luciferase. Luciferase, takes chemicals and oxygen and processes them into a photon of light, emitting a glow.

**Susan:** Wait, we’re working with a protein called Luciferase, like... Lucifer...like, the evil hell-angel Satan kind of Lucifer?

**Tom:** Um...well, not intentionally like that. They're both derived from the same Latin word, which just means "Light-bearer", or something along those lines. But it's not actually like this protein is the spawn of the devil or anything like that.

Anyway, the last step. After we figure out which plant cells took up the DNA from the gene gun, we can grow those few cells into a brand new plant that expresses the gene we want. Et voila! A transgenic glowing plant!

**Susan:** [*sighs.*] Tom...Tom, this is a public relations nightmare!! Sure, the plant looks cool, but did you think at all about how this will help people embrace GMO foods? You've made something that looks like it might as well be radioactive, and then tell me you made it by firing a gun at a plant to inject it with the DNA of Lucifer?! That's fucked up Tom, what am I supposed to do with that?

**Tom:** Look, um, this whole thing only started today, but I've had this idea for a really long time. And when you first saw the plant you were so captivated with it! Long-term this kind of technology could help us to replace streetlights, or maybe even the whole power grid! People will be interested in this. I guarantee!

**Susan:** Even if they are — I still foresee problems. Interested isn't the same as enthused. We have to be very careful about how we bring this forward tomorrow.

**Tom:** They've made rabbits and fish that glow under ultraviolet light and people love those! They're a huge success!

**Susan:** Wait, there are already GMO glowing pets? I thought you said this was your idea. How does this make Avantos any more innovative or inspiring if it's already done?

**Tom:** It's my idea. Well, it's an idea a lot of people have had but that nobody is really working on right now. And also, this little guy [*referencing plant*] is even better because he doesn't need anything external to glow. He doesn't need UV light, or dyes to glow like the fish or rabbits. He just glows — all on his own!

*[Maybe, a large crash is heard. Maybe not? Either way, after a moment Jessica comes storming into the lab, anxious and fearful. She rushes to her father's side.]*

**Jessica:** Dad! Dad! Someone just broke down a window at the entrance!

**Susan:** What? An accident?

**Jessica:** I don't think so. I was walking towards the staircase and a security guy found me and told me that we're all supposed to go through the emergency exit with the back doors and wait. Like during a fire drill.

**Tom:** Shouldn't there be an alarm or something?

**Susan:** I don't know. Maybe they only use it during a fire?

**Tom:** You're sure about this Jess?

**Jessica:** Yes! I'm not lying! Come on Dad, I don't want to hang around in here!

**Susan:** Of all days. Just when things were looking up! I can't believe this!

**Tom:** Okay then. Come on, let's go! This way!

*[Tom guides the trio offstage. Exit all.]*

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## **Scene 2 - [The Break-In]**

An Office in the Avantos Building

*[An unused office room in the Avantos building. The room has a few scattered office supplies, but is clearly dusty and neglected. Sitting in the corner in a chair is **MARK LANCE**. He is 21, young and angry. He wears a hat and a teeshirt with a graphic print and well-worn jeans. He is sitting on his hands and using his feet to wheel just a little bit, back and forth.]*

*[Robbert enters from the side, lightly.]*

**Robbert:** Hello.

**Mark:** ...

**Robbert:** My name is Robbert. I'm in charge of this research facility and I wanted to speak to you before the police arrive.

*[Beat.]*

Your name is Mark, yes? Listen, Mark, I know you might be scared, but that's what it feels like to acknowledge the ramifications of your actions this afternoon.

*[Beat.]*

I'm sure you're aware that this is private property. I know you're not armed, and you say you don't want to hurt anyone, but that doesn't excuse breaking and entering.

*[Beat.]*

So, no plan? You just, off the cuff decided to smash in our window? Are you going to at least apologize for that?

**Mark:** I would have broken a lot more if I had had the chance.

**Robbert:** Excuse me?

**Mark:** The whole point was to break in here, and derail as much research as I could.

**Robbert:** Look, kid, this isn't some petty vandalism. You broke into a scientific research center, and it's a serious crime. There are dangerous chemicals in our labs. You could have gotten hurt, or put other innocent people in this building in serious danger.

**Mark:** It's funny to hear anyone working for Avantos is concerned with anyone's wellbeing. Then again, I guess everything in here is all your *investments* and you can't lose those can you.

**Robbert:** Are you working with anyone, kid? Greenpeace, Nogmo, the Earth Liberation Front? Should I expect an angry mob at our doorstep later this afternoon?

**Mark:** What? No, I don't know any of those groups.

**Robbert:** So some young — how old are you?

[*Beat.*]

How old are you?

**Mark:** I just turned twenty one.

**Robbert:** So I'm supposed to believe that some young guy who just legally is able to drink happens to pass by our building and smash in our windows? You look smarter than that. What's the story here, Mark.

**Mark:** I go to Cleveland State, and I study international relations there. For the past couple of years I've been doing really deep research on developing countries, and I first started learning about Avantos when you put out that newspaper report on research funding for drought-resistant crops in Africa.

**Robbert:** We were very proud of starting that endeavor.

**Mark:** But that announcement got me to research the terrible things your company has done — locking farmers into one-sided contracts, selling dangerous war chemicals off as fertilizers and pesticides.

Then I spent a year in Africa, I met some of the people your company supposedly "helped". I met people who were suffering from hunger. Real hunger — not missed breakfast on my way to work hunger, but people who only had one meal a day every day, and that meal was just as filling as a bag of chips. It disgusts me, that these people are suffering while you get to stand there saying you're starting a new Green

Revolution. You're making things in those poor developing countries worse off than before.

**Robbert:** We know people are suffering. That's why we started the endeavor. Look kid, your accusations are misguided and baseless.

**Mark:** They're the truth! And no matter how you spin the facts you can't deny that people are suffering. That some of the science you said was completely safe has risks you didn't even think to think about! When people start getting cancer from eating your GMO crap, maybe then you'll feel a hint of guilt.

**Robbert:** Saying GMOs generally causes these outcomes of cancer and health problems is ridiculous. We are not aware of any immediate dangerous effects from consuming any of our products.

**Mark:** But how can you say that when you haven't even done any testing to look for negative side effects? That's straight up negligence. Just because you "are not aware of" anything dangerous doesn't mean that there isn't any danger. It just shows that you haven't been doing your job!

**Robbert:** We do years of testing here. We would never argue against testing. We're a science-based organization, for crying out loud. Testing and science is what we do! But doing good research requires money *and time*. So if you wouldn't mind not wasting our time with your sensationalist accusations we could gladly get back to our scientific research uninterrupted.

**Mark:** And what research is it you are doing right now, hmm? I'm sure it has nothing to do with testing the non-target effects of your Bt corn products. You're probably working on something entirely different!

**Robbert:** I cannot disclose our confidential research to some stranger who broke into our building.

**Mark:** [(*Mocking*)] I can't disclose our confidential blah blah blah

**Robbert:** Oh, you smug little — What Avantos is working on right now is irrelevant! We have never had a single report of our corn products or any of our products causing any type of allergic reaction.

**Mark:** Which pairs wonderfully with the fact that there are no labels on GMO foods in stores. How could anyone possibly report having an allergic reaction to your corn when they don't even know it's been genetically modified?

**Robbert:** Our corn is exactly like regular corn in every single way except for one gene - one little tiny gene — which exists all around the world in bacteria anyway. We've run many comparison models of the genetic make-up of both our corn and traditional

varieties and we haven't seen any abnormalities in the DNA that would suggest irregularity. Because the two corns are nearly identical there is no point in labeling them.

**Mark:** That's a terrible, terrible argument and you know it!

A brownie without nuts can be made *exactly identical* to a brownie with peanuts in it. The only small change would be the nuts, but it still could kill someone with a severe nut allergy! People have the right to know what they are eating, and if you truly are the saintly company you say you are selling a safe food product to the masses, you have no reason not to be transparent.

**Robbert:** I can't argue that labeling might not be good thing, but if you think about the costs it is very impractical and not worth while. —

**Mark:** — You're mixing two ideas there. Just because something is difficult doesn't mean it is not worth while.

**Robbert:** Could I please finish. People have been growing different varieties of crops for generations, selecting for the desirable traits which have made our tomatoes, our apples, and our corns so delicious and hearty. Even if you decided to label them, how would you go about categorizing them? What actually is a natural food? Our corn is a natural product. It grows naturally out of the ground like any other type of corn. You plant the seeds in soil, and they grow.

**Mark:** No. No. Some of them require —require— the use of pesticides or herbicides to grow. You didn't make them better, you made the plants into drug addicts.

**Robbert:** That is simply to protect our creations from being abused.

**Mark:** Whatever your excuse is, I can say for sure that not everything that grows is natural. If you mash up some Franken-food in a laboratory, it's something completely different from a plant found in the wild!

**Robbert:** And not everything that grows in the wild is safe!! There are poisonous plants, inedible plants, all kinds of "natural" plants that aren't safe. Even the safe ones — apples have arsenic in their seeds. Potatoes have alkaloids and solanine, GMO or not. It took generations for people to figure out what foods were safe to eat and what isn't. Now we have the opportunity to figure that out before we put things in our mouths. We've tested our foods and they're safe.

**Mark:** You bold-faced liar! Every longterm feed trial with pigs and rats, shows inflammation, cancer, or health problems for the animals. I don't want humans to be the next animal on that list!

**Robbert:** Look, we live in the year 2015. We have a population of seven-plus-billion people living busy lives. We don't feed that many people scavenging for food in the wild.



If that's your definition of natural foods, than agriculture in general is not natural — it is a necessity.

**Mark:** So you admit it? You admit that your GMO products aren't natural! Unsafe!

**Robbert:** I admit that our work is necessary for a sustainable future.

**Mark:** [(with laughter)] For the sustainability? You think your work is promoting sustainability? You sit there creating super-weeds, creating carcinogenic foods, and cheating farmers out of their seeds and profits and you say you are enforcing sustainability?!? You're a liar! You're lying to everyone, and most atrociously you are lying to yourself!!

At least I'm being honest. I'm speaking from the side without all the answers, and I'm only arguing that we need to put more time and thought into the systems you have created before you roll them out to the rest of the world. I'm saying we don't know enough and we shouldn't go charging into things. If we start putting these new GMOs out on the selves, people have the right to know!

**Robbert:** So now you'd just be labeling the GMOs from this past year? I just told you there have been transgenic foods on the shelves of grocery stores for a couple decades now. When times are tough the American consumer wants affordable, reliable food for their families. When times are good, people don't want to spend their cash on food. Either way, people all over the world are hungry, and our company wouldn't exist if there wasn't this overwhelming demand to fill by feeding them.

**Mark:** And it's not a problem if you squeeze them for profits along the way?

**Robbert:** I see nothing immoral about asking for compensation for our contribution and hard work.

**Mark:** You can't claim achievement of a philanthropic goal if the only person who benefited in the end was yourself. The vision of changing agriculture for the better is not so one-sided that your company should be allowed to have a monopoly on fruits and vegetables across the globe. Again you're lying.

**Robbert:** Look, I will not take being called a liar one more time. I've tried to listen to your ridiculous accusations and fear mongering statements and I just can't find common ground with you. It's exactly the same with everyone I speak to from any other organization that's upset with us. And really, it's sad. You're smart. You argue well. But you won't win any arguments smashing in windows.

But all of you are exactly the same, you simply won't listen to reason or fact. We're done here.

[He turns to exit.]

**Mark:** You can walk out on me, but you can't walk away from the storm of problems you've set loose! You might know what it is you're making, but you have no idea how it will interact with the world!

And locking me up here as your prisoner isn't going to make things any easier for you!!

*[Robbert turns to respond.]*

**Robbert:** Oh, you'd love that wouldn't you. The big scary corporation locking up the rebellious backlashing youth and shoving him under the rug. Well, surprise. Nobody here is locking you up anywhere. We didn't go out and kidnap you, you broke into our building. You're a trespasser, and a vandal. Not a prisoner. We know your name and where you go to school. We even have you on camera smashing in our windows. You can wait for the police here or they'll come looking for you at school. Either way, you are free to leave.

*[Beat.]*

Fine, stay here. But when you do leave, either on foot or in a cop car, I don't want to ever see you back within fifty miles of anyone from Avantos.

*[Robbert exits.]*

*[Mark, alone, takes his anger out on the room, then pauses to breath. He exits.]*

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### **Scene 3 - [The Interview]**

WONS, Ohio News Broadcast Center

*[Tom and Susan sit in the "Interview Chairs" at the news table of the center's broadcast room. The table has one sheet of paper on it and three white mugs atop it. There is an empty chair at the other end of the table of a different color. Susan is dressed to impress, amped. Tom is pale and tense.]*

**Susan:** So, you ready for this?

**Tom:** I hope so. I mean, I think so.

**Susan:** Oh boy...

**Tom:** No, no really I am!

**Susan:** I wish we had had more time to review those prep questions! God, why did that kid have to break in yesterday? We lost basically all our prep time.

**Tom:** It was pretty rattling. I mean, we've had protesters outside the building before, but no one has ever broken into the building.

**Susan:** I'm just glad it was a kid and nothing serious. You're feeling rattled though? We can cancel this interview right now Tom. But tell me, right now.

**Tom:** No, Susan I'm fine. It's just, well, you could have picked anyone else for this interview. Someone younger or better looking —

**Susan:** Speaking of which, come here, your makeup is smudging a bit.

*[Susan produces a cloth, and gives Tom a touch-up.]*

**Tom:** I can't believe I have to wear make-up for a five-minute TV interview. But my point is, you could have picked Rebecca, or Robbert, or any PR person, but you chose me and—

**Susan:** —Because you know the most about plant science out of anyone at Avantos. This is your work, Tom. And I chose you because I think that if you just explain what you do, and why you do it everything will be fine.

**Tom:** Okay.  
Thanks.

**Susan:** Of course.

*[Allen Reckwether bursts in drinking an iced coffee and eating a donut. His tie is untied, but he is otherwise immaculately prepped and kempt.]*

**Allen:** Ah! Avantos people! How are you doin'?

*[Allen heads straight for the empty seat, his seat, and settles in. He ties his tie.]*

**Allen:** Sorry for the little delay folks. This is an mid-day show, so you gotta eat when you can, you know! Susan, good to see you again.

**Susan:** Hello Allen. This is Dr. Thomas Hariford, the head genetic researcher at Avantos labs in Ohio.

**Allen:** How ya doin'?

**Tom:** Hello.

**Allen:** Have you both eaten. Can I get you anything? We have interns who make the worst coffee you've ever tasted, but it's worth it to have something to complain about when you get home. HAHA!

**Susan:** No, I think we're good. Thank you though.

**Allen:** Ah, afraid our coffee has been genetically engineered? Haha, I'm just messin' with ya! So, Tom, you look a little nervous. You ever been on TV before?

**Tom:** Just when my family puts our home videos on the screen.

**Allen:** Well, welcome to the show. It's real simple. You don't even need to look at the camera. We angle them so you'll look perfect! Just talk to me like you would over coffee, and the whole thing will be done before you know it. We won't even be interrupted for a commercial break with this one, so just sit back, relax, and enjoy the ride.

**Tom:** Uh, Thanks.

*[A time call is shouted. Allen stashes his supplies below the desk.]*

**Allen:** Ah, well, this is it! Don't worry about that stuff, they only film above the desk. When that little red light goes on, we're on. Here we go!

*[Allen adjusts himself in his signature position. The lights change, and the broadcast begins. Susan perks up, but Tom visibly sickens.]*

**Allen:** Good morning, you're watching WONS, Ohio News. I'm Allen Reckwether and welcome to the *Morning Delivery*.

Today to discuss the pressing controversy surrounding genetically modified foods, we are joined by two very special guests. Dr. Thomas Hariford has a Ph.D in genetic engineering and is the head researcher at The Avantos Company for plant sciences. And he is accompanied by Susan Orlov, head of communications also from Avantos. Thomas, Susan. Welcome to the show.

**Susan:** Hello!

**Allen:** First of all, let me thank you so much for coming down in person for this interview. All of this Genetic Modification science or GM, GE, or GMO, did I get all of those right, all of this science seems really new and confusing to some of our viewers and it's really wonderful to have some first hand explanation of how these things work.

**Susan:** Thank you, Allen. Avantos is always happy to engage with our customers and the public about our science. While it can be very complicated, and Avantos is making brilliant new strides with genetic engineering every day, the main science we use isn't really new. In fact, genetic engineering technology has been studied heavily for almost 60 years now.

**Allen:** Really? That long?

**Susan:** Well, GMO foods from products not just from Avantos, but modified products in general, have been in products on grocery store shelves for almost two decades now. In fact, they're in almost 70% of all processed foods. Mainly corn and soybeans, but a growing variety of foods are available.

**Allen:** So if these foods have been on the shelves for so long, how come we are only hearing about them now? Have the public been misled? I mean, don't we have a right to know what the composition of our foods are?

**Susan:** No no, certainly not misled. Avantos has always followed all guidelines for the growth and distribution of our products on the market.

**Allen:** Of course. But don't you think that this issue is surfacing in part because of concerns that were not communicated to the public earlier? Dr. Harriford?

**Tom:** Um...

**Susan:** (interjecting) I think people have always tried to be healthy, Tom, but I also think people today are more curious than ever about what goes on their plates. There's been a whole foodie movement, people photographing their foods and posting them on social media. They're sharing recipes and nutritional information, and it just turns out that this curiosity has people realizing that companies like Avantos, and others, have been helping to improve our foods for a long time.

**Allen:** So you say improve, but a lot of people are pointing to some recent studies which say there are a lot of things to worry about with these GMO foods. We have studies linking them to inflammation and adverse health effects. We have other people arguing that these plants are creating super-weeds and super-pests, resistant to herbicide and pesticides...Dr.Hariford, what do you tell people concerned about these effects?

**Tom:** Well, um...well...there are always things to be worried about when..., um. Sorry, what did you ask again?

**Allen:** So, speaking for Avantos, with your scientific opinion you would say that GMO crops are a danger to the environment?

**Tom:** (*Poorly presented*) Um. Well. No. No. I wouldn't say that. Pesticides are... evolution is... See with genetic engineering it's not a very precise science, to add a gene or shut off a gene. We can know exactly what it is we are changing, but we don't always know right away how that little modification will change the bigger picture. What we try to do is find changes that are so little — so negligible — that it's almost like we didn't change anything at all, just how these thing happens in nature.

**Allen:** I see.

**Susan:** [*whispering, seeing Tom failing*] Tom, Tom! The plant!

**Tom:** Oh, right. I made this plant!

*[He reveals the plant from below the desk to the top of it. The lights dim and adjust. Everyone takes an awkward moment to embrace the plant's presence on the desk.]*

**Allen:** It glows.

**Tom:** Yes. It glows.

It's a plant that glows because it has been genetically modified to do so. After careful study, I — well, Avantos, grew this plant with a gene found in jellyfish at the bottom of the ocean! And with that new DNA, the plant can now produce a completely natural enzyme that makes it glow.

This plant is a GMO - a genetically modified organism. And we made it.

**Susan:** (*under her breath*) Tom?

**Tom:** This plant would never have existed if we didn't make it. But we have. Cellphones, airplanes, the internet. Skyscrapers, cars, and factories. All of those things wouldn't have existed if we hadn't worked to make them. And we did.

Why did we make them?

Because we think, we feel — **we know** that we have the ability to improve. We as a species are driven to improve our condition. To shape the world in our image. It might not be humble, but it is always out of a common desire - out of love. A desire to live our lives better. We invent because from our love for our families, friends, and communities, we want to make their lives better too. Simpler. Easier. More comfortable.

As an Avantos employee, and I probably shouldn't be saying this —

**Susan:** [*Now whispered through her teeth*] Now is not the time to be a hero, Tom!

**Tom:** — but I can't guarantee the safety of our products. I cannot detail to you the profit-related-reasons for why we grow GMO plants, or their benefits to society. I cannot deny that they might change the world, or our natural environments. But to me, as a scientist, I don't walk into the lab thinking about profit margins. I don't think of Bt corn as any different from paving a sidewalk or building a mall. Plants have problems. The foods we eat have problems. They experience the same struggles we experience day to day. And I work on how to fix them. And if I know that making one small change to the DNA of a plant could feed just one more person, I don't need to ask any more questions.

Now this plant here isn't edible, but it is beautiful. And to me that says it all. Our work at Avantos is beautiful, amazing science. And maybe, when this little plant grows up, who knows? Maybe we could line our sidewalks with them and eliminate streetlights. Maybe we've just found a new, natural alternative to the candle — the lightbulb that will last us the next hundred years. God gave us the intelligence to improve the world around us, for plants, humans, and all creatures. And we should not let that gift go to waste.

**Allen:** Well, uh...that was a very heartfelt answer, Dr. Hariford. While I'd love to hear more, unfortunately we have now run entirely out of time. Thank you so much again Dr. Hariford, Susan, for your time.

Coming up! A new state highway policy that could save you money at the gas pump? Stay tuned for that story and more after the break.

*[Lights change and the broadcast is over. A casual ambience immediately flows in. Tom holds his plant at arm's length, but with a grip of steel. Susan is now the pale one, she is appalled. Allen resumes eating his coffee and doughnut.]*

**Allen:** WOW! Haha, well! We haven't had a report like that on WONS in quite a while! Hot dog, I have to see what kind of traffic we're getting on the web! You're a rockstar, Dr. Hariford! It's been a pleasure!

**Susan:** He's a complete and total idiot!

**Allen:** Oh come on, how many times have you seen un-edited emotion like that on TV? People will be talking about this for days! Are you sure I can't get you guys anything? Like I said, coffee here is on tap, all you have to do is ask!

**Susan:** No! No thank you. Dr. Hariford and I, we should be going.

**Allen:** Hey, you don't have to leave so fast! If we really got some traffic going, I might be able to convince the network to get you some additional airtime? Interview part two?

**Susan:** Absolutely out of the question. We have to leave.

**Allen:** Okay, suit yourselves. Pleasure to see you again Susan! Bye bye!

*[Allen exits.]*

**Susan:** *[To Tom]* What the hell is wrong with you?

**Tom:** I...I'm sorry. I just...I've never been on camera before, and and you said to be honest, and...

**Susan:** Do you realize what you've just done? How big a nightmare this is going to be? This is worse than the Glyphosate interview?! Oh god... I can see it going viral now. This is a disaster.

**Tom:** Susan, it's going to be okay. We got to show them the plant —

**Susan:** We barely got to show them the plant! What happened to the way we planned to unveil it Tom? What happened to the prep-questions?

**Tom:** Well, you whispered about the plant and I just thought —

**Susan:** No Tom, I don't think you thought. I don't think you were thinking at all! That was a completely unnecessary outburst there. You even brought religion into it? Religion, Tom? I thought you'd interview well because you know the facts, but it's like you just threw them all out the window! I just can't even —

**Tom:** Susan. Please. Look, let's just return to the office and —

**Susan:** No. I'm going to go get a coffee. A decent one. Alone.

**Tom:** Are you sure that's a good idea?

**Susan:** Yes. Yes. I'll meet you back at the office later.

*[She exits, vocalizing discontent.]*

*[Tom stands alone holding his plant. Maybe he tells it he is sorry.]*

*[Tom exits.]*

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#### **Scene 4 - [Going Forward In Light]**

Tom's Laboratory in the Avantos Labs & Research Building

*[Tom's laboratory. Nothing has changed from earlier. Large stacks of paper cover Tom's desk. Sitting in the rolling desk chair is Robbert.]*

**Tom:** Rob...

**Robbert:** Well Harry, I can't let you get away without saying that I'm a bit disappointed.

*[Beat.]*



**Robbert:** I really thought you had it. I know we didn't give you a lot of time, and spreading everyone so thin was probably my fault. But still, you lost it up there. That interview is going to be rolling around the internet causing us headaches for weeks.

**Tom:** It's my personal reputation that's floating around too, in that interview. And honestly that's not what I was hoping to be remembered for either.

**Robbert:** It wasn't a bad idea Tom! You could have been the guy who created the world's first bioluminescent plant. Now you're just the guy who ripped the GMO controversy open even wider.

[*Beat.*]

I hope you realize what this means.  
I know you've been with me, with this company, from the start. You're my friend, Tom. If it were up to me you know I'd keep you around no matter what.

**Tom:** But...

**Robbert:** But the shareholders... Yes, they might only care about that bottom line, but right now you're a drain on the tub.

**Tom:** Who's lines did you steal that one from, hmm?

**Robbert:** Well, they left it to me to tell you this one, buddy. You're fired.

[*Beat.*]

**Tom:** What?

**Robbert:** Well, not officially "fired" of course. This is the end of your stay with this company, Dr. Hariford. Avantos is letting you go.

**Tom:** Don't Dr. Hariford me, Rob. I did exactly what you and the company asked me to do. Represent things as honestly as I could on public television with barely a day's notice! I'm sorry it didn't go as perfectly as planned, but you can't just get rid of your head researcher. What will happen to all of the projects underway?

**Robbert:** The company will be fine without you, Harry. This whole nightmare is a major setback for sure, but some layoffs are necessary to show we're being held accountable.

**Tom:** I've been there with you from the beginning Robbert. This company wouldn't exist if it weren't for the two of us combining our knowledge-bases.

**Robbert:** You'll still have your shares of stock in the company. It's not like you can't ever come back to say hello. This is just a formality.

**Tom:** Just a formality? What will I do now, Robbert? I told my daughter, my family, that my job was fine?!

**Robbert:** We're going to give you a glowing recommendation, Tom. You just screwed up with one little PR statement. You're still a brilliant scientist. There are lots of places for you to go and keep working with genetics. Any company would be happy to have you. You could even teach? Universities love hiring scientists with research experience, or so I'm told.

*[Tom begins to forcefully cram stacks of paper into his cardboard box on the desk. Maybe he chuckles darkly.]*

**Tom:** *[Bitterly]* Well, I knew there was the chance that this would happen, but I thought we had a shot to make it all work out. I guess maybe we had different visions. I'm sorry I'm not the perfect public image tool. I'm sorry your PR people are idiots. I'm sorry I'm just a scientist.

But don't worry. If that's the way it has to be, I'll be all packed up by the end of the day. Only a couple of boxes, and you won't have this "drain on your tub" keeping you from bathing in your own garbage.

**Robbert:** You don't have to worry about the research.

*[Beat.]*

You can leave now.

I'm sorry Tom, but all that research was funded by Avantos, and so it's our property. Not yours. You can't take any of it with you.

**Tom:** Now this is just too much!

**Robbert:** You have to leave that here.

**Tom:** To hell I will! Robbert, this is my work! I've contributed to this company for more than two decades! I was happy to give and study, I've contributed more than my fair share. I just came with this to you the other day?

**Robbert:** Look, you don't want farmers infringing on patents, we don't want anyone infringing on this one. Surely you should see how they're the same.

**Tom:** No. No it's not the same. This project is mine. It has always been mine. I shared it with you for less than a week. It was a side project. You don't get to just send me on my way without it!

**Robbert:** That decision is even further beyond the company. It's not like if I let you take it with you that you could go back to tinkering with it in your garage. I mean, especially not now, after all the hubbub you stirred up over GMOs on TV. There's going to be all kinds of reform now. As a matter of public safety you can't take that research with you.

**Tom:** OH THE HYPOCRISY! There's nothing dangerous about this work. That's been Avantos' whole argument, your argument, my argument — from the start! Suddenly out of nowhere you're barring me from my own work for the interest of public safety?!

**Robbert:** Just leave it! You already lost your job today, don't get yourself strung up in a lawsuit too.

*[Tom dumps the box of papers. He scuffles them up in rage. Robbert watches.]*

**Tom:** Some friend you are, Rob. Some friend!  
You know what? I hope this place does fall apart. I hope the activists and the competition and the politicians rip this place to shreds and takes you with it!

**Robbert:** Like you said, we both knew really well what it was we were doing, but I'm not sure we were ever really sure of how things would turn out in the end.  
You can spend whatever time you need here. And you're always welcome to come visit me. But if you leave with anything that belongs to Avantos — if you do this — I can't support you.  
Other than that, I'm a man of clean breaks. So I guess...  
Goodbye, Harry, old friend.

*[Robbert exits.]*

**Tom:** You come back here, Rob! I won't stand for this Robbert! Rob!

*[Tom crumples up one last paper, and leaves it on shreds on the floor. Tom trashes the room, until he finally reaches his plant. He lifts it to smash it, but cannot do it. He collapses into the mess with his plant in defeat.]*

*[Tom is left holding his bioluminescent plant, center stage...]  
[...it is his beacon of hope and light in the dark.]*

**[-FIN-]**

## SCRIPT APPENDIX A - Science Soliloquies

### Soliloquy #1 — Robbert's — Act 1, Scene 2

I remember the year 1999. A wonderful year. We were on the edge of the new millennium. In my lifetime, the world was about to be opened to a new chapter of progress. And that progress was everywhere. We were making computers, the internet!! And we were making papayas.

See, all of the world's papaya market — not just one or two small areas that grew them — THE WORLD's papaya supply was suffering, dying out, because of a Ringspot virus. This plant, this species, was actually at risk for disappearing entirely. Imagine, your children growing up in a world without the papaya? Would your life really be changed? Would you care?

But we cared. And the market cared. Whole families relied on growing the papaya. Relied on this fruit to survive. So scientists, researchers, and biotech companies went to work. We observed. Experimented. And in 1999 we had made a solution! 1999 was the first year we put genetically modified papayas out into the Hawaiian market. See, we had introduced a gene into the plant that allowed the papaya to fight off the infection. We had saved the species. We were heroes! Protectors of Earth!

And it was a Win-Win scenario. We had saved the papaya, and in return nature thanked us by bringing back an economy. Ah, the money... In 1999 no one would have looked at Avantos with hatred. Tobacco salesmen, they were villains, selling poisons. But we weren't selling poisons, we were...we were ambassadors of the future!

But now we're villains. Demonized for taking risks. But "you can't make an omelet without cracking some eggs". We didn't know for sure if we could save the papaya — but at least we tried. We went through two decades of research, and paid for every early risks. But now the public feels like they're the ones paying out, and that we're just sitting on profits. We were the ones who payed. I'm the one who's paying. We payed heavily to set the wheels of change in motion, and anyone in doubt of that is just jealous of our success!

## SCRIPT APPENDIX A - Science Soliloquies

### Soliloquy #2 — Susan's — Act 2, Scene 1

What a day! ... What a day....

They say Rome wasn't built in a day. That it didn't fall apart in a day either. But do you know how much notice I was given about today — this day?  
Twenty four hours. Just one day...

I mean, sure, we knew this report was coming out for a while. Sure we knew that if the local news stations couldn't be persuaded to let this story go that something drastic would have to be done... That we would have to send some people out to find a positive response plan to their misguided accusations.

But send out some people? No... They just sent me.

Imagine, you wake up, get dressed, go to work and settle in behind your desk. And then you're just told: "Here. Here's a ticket to Ohio, we want you there tomorrow. You'll be in charge of the Avanto's response through their local television media."

And you can't just say no. I mean, what if I had kids? A husband? A family?

Well you don't. Well, okay.

Just hop aboard a plane and take care of our problems...

And sure, as I leave I see men scrambling to phones and shouting behind doors. But how many of them are being asked to board a plane and be on TV tomorrow?

I should be happy! Right? This is being entrusted with a serious mission. And I've never been to Ohio; it could be fun!

But this isn't a planned vacation. And this isn't being "trusted". This is being forced into saving a sinking ship, or being the scape-goat for whatever storm blows in after it sinks.

I know I can handle this... but in the few hours that I've been here, I've only had my ideas rejected, my attention pulled in every direction, and my time wasted by people who see me and don't even think to respect me or my commitment to them. An absolute lack of any support from administration.

And now I'm instructed: "stay here, watch her, and Tom will be free to talk to with you soon."

We're in the middle of a crisis and this is what you think is the best use of my time?

This is the highest level of support you think I can provide?

Still... I enjoy watching her... We haven't crossed paths with a single other woman in spending the last hour wandering through the labs, and her presence is comforting. I think I was like her once... See, she fakes apathy and disinterest. Why does our culture support that attitude? But under the charade you can see her curiosity. Her passion for discovery. Her calculating understanding of her surroundings. We should be asking her what to do!

The world needs every talent available — because a truly inquisitive...positive... loving soul (female or male) is becoming harder and harder to come by...

**SCRIPT APPENDIX A - Science Soliloquies****Soliloquy #3 — Tom's — Act 2, Scene 4**

(\*\*NOTE: Omitted Performed in Final Performance)

Of course, when I look back at this moment, I wonder what could have happened differently. Did I not do the best that I was capable of? Did I not do what I felt was right being in the position I found myself in? What portion of my story would you change to ensure the security of job, my family, — to keep my reality from being shattered? And if you could go back in time, and change this ending, my story, for the “better” — would my story still be “right”?

And then you could also wonder, as I wonder: What gene could have been added to my being that would have saved me my job? What change could have been made to my genetics that would have saved me from this moment of suffering? From this moment of...of stepping out of security and back into the unknown? Would a change that kept me from this fate and kept things as they had been at the start — would such a change be “correct”?

Is making a genetically modified organism... “correct”?

These conjectures are not scientific, but they assure me that no change, be it as small as the change to the genetics of an organism, or as large as the formation of a star — no change is free from the ever-reaching shadows of the unknown. There will always be outliers. There will always be statistic anomalies, and random odds. There will always be fate. But we cannot let this devalue our actions, our intent.

Science provides us the truths of our world, but it does not assure us our futures. We can only strive to create manifestations of our good will from the best of our current knowledge, and pray those actions shepherd in a future of good fortune.

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Mike Punter	Downing Cless



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## LUMINESCE: A BioDramatic Fiction

### CAST:

(in order of appearance)

Tom Hariford .....	Ben Fuligni
Robbert Sleck .....	Ben Nissan
Allen Reckwether .....	Orian Sneor
Susan Orlov .....	Jennifer Sohn
Jessica Hariford .....	Julia Bront
Mark Lance .....	Harrison Downs

### SCENE LIST:

<b>Act 1</b>	<b>Act 2</b>
<b>Scene 1</b> — Opening Sequence	<b>Scene 1</b> — In Which Susan Explains Things To Jessica, and Tom Explains Things To Susan, and Many Questions Are Answered...
<b>Scene 2</b> — Growing Pains [or, The Assignment]	
<b>Scene 3</b> — The Roots [A Flashback to the 80's]	
<b>Scene 4</b> — Symbiosis	<b>Scene 2</b> — The Break-In
[[ <b>Intermission - 10 Minutes</b> ]]	<b>Scene 3</b> — The Interview
	<b>Scene 4</b> — Going Forward In Light

### TECHNICAL STAFF & DESIGN TEAM:

<b>Playwright &amp; Director</b> Wally Napier	<b>Primary Thesis Advisor</b> Barbara Wallace Grossman	<b>Sound Designer</b> Gabriel Terracciano
<b>Stage Manager</b> Colin Burnett	<b>Production Manager</b> Jo Williams	<b>Light Designer</b> Jonathan M. Rooney
<b>Poster Design</b> Imagnet Jocelyn Chen Erica Massaro	<b>Theater Manager</b> Joanne Bertelsen Barnett	<b>Set Designer</b> Irem Bugdayci
<b>Lighting Mentor</b> Brian Lilienthal	<b>Costume Designers</b> James Williamson Kevin Lombard	<b>Sound Board Operator</b> Nicky Carne
<b>Design Mentor</b> Brian Lilienthal	<b>Costuming Mentor</b> Linda Ross Girard	<b>Carpentry</b> Daniel Ward
<b>Guest Speakers</b> Sheldon Krinsky Johnathan Garlick Nina Stein	<b>Assistant Technical Director</b> Robyn Goodner	<b>Technical Director</b> John Mulligan
	<b>Department Administrator</b> Rita Ortolino-Dioguadi	<b>Department Chair</b> Heather Nathans

In my study and creation of BioDramatics, I have found that both artists and scientists, biologists and thespians, and audiences of all kinds are only just beginning to find the appropriate vocabularies to explore and appreciate scientific information in the theater.

My goal in writing this play was to present a narrative driven by the tension and emotional weight of the science and biology of Genetically Modified Organisms, or GMOs. It is difficult to create a narrative around scientific information that is both honest and captivating. Because of our systematized separation of disciplines in academia, plays addressing science are difficult and challenging to write or stage. We instead form the illusions that audiences and actors don't care about science, and that scientific study is free from emotion and humanity. These beliefs are seriously damaging to both fields of work.

Such separation not only inhibits cross-discipline discussion, but takes a toll on our dramatic pursuits as well. Playwrights who do not have a strong background in the sciences may write a script where the plot is completely irrelevant to the truth of the facts they include. For example, the playwright may tell the story of an intricate and fascinating love affair, and then afterwards attempt to hang the scientific facts on top like ornaments. But here the science is not substantive, and audiences struggle to reconcile the factual material with the plot. Alternatively, the problem can arise from the other direction — and an individual with a strong scientific background who attempts to present factual material dramatically may simply hang some characters over the facts with no attempt to communicate why the science is significant to those individuals personally. In other words, there is no true emotional connection or dramatic tension between the story and the science. It is this disconnect that I hope to resolve with **BioDramatic** productions like *Luminesce*.

What is often overlooked is that both artists and scientists are skeptical seekers of truth. Through precise craftwork, they absorb and observe their surroundings to develop hypotheses that explain their discontent and satisfy their curiosity. As you watch *Luminesce* tonight, I hope that you too will adopt the role of the passionately curious observer — always asking the questions of who is on stage, who is not, and why? Who is given a voice, and who do we neglect? Which characters are telling me biology facts? Why? Do I trust these individuals? Do I like them, and what do these feelings mean? Who is allowed to have an opinion about how we should apply scientific knowledge? Ultimately we must ask: **How do I feel about these issues?**

In an early rehearsal, one member of the cast commented that the play's ending did not seem to supply any resolution for them, and they asked me if this was intentional. I too believe I have written a play without resolution, because in all honesty the issues explored in *Luminesce* have not yet been resolved in our year 2015. Scientific study is a never ending process, and so too is one's personal connection to an artistic work. *Luminesce* aims to objectively stir you into a passion for the science of genetics through juxtaposed biology and emotion. If we have succeeded, you will leave the theater this evening a little more informed on the science and controversy of GMOs, with an emotional connection to some of our characters, and most importantly a desire to continue to ask questions. Thank you so much again for your support and your attendance at this evening's production of *Luminesce!* Please, sit forward and enjoy the show!

— Much thanks, Wally Napier

## Appendix B — Program from the 2015 Performance of *Luminesce: A BioDramatic Fiction*

### PERFORMING CAST

**Julia Bront (Jessica Hariford)** is making her theater debut at Tufts. Previously, she has been involved in stage performances for many years. Some of her favorite productions were *Dracula*, *Alice's Adventures in Wonderland*, *Beauty and the Beast*, and *Almost, Maine*. Off the stage, Julia is interested in pretty much everything. She's very involved with the ballroom dance team, despite being off-balanced and a terrible klutz, as well as Tufts Literacy Corps, Spoken Word Alliance at Tufts, and of course, the Tufts Baking Club. As a freshman, she has no idea what to major in, but she plans to pursue law in the future. For now, she'll stick to English, Spanish, Computer Science, and anything else she can squeeze into her schedule.

**Harrison Downs (Mark Lance)** is a first-year who is thrilled to be performing in Balch for the first time! He is planning to study Computer Science at Tufts. He is originally from New Orleans, Louisiana where he was an active participant in his high school's theater productions. Some of his favorite shows from there include *Into the Woods*, *The Music Man*, and *Romeo and Juliet*. When not acting or studying, he enjoys writing, building things, and otherwise being a complete and utter geek. He would like to thank Wally and the entire Cast and Crew of *Luminesce* for being wonderful and making his first production at Tufts so amazing.

**Ben Nissan (Robbert Sleck)** is a sophomore majoring in Physics and Computer Science who could not be more excited to be in *Luminesce*! You may have previously seen him yelling at people in Balch last year as Chuck in *She Kills Monsters* or Harold in Play by Play's *The Murder of Harold French*, and he promises to continue doing so tonight. When not yelling at people on stage, you can usually find Ben yelling at people in tune with Enchanted, Tufts' most magical a cappella group, or slowly decomposing in 574 Boston Avenue. Ben feels a special personal affinity for this plant-heavy show, as he is in fact a walking seasoned potato wedge. This is his way of insisting that potatoes are totally vegetables, he swears. Ben would like to thank Wally, Colin, and his fellow cast for all their hard work, and hopes you enjoy tonight's show!

**Ben Fuligni (Tom Hariford)** is a sophomore studying Drama and Computer Science. You may have seen him in *The Children's Hour*, *At The Vanishing Point*, and other things. He is really terrible at writing bios, and so will stop now before things get out of hand.

**Orian Sneor (Allen Reckwether)** is a freshman at Tufts and *Luminesce* is his first show here. He intends to study cognitive science, theater, and ethics. When he's not reporting for WONS Ohio News, Orian is on stage performing with *Lord Barnum's Players* or *Major: Undecided*, teaching kids engineering with STOMP, or making podcasts with the Tufts Podcast Network. Orian may have definitely overcommitted himself... but he wouldn't want it any other way. Past theater experience includes: nothing worth mentioning except being the president of his high school drama club. Orian would like to thank the members of the *Boston Shakespeare Project*, his hall-mates, and all the people who have made him feel truly loved and supported here at his first semester in college. Orian is glowing with pride to be part of *Luminesce*. All he has left to say is GmO big or GmO home! The show must GmO on!

**Jen Sohn (Susan Orlov)** is thrilled to be involved in this amazing production. It is her first show at Tufts and she is so thankful to have gotten to go through this new adventure with such great people! Past theater experience includes singing in the ensembles for *Phantom of the Opera* and *Mary Poppins*. When not on stage, you can find her writing papers and problem sets in the Tisch stacks, helping out with Engineers Without Borders, or kicking it with the Tufts Tae Kwon Do team. Jen would like to thank the cast and crew, her friends for the support and sass, her sister for her moral support and long-distance love, and her parents for coming to see the show!

### CREATIVE TEAM

**Colin Burnett (Stage Manager)** is a senior Pisces who will someday own a manatee farm in Florida. In the mean time, he is determined to taste every type of cheese in the United States and collect fun socks from each of the 50 states. Enjoy the show!

**Irem Bugdayci (Set Designer)** is very excited to be a part of *Luminesce* as a set designer. Coming from a background of architecture, it is her first experience in a production. She is a Junior majoring in Architectural Studies and Art History. She is a part of the Art History Society at Tufts and loves sculpting, drawing and designing art installations in her free time.

**James Williamson (Costume Designer)** is so happy to be costume designing his first show here at Tufts. He would like to thank Linda for supporting him in all his costume endeavors and Wally for taking a big leap and having him coordinate this show. He hopes that you enjoy the show!

**Kevin Lombard (Assistant Costume Designer)** is extremely excited to have assistant costume designed his first show ever! He learned so much under the tutelage of legendary designer James Williamson, and only hopes that in the future he can emulate James's talent, drive and passion for costuming.

**Jonathan Rooney (Lighting Designer)** is a sophomore mechanical engineering major who, between *Luminesce* and *Little Shop of Horrors* (Technical Director), has only worked plant-themed shows this semester. Jonathan killed five different houseplants last year. He is not yet certain of the implications on his show schedule. Thanks to a certain blue-haired goddess for keeping him humble.

**Gabriel Terracciano (Sound Designer)** A native of Portland, Maine, Gabriel has been playing the violin since the age of three. After eight years of strictly classical training, he discovered the jazz violin playing of Joe Venuti and, later on, Zbigniew Seifert, who both changed his musical life (and life in general!) forever. Gabe is currently completing his Double-Degree program at Tufts University/The New England Conservatory of Music majoring in Peace and Justice Studies and Jazz Violin Performance. He has studied under the tutelage of Cecil McBee, Tanya Kalmanovitch, John McNeil, Jerry Bergonzi, Nick Kitchen, Billy Hart, Jason Moran, and Frank Carlberg while at NEC. He has also spent a large part of the last year in Ghana, where he played extensively with the Ghanaian National Symphony Orchestra, along with other smaller classical and jazz groups. He has also played throughout the United States at venues including the Bar Harbor Jazz Festival (Bar Harbor, Maine), Merrill Auditorium (Portland, ME), The State Theater (Portland, ME), The Know Tomorrow Festival (Boston, MA), The Lucas Theater (Savannah, GA), and The Berklee Performance Center (Boston, MA) as both a leader and sideman. He has recorded with bassist Ron McClure on two albums for Steeplechase Records (*Crunch Time* in 2012, and *Ready or Not* in 2013), and with acclaimed pianist Samuel Ascher-Weiss (Shnabubula) for the album *Americana Dawn: Civilized Folk* (2013). He would like to thank his family, teachers, friends, and colleagues for all of their loving support.

**Wally Napier (Playwright & Director)** is a Senior at Tufts University with a self-designed major in *BioDramatics*. He has always had a deep passion for both Biology and the Performing Arts. In high school, Wally won several first place awards at state science fairs for his work on the phylogenetics of tube worms around hydrothermal vents, while simultaneously starring as The Proprietor in his school's production of *Sondheim's Assassins*. His summers were spent on the Balch Arena Stage in the *Tufts Magic Circle Theater*, once playing Daddy Warbucks in *Annie*. More recently, Wally has performed improv comedy with the *Cheap Sox* troupe at Tufts, and the *Royal Holloway Players* in England. He has also performed various roles in college productions of *Merrily We Roll Along*, *The Wedding Singer*, and in the Tufts' original *Hamlet The Hip-Hopera* as Polonius. His first successful self-written play, *Milkshake Moments*, has been staged several times, first winning a staged reading at the Boston Playwrights' Theater as part of their annual young playwrights' competition, and later being staged both at Tufts and in the UK. He is incredibly thankful for all the support from his family, his major advisory panel, to everyone in the acknowledgements section, and of course he is most thankful for his absolutely amazing cast and crew. He is thrilled to be having his first full length play staged, and hopes you enjoy the show!

### Welcome to Luminesce!

First and foremost, thank you so much for coming to see this world premiere of *Luminesce*! The show is the culmination of over three years of work, and so it is absolutely thrilling to finally see the script brought to life by a brilliant cast of dedicated actors! This production is the practical component of my thesis work for an interdisciplinary studies major examining the intersection of biology and drama — a field of study I have coined: **BioDramatics**. But what exactly is BioDramatics, and how is *Luminesce* a BioDramatic fiction? These are the first questions always asked about both my major and the show...

From penning the dialogue in the script through working with the actors in rehearsal, I have attempted to use biological science to inform as many components of the production as possible. The work is therefore **BioDramatic** not only in the content and issues it probes, but also in its very presentation. Our process was constructed from a groundwork in the biological fields of genetics, botany, biopsychology, neuroscience, animal behavior, and human anatomy. We warmed-up in rehearsals using exercises pioneered by directors such as Anne Bogart, Richard Schechner, and Katie Mitchell — who have developed new theater theories in response to findings in these aforementioned fields of biology. Of particular interest is the discovery that human emotional processing occurs after an individual takes action. For example, when one runs away from a dangerous animal, it is only once the individual reaches safety that he truly begins to process the emotion of fear. This finding from a study in biology drastically changes how an actor can go about embodying emotion. Instead of attempting to summon up an emotion first and then present a related action (as in traditional acting techniques), our actors attempt to naturally feel emotions after taking action and presenting this truth instead. Though there are many people to thank for this production (please see our acknowledgements page), the biggest thanks must go out to my cast for all of their hard work and for enduring all the bizarre warm-up exercises or strange BioDramatic theories we discussed in rehearsals.

But of course *Luminesce* is ultimately a work of **BioDramatics** in its presentation of the science of genetically modified organisms. The science of genetic engineering is rapidly advancing every year — introducing amazing potential benefits, as well as possible risks. (Just google the technology of **CRISPR** and you will hear the enthusiasm and debate from the scientific community!) Companies like Monsanto, Syngenta, DuPont, and others have found incredible ways to combine our knowledge of chemical and biological sciences in remarkably novel ways to improve the agriculture industry on a global scale. But both the risks and benefits of genetic engineering should be critically reflected upon — not only for matters of safety and ethics, but also reviewed agriculturally, environmentally, economically, and politically. The only way to engage in this kind of reflection, however, is if everyone involved is both accurately informed and passionately aware of each other's honest opinions at the debate table...

The Director's Note is continued on the final page of your program. Thank you.



