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Hypatia's Math: A Play

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Hypatia's Math: A Play

Cover Page Footnote

This play was developed while I was a graduate student at Prescott College and at California State University Long Beach. Thanks to Meron Langsner, PhD, for comments and mentorship, and to Mike Levin of FALA and Fuzz Roarke & Elena Kostakis of Spotlighters/Strand Theater for the first two productions. And love always to my parents.

Hypatia's Math: A Play

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Synopsis

Hypatia of Alexandria was the most famous woman mathematician of antiquity, and her story is as relevant now as it was in her day. This play tells her story. While the events in the play are based closely on extant historical texts, inspiring excerpts from classical works by Porphyry, Plotinus, Aristotle and Plato are woven into the action to further the plot and add to the classical mood. Dance and music, including an Homeric hymn, add to the artistic texture.

Plot Summary.

A young woman (Hypatia) in Roman Alexandria develops herself into a gifted geometer, mathematician and philosopher, but her world is destroyed by the growing darkness and political strife that emerge. Religious fundamentalism builds steadily in this clash of cultures.

Cast Requirements.

Minimum of six (6) actors.

Major Characters: Hypatia, Synesios.

Minor Characters: Listed in the following table; minor characters are grouped as they appear in various scenes to allow for ease of casting. For example, the same actor could play Emperor Constantios, Athanasios, Orestes, Cleonios, Athanasios (again), Monk6, Theon, Bishop, and Hierax without any scenes conflicting.

Emperor	Athanasios	Orestes	Cleonios	Athanasios	Monk6	Theon	Bishop	Hierax
Empress	Theodosios	Heliodoros	Trypho	Heliodoros				
Martyrios	Gaios	Ammonios		Gaios				
Messenger	Theotecnos							

Others: Children, Christians, Dancers, Dancers (Women), Disciples (Other), Guards, Jews, Monastics, People, Townspeople, Women.

Artistry Details.*Songs*

Act I Scene II — Monastics

Act II Scene VI — Hypatia

Other Music

Flute: Act I Scene III

Kithera (or other stringed instrument): Act II Scene VI — Hypatia

Music: Act III Scene VIII

Dances

- Act I Scene IV — Dancers
- Act I Scene VI — Townspeople
- Act I Scene VII — Dancers (Women)
- Act II Scene II — Disciples, Women
- Act II Scene VII — Dancers
- Act III Scene I — Dancers
- Act III Scene IV — Dancers (Women)
- Act III Scene V — Dancers (Women)

Philosophy Texts Quoted

- Act I Scene VI: Porphyry, *On the Cave of the Nymphs*.
- Act II Scene II: Plotinus, *An Essay on the Beautiful*.
- Act II, Scene IV: Aristotle, *Physics*.
- Act II, Scene VI: "Hymn 14: To the Mother of the Gods." *Homeric Hymns*.
- Act II, Scene VII: Plato, *Crito; Or, the Duty of a Citizen*.
- Act III, Scene II: Letters 10, 15 and 16. *The Letters of Synesius of Cyrene*.

See *Text Sources* at the end of the play for more complete bibliographical information.

Dedication.

To my parents, who have been supporting my creative endeavors all these years.

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Act I Scene I – Emperor Constantios' Edict

Scene: Private chambers of Emperor Constantios, where he and the Empress are bathing, both with water, and scraping with oils.

Characters: Emperor Constantios – Eastern Roman Emperor (fourth century); Empress; two Servants – Martyrios and Messenger.

EMPEROR CONSTANTIOS: My foot is Laodicea.

EMPRESS: Yes. Have there been uprisings in Laodicea this week?

EMPEROR CONSTANTIOS: Thankfully, no.

EMPRESS: Good. I'd hate to see bloodshed there.

EMPEROR CONSTANTIOS: Quite right. My right thigh is Eastern Aeolia.

EMPRESS: Yes. And have there been uprisings in Eastern Aeolia recently?

EMPEROR CONSTANTIOS: Let me see. Martyrios!? Yes, come here. Tell me news from Aeolia.

MARTYRIOS: None recent sir. The last was of massacres two years ago, outside of Jerusalem, young men.

EMPRESS: Where is that cut from?

EMPEROR CONSTANTIOS: This? (*points to . . .*) A new wound, a reminder of mortality, the poke from a thorn, hunting, trying as I was to find solace in the chase, and never has it been so chaste – no luck with boars nor gazelles, strong luck ever from Our King who Saves, whose thorns hang down before my eyes, and blood, everywhere. But we are not in Heaven. And the boars and gazelles were shy today.

EMPRESS: It doesn't look that big.

EMPEROR CONSTANTIOS: Oh. (*Points to cut, then points to right thigh.*) Aeolia is rising. (*Points to foot.*) Laodicea, too. (*Points to navel*) Alexandria is rising.

EMPRESS: Oh. Has there been famine in Alexandria?

EMPEROR CONSTANTIOS: Our Lord is so merciful, no. I should think there has been enough food.

EMPRESS: Let's see. . . . Any predictions?

EMPEROR CONSTANTIOS: Maybe a fig. . . . Any predictions? My wife, you remind me, like the sky which circles the stars for time, you are strong with hope and beauty, both. You remind me to call. To send a Messenger. Message! (*That last was a call for a messenger.*)

(*Addressing the Empress*) Laodicea will have its council soon, and this is good news for the (*points to self and Empress*) faithful. We've not had any problem in our body, but the body of this place does indeed have its (*points to head*) temples, and these temples are forever going to be a source of dogged and strong challenges, acts of turmoil. One Sun rises and another sets... and in them are an abhorrent two dates set for one holy Christian feast. One calendar but two dates given out as equinox and spring.

With charlatan charts of the future, sacrifice a goat upon the altar, burn incense and find a trance from the sky, which will make the world blinder than an eye from that goat gazing at my navel. With tables to mark the stars, there is sure to be a mathematician, astronomer or soothsayer bringing some armillary sphere into that chamber of insurrection which we have no intention of letting stand. It is our royal right to set the calendar aright. When words and dates and feasts are double sprung, then other banners will claim that we are undone. Yes, we do not like to think such thoughts, not like this.

(*Enter Messenger.*)

I think Laodicea will be fine. Let me make a strong edict.

(*To Messenger*) "No one may consult a soothsayer nor mathematician. So says Emperor Constantios, on pain of death." Have this sent to every single city and town large enough to have a marketplace. Thank you.

(*To Empress*) My wife, you remind me of hope and beauty, both, in the furnace of dark lands ruled by the Sun. I will never tire of seeing you rise.

Act I Scene II – Monastics and the Council of Laodicea

Scene: Monastery in Constantinople, fourth century, monastics breaking bread (eating) together.

Characters: six (or more) Monastics – dressed in dark robes.

MONK1: What a miracle (*looks up at his hand, holding a piece of bread*) is bread. Risen from the silver coin which bought it. Greater than the coin.

MONK2: Go on?

MONK1: Bread is virtue, full and sweet, with no sword hiding to take the bread from your fingers. Some may steal your sandals or your purse, but hard pressed to take bread from your hand. It is yours, impressed like the Faith in Our Lord, inseparable from the flesh which holds it dear. (*To another*) Pass the fava beans.

MONK3: This is a nice salad, beautiful cucumbers.

MONK4: What is that – water or wine?

MONK5: Are those (*points to neighbor's sandals*) comfortable? Have you come far with them.

MONK6: Yes, Laodicea is far, and I have been three weeks walking, from Laodicea to Constantinople. Nothing special. The laces are (*lifts his foot*) a bit wide, that's all. Yes – they are good for the journey. Far and near, like those who practice.

MONK1: And those who sing – (*in song*) "Give us this day, our daily bread, and forgive us our trespasses."

(*a few more join in*) "as we forgive those who trespass against us. And lead us not into temptation, for Thine is the Kingdom, and the Power, and the Glory, forever, Amen."

(*To another*) Hope, Harmony and Beauty. Perfection's song, a Trinity, in the voice. I grow wise from ear to ear, and the ear becomes distinct as if it were a mother's voice, and from the mother comes a new Savior.

MONK4: Is that milk salted?

MONK2: Is that your Trinity? Hope, Harmony and Beauty? It's a good one. Or, Kingdom, Power and Glory? I'd like that. Or, Perfection, Ear and Mother? Which is your Trinity, or do you have another?

MONK3: Mine's Grammar, Logic and Rhetoric. A Holy Trivium.

MONK6: (*To Monk3*) Quiet . . .

MONK1: Certainly not Quadrivium – (*counts on his fingers*) Number, Harmony, Geometry, Astronomy. There's no ring to it. Do stars move in circles about the heavens? The kingdom of the sky is wide, says Our Lord, but none may enter except through Me.

MONK6: Just so . . . Just so . . . Just so . . . and a fourth time. "Priests may not practice mathematics." That's from the Council, from Laodicea, this year. They are worried we will set up our own feast days. We will track the heavens and say the equinox is now... or now... or now... or now.

MONK5: Apples, Honey and Wine, a Holy Trinity, I'll say.

MONK6: None's sweeter than a study of the Blood of Our Lord. Who would love so deeply and gave his life for his fellows, for life eternal. (*Quietly*) Pass the wine. (*To the group*) It was quite a sight, hundreds and ten thousand more priests and bishops, many drunk like wine on the philosophy and the writings of the day. You could have counted the literate more numerous than the illiterate for the first time in the history of Laodicea. We talked and ate, prayed and stayed in deep discussion very late. The result was this: "Priests may not practice mathematics." Keep the mind fast to the Word, to letters and writing, and far away from the works which bear such worldly little fruit, as Astronomy. To keep us safe, to build a wall around the priesthood, an unassailable wall. To keep us safe from dissolution in those dreadful practices, like divination, which are not rooted in reality. What is the number of this star or that star? Count the grains which fall on the side of a jar. And soon you are believing in a future of goats, sacrificed on the altar, whose guts spell out the word of God. Better just to study the Word. Lord keep us safe.

MONK3: Amen.

MONK5: How many are we? We'll say grace after meals.

MONK2: (*Says number of people present*)

MONK1: Shall I? (*Starts singing*)

(*lyric*) Blessed is The Lord our God, Sovereign of the universe, who sustains the entire world with goodness, kindness and mercy. God gives food to all creatures, for God's mercy is everlasting.

Act I Scene III – Hypatia's Ghost

Scene: Fifth century Alexandria, a palatial home.

Character: Hypatia's Ghost.

HYPATIA'S GHOST: (*Flitters around the scene*) . . . (*Looks in a mirror*)

But alas! No reflection. . . . It's hard to see what would or could not be as I am not myself, I am not me. . . .

(*Draws a circle in the air, then a triangle superimposed on the circle, then reaches through and pulls out an imaginary rose, and brings it to her nose*) . . .

The smell of flowers, how I miss them so, but better me to have had the light of mathematics, and of circles and geometry? (*Makes large frown*) But . . . no nose for flowers. No head for thoughts. No life at all is left in me. All's quiet upon the waters of infinity.

(*Flitters around the scene some more, then stops to face the audience. Stomps.*)

Oh what gentle soul was my father, the noblest of men, happy Theon whose leadership made Alexandria shine. He lived in realms of pride, with lamps and oil and wicks – as with words of mathematics he'd make all the world divine. He sat and copied text and word, chart and all the Museum could contain, while there was yet time. He was the one to transmit Euclid to the world.

Divine. (*Holds up two hands*) "Di" is two and . . . "vine" a wind. Blow and see which one will fall. Aristotle says not on chance, but on the strength of each, and every principle deducible within your easy reach. Come let us learn. Walking miles and talking. Do you believe it? Reason triumphs? Well?

Does it say so in this book? Or should you see for yourself? And if you would see the brighter things, mathematics, better come study. How many mathematicians do you know?

Euclid? Appolonios? Diophantos? Archimedes? Ptolemy?

Quickly – How many names did I say? Five. And a five-sided figure? A pentagon. And the subject of Euclid's *Elements*, book five? Magnitude and multiples. And the subject of *The Mathematical Collection* of Claudios Ptolemy, book five? Making astrolabes. And what is this?

(*Holds up an astrolabe. Looks up and then at the instrument. Looks up again.*)

An astrolabe? It is (*Takes a quick sight with the lever on the back, then looks to the front, and says present time + some hours based on time zone*) if we're in Alexandria, Egypt. (*Points to astrolabe.*) I made this one.

My noble father Theon. A gift, to have given me my life and passion both, and this dream, a happy one.

(*Flute melody plays*)

Act I Scene IV – Copying Scrolls

Scene: The Museum of Alexandria, fourth century.

Characters: Theon, Young Hypatia, Dancers.

YOUNG HYPATIA: Shall I start? (*Pulls out a scroll*) Look at this!

THEON: Eratosthenes! A good find, and maybe there will be time, time to copy all the wondrous things that you desire in here. You do so by design. And ours is now...?

YOUNG HYPATIA: You are back on Euclid, *Elements*, Book 3, writing and redacting commentary. And me?

THEON: None but mathematics, and beautiful heavens. The *Mathematical Collection* of Claudios Ptolemy, copying for you. Continue, my daughter, your majesty, your highness, preserve that work for history.

YOUNG HYPATIA: My father.

THEON: Come.

Dancers start, sharing the stage with Theon and Young Hypatia, who work on copying text from one scroll to the next. The following themes progress through the dancers' dance –

Writing & Work

Day, Night, Day

Which scrolls to save? What will be the most valuable?

Train the mind, a system of thought

Quiet

Writing and Collaboration

Act I Scene V – Groundwork for Diophantine Equations

Scene: Fourth century Alexandria, a palatial home.

Characters: Young Hypatia, Five Disciples: Synesios, Athanasios, Theodosios, Gaios, Theotecnos.

(Athanasios and Synesios are talking jovially; Theodosios is sharpening a small stick; Gaios is searching in a sack; Theotecnos taps his foot slowly and moves a hand in rhythm; Hypatia enters.)

YOUNG HYPATIA: *(To Gaios, smiling)* My friend Gaios, Gaios, Gaios, are you eating enough?

(Gaios smiles back; Hypatia quickly turns to Athanasios and Synesios.)

And you? Athanasios? What foods there are at the market now!

(Gaios pulls out some dates and hands them to Synesios, who takes some and gives to Athanasios while Hypatia turns slowly to Theotecnos, speaking peacefully.)

Holy father, Theotecnos, there is a lot of good food at the temple.

(The dates are passed around).

Suppose fifteen types of food, all seasonal, all ripe, none in a dish by itself.

Suppose a dish of five foods, all from the ocean. Suppose a dish of five foods, all sweet fruits. Suppose a dish of five breads, and their aromas. Now . . . unity. Suppose fifteen types of food, all seasonal, all ripe, none in a dish by itself.

GAIOS: Hypatia, here is the reason for your fame.

YOUNG HYPATIA: Suppose two numbers. Suppose a number. Suppose another number. *(Repeats.)* Suppose two numbers. Suppose a square number, eighty one, for example. Suppose the second square number. *(Repeats.)* Suppose two numbers.

(To Gaios) Suppose two houses, each with square gardens.

(To Theotecnos) And the morning, with its prayers.

(To Theodosios) Suppose two flocks of birds.

(To Athanasios and Synesios) Suppose two crowds of people.

Suppose just one? Suppose one number. 168. It is not 169. It is 168. Let us

put 168 into 12 groups. Square 12.

GAIOS: 144.

YOUNG HYPATIA: Square 13.

THEODOSIOS: 169.

YOUNG HYPATIA: 168. Let us put 168 into 12 groups. I suppose there is a difference between 144 and 168. What is the difference . . .

THEODOSIOS: 24.

YOUNG HYPATIA: Now 12. Let us put 168 into 12 groups.

THEODOSIOS: Answer 14. 168 is the product of 12 and 14. 169 is square thirteen.

YOUNG HYPATIA: (*Smiles broadly.*) Suppose we have a number. One number. 80. It is not 81. It is 80. Let us put 80 into 8 groups. . . . What is 80 into 8?

THEODOSIOS: Answer 10. 80 is the product of 8 and 10. 81 is square nine.

YOUNG HYPATIA: (*Smiles even more broadly.*) Whether by boat, camel, horse or chariot, we should go for an outing. We may need to take priests along, for safety. Let us take 80 priests. We may need to stop and get dates.

Suppose we have a number. 120. It is not 121. It is 120. Let us put 120 into 10 groups. . . . Our number is 120.

THEODOSIOS: Answer 12. 120 is the product of 10 and 12. 121 is square eleven.

YOUNG HYPATIA: (*Smiles broadly.*) The Temple of Serapis is nearby. It is time to dress the statue. It is time to say prayers.

Suppose we have three numbers. Suppose we have three square numbers. Let us take 169, 81 and 121. . . . squares . . . Suppose we have three numbers.

Suppose we have three numbers that are not squares. Let us take 168, 80 and 120. . . . not squares . . . Suppose there is a number to add . . . that will make each a square. Let us take one.

Now . . . there is a window to the heart of this place with people of learned grace. The temple. Suppose three numbers. Suppose three houses. Suppose three squares.

Act I Scene VI – Poetry and Plotinus

Scene: In the city square adjacent to the marketplace

Characters: Young Hypatia, Townspeople.

(Young Hypatia wears a scholar's cloak of white. The townspeople are diverse, comprising local Egyptian and Greek, Christian and Jewish citizens, plus foreigners. Groups don't mix well. Christians and Jews both dress in a similar fashion to present-day Arabic peoples, but are distinguishable by some feature between them.)

TOWNSPERSON1: Look at the sky . . .

T2: Clear as a wall without a fresco. There is beauty to come!

T3: Is that a new belt? What wonderful twists!

T4: Thank you.

T3: It looks a bit heavy, though

YOUNG HYPATIA: A book of Porphyrios. On the cave of the nymphs. The thirteenth book of Homer's Odyssey. We ask your blessing . . . To the light and to the darkness, to the world of its forms and to the world behind the forms. Come, gather us in, Porphyrios. Alexandria awaits. Alexandria.

Tell me, what does Homer really mean by the cave in Ithaca, which he describes in the following verses:

High at the head a branching olive grows
And crowns the pointed cliffs with shady boughs.
A cavern pleasant, though involved in night,
Beneath it lies, the Naiades delight:

(T4 starts juggling some fruit, and then hands some out to Townspeople.)

Where bowls and urns of workmanship divine
And massy beams in native marble shine;

(T1 pulls out a coin and looks at the edges, trying to judge if it's been clipped. Hands it to T2 for an opinion.)

Perpetual waters through the grotto glide,
A lofty gate unfolds on either side;

(T1 pulls out some wire for jewelry making, and shares it with T2. They each start devising jewelry.)

That to the north is open to mankind:
The sacred south to immortals is consigned.

(Hypatia changes tone. Townspeople pay closer attention.)

That the poet, really, does not narrate these details from historical information, is obvious from this . . . that those who have written a description of the actual island, have, as Cronios says, made no mention of such a cave being found in it.

(Four townspeople start to stretch, dance, exercise and make movements, often following Hypatia's mannerisms. She acknowledges them and encourages them.)

He likewise says that it would be absurd for Homer to expect, that in describing a cave fabricated merely by poetical license and thus artificially opening a path to Gods and men in the region of Ithaca, he should gain the sincere belief of mankind. And . . . it is equally absurd to suppose that nature herself would create, in this place, one path for the descent of all mankind, and again another path for all the Gods. For, really, the whole world is full of Gods and men.

(Some cloaks come off of dancing townspeople, making beautiful costumery visible. Movement and dance continue.)

It is impossible to be sincerely persuaded that in the Ithacensian cave men descend, and Gods ascend. Cronios therefore has set the stage. He says that it is evident, not only to the wise but also to the vulgar, that the poet, under the veil of allegory, conceals some hidden meaning; thus inspiring others to explore what the gate of men is and also what is the gate of the Gods:

(A townspeople stops, opens a water bottle, and washes up briefly.)

Namely, what does he mean by asserting that this cave of the Nymphs has two gates; and why it is both pleasant and obscure, since darkness is by no means delightful, but is rather a cause of both aversion and horror.

(At this point, the dancing and stretching increase in spirit. Hypatia leaves off her speaking, and slowly joins in the dancing.)

T2: . . . You may mention Serapis.

T1: Hypatia is so light.

Act I Scene VII – The Temple of Serapis is Destroyed

Scene: The Temple of Serapis.

Characters: Dancers (Women), Christians.

(Dancers speak Spanish only. The “Temple” is made from the dancers. They greet each other softly and begin to dance. After some time, Christians arrive.)

CHRISTIAN1: *(Reading from a scroll).* Following the decree of Theodosios, Emperor of the East, Father of Light, beneficent leader of all the world, and his servant Theophilos, Bishop of Alexandria, a young beacon, a great light unto us all.

Neither Osiris nor Serapis are saved from death. They are not reborn. There is no need. Their stories are old. They are not needed. There is a Living God. What use is there for temple sacrifice?

DANCER1: Porque no habla en español, el?

C1: There is now no need for temple service. No need for the work of the temple. There is no need for mathematical calculation. No need for training. There is no need for astronomy. There is no need for prognostication. There is no need to observe the skies.

These are all heretical. They lead one from life, from a Living God. They lead only to oppression.

C2: We have been oppressed! *(Wails.)* Murdered.

C3: How many recent murders of Christians have there been? How many of us were gathered up and offered as sacrifice in these very walls?

C4: And for years, and years. Put in the arena and given to the lions ... because we would not obey these idols, with their observances, their darkness.

C2: Lions.

(C1 and other Christians start to build a bonfire. More wailing ensues.)

D1: ¿Porque nos destruyen?

D2: Hablame, gente, del rio, del sangre.

(Scene ends in cries of misery.)

Act II Scene I – Astrolabe and Predictions of Nature

Scene: At night, in the city square adjacent to the marketplace.

Characters: Young Hypatia, Disciples: Synesios, Athanasios, Theodosios, Gaios, Theotecnos and others.

(Gaios and Theotecnos hold torches. Athanasios and Synesios are sharing an astrolabe, examining it and taking sightings of stars. Theodosios arrives with Hypatia and other disciples. She gives two astrolabes out for sharing.)

YOUNG HYPATIA: *(To a disciple)* Are you a new friend? *(To Synesios)* Is there enough light? *(To Theotecnos, smiling)* Holy father Theotecnos! *(To Gaios)* And Gaios! Gaios! *(To all)* Welcome all! *(To Athanasios)* Remind me? What is the date?

ATHANASIOS: You are so spirited, Hypatia! Shall I tell you the date so I can find the Sun's house on the back here? *(Holds up the astrolabe)* And then we shall have our longitude? That is your plot! I see, even in darkness!

YOUNG HYPATIA: *(Stamps foot)* Synesios, will you . . . or Athanasios? Teach us some with the astrolabe, that symbol of humanity, engraved with the projections of this universe on something that fits in your hand, not unlike the dreams that come. These fit in our thoughts, a small window into something larger.

SYNESIOS: *(Nods to Athanasios)* Yes! North! *(Elegantly in all this, he points to the heavens, sights a star with the lever on the back of the astrolabe, places the astrolabe flat in his palm, motions the other disciples with astrolabes to follow suit and do the same with their astrolabes, then looks down at his instrument, rotates the top face, then looks up to the disciples. Athanasios gives him congratulatory gestures.)*

Yes?

(To the other disciples with astrolabes) What time is it? Can you figure? Who will tell me?

DISCIPLE: I have the eleventh? The eleventh hour plus some minutes?

SYNESIOS: Wait. Altitude? What altitude did you get for the northern star? We'll all be in bed by the eleventh hour, or zombies we are! Altitude first, then match the longitude to the front. Find the altitude circle, and the star where it touches that circle. I had 16 and a half degrees.

DISCIPLE: Oh, yes. Sorry. Third hour precisely?

ATHANASIOS: And a half degree! Synesios! The master!

YOUNG HYPATIA: (*To Gaios, with joy*) Tell me, why has Athanasios said this? Who? The master?

GAIOS: It is the master, Claudios Ptolemy . . . our own Alexandrian master . . . his work, his book, his masterful tables . . . to a half degree.

YOUNG HYPATIA: (*Again with joy*). I don't understand. Tell me more?

SYNESIOS: (*Pulls out a scroll and hands it gently to Athanasios, who passes it to Theodosios*) Ptolemy will marry the moon! (*Laughter all around.*)

DISCIPLE: (*Reading*). Those who have been true philosophers, Syrus, seem to me to have very wisely separated the theoretical part of philosophy from the practical.

YOUNG HYPATIA: Brave Synesios, yes, you are both. Perhaps you will contribute books as this Ptolemy has done. Will you construct even better lists of chords? Your books will shine like the stars.

(*Disciple hands scroll to Theodosios, who had wanted it.*)

THEODOSIOS: For indeed Aristotle quite properly divides also the theoretical into three immediate genera: the physical, the mathematical, and the theological.

YOUNG HYPATIA: What room is there in the world for God, whose love is solid, unmoving—so unlike the seasons, the stars, and people, ever changing—without your mathematics, inside and out, a light that shines in both worlds? (*To Theodosios*) Is there enough light?

(*Referring to the back of the astrolabe.*)

Do you like the calendar? Is it a good addition? Let us watch until dawn, or until you are confident.

(*Disciples and Young Hypatia spend some time elegantly using the astrolabes, moving nearly like dancers.*)

Act II Scene II – Literature, Philosophy and Beauty

Scene: Veiled chamber in Hypatia's home.

Characters: Hypatia, Disciples, Women.

(The scene is peaceful. Disciples and women present are at times rapt, playful and respectful. Hypatia is older than in previous scenes.)

HYPATIA:

Recall your thoughts inward, and if while contemplating yourself, you do not perceive yourself beautiful, imitate the statuary.

When you desire a beautiful statue cut away what is superfluous, smooth and polish what is rough, and never give up until you have given it all the beauty your art is able to effect.

(To Synesios, answering him.) From Plotinos. Yes.

(Slowly, those present move to inhabit a unified and slow dance pattern.)

Beauty for the most part, consists in objects of sight; but it is also received through the ears, by the skillful composition of words, and the consonant proportion of sounds; for in every species of harmony, beauty is to be found.

And if we rise from sense into the regions of soul, we shall there perceive studies and offices, actions and habits, sciences and virtues, invested with a much larger portion of beauty. But whether there is above these, a still higher beauty . . . this will appear as we advance in our investigation.

What is it then, which causes bodies to appear fair to the sight, sounds beautiful to the ear, and science and virtue lovely to the mind? May we not enquire after what manner they all partake of beauty? Whether beauty is one and the same in all? Or, whether the beauty of bodies is of one kind, and the beauty of souls of another? And again, what these are, if they are two?

(Dance ends dramatically.)

Act II Scene III – Geometry

Scene: Outside in the city along a street.

Characters: Hypatia, Synesios, Townspeople, Children.

(Children are seen gathering small sticks and larger. The larger are broken into a size about 6" long. Hypatia passes out some thread.)

HYPATIA: *(To a child, as she receives two sticks, smiling).* Thank you, Beauty! You are so generous!

(To the larger group, holding the two twigs up) Like so. Which one looks straighter?

This one? Truly! This will be the pivot. And this *(indicating the other)* will be the stylus. Good stylus! *(Looks at townspeople and motions for them to pick among their sticks one stick as pivot, and one as stylus. Dialogue may be improvised. Gesture is emphasized.)*

Wonderful! Truly. Yes. That. Oh, not this one. Truly. Yes. Great. Most excellent. I like your choice. Yes. Yes. Truly. Very good. Yes, that is right. ...

And ... Like so. *(Hypatia pulls out thread in one hand, two twigs at an angle in the other, and wraps the ends to make a compass, weaving thread around the two at one end so that they are steadily held. She gets very excited to see others doing the same. Dialogue may be improvised.)*

And ... These look wonderful! Wonderful! You are following in the great tradition, the life of this city. Oh, Alexandria! Yes. Truly, let's make circles in the sand. Find your spot. Let's!

(Hypatia and all draw circles on the path with their improvised compasses. Hypatia offers great praise. Synesios is demonstrably helping those around him.)

I see a steady circumference! Yes, that's right. The edge. And this is the center. Center. Edge. Circumference. Edge. Radius. Yes. From the center to the edge. Radius. Circumference. Center. Circumference.

(Looking up).

OH! What are the traffic regulations today! I hope there is not so much traffic! This is a roadway, after all!

Center. Circumference. Radius.

(Stops, and gathers attention.)

Language is a gift, as are all of you. And like all gifts, we owe a sign of gratitude . . . both for where we are, and for where we will be. To Euclid, let us turn and see if we cannot ask a question.

(Twirls compass)

With this, I wonder if we can make triangles. And not just any triangles, but . . . triangles of equal sides.

Center. Circumference. Radius.

SYNESIOS: *(Motioning to those around him)* Like so.

HYPATIA: *(Adding encouragement)* Yes. Your circle. Place the pivot on the edge! The second circle. Yes. Two circles. Does it cross at the center of the first? Yes, it does look like an insect's wing.

(Hypatia goes from person to person, helping them make the second circle with center on a first circle's circumference.)

Good? Yes? Truly . . .

I hope we are not beset with soldiers. All this sand! They may be stricken by the Sun and take this roadway for an arena . . . And our circles are no match for fits of anger! Two circles, when one is hunting harm's heavy hand, are hardly hoops for happiness.

Truly . . . Now a line connecting centers. And the top, to make a triangle! Yes! Yes! *(Hypatia rushes to praise those around her.)*

And who will prove that these are all the same length, the sides?

SYNESIOS: Not the radius. Certainly not the same radius!

HYPATIA: Yes, bright Synesios! Of course! The radius, the line from center to edge is the same all around. So these two are the same. And this radius from this circle? Yes, the circles have the same radii. Yes. Yes. Yes. All three sides the same!

But . . . Tell me, what is the measure of this angle?

(Townsperson and children continue. Synesios and Hypatia slowly exit while offering goodbyes and then wave goodbye. They continue walking and meet up with disciples for the start of the next scene, while stage clears.)

Act II Scene IV – Aristotle

Scene: Outside walking along the countryside

Characters: Hypatia, Disciples: Synesios, Athanasios, Theodosios, Gaios and Theotecnos (and others, perhaps).

(The Disciples and Hypatia greet and make small talk, then find their way to the stage.)

THEODOSIOS: *(To Gaios)* Which scroll have you been copying?

GAIOS: *(Replying)* Oh, Theodosios, you are so much more skilled than I. I'm yet working with Euclid's first book. The figures really are a challenge.

HYPATIA: *(To all)* A man is engaged in collecting subscriptions for a feast. He would have gone to such and such a place for the purpose of getting the money, if he had known. He actually went there for another purpose . . .

THEODOSIOS: *(Replying softly)* Do you want to help me? I could use the help with organizing the collection. Both by topic, and by language: Demotic, Greek, Aramaic, Latin.

HYPATIA: and it was only incidentally that he got his money by going there; and this was not due to the fact that he went there as a rule or by design, nor is the end successful (getting the money) a cause present in himself at all—it belongs instead to the class of things that are provisional and the result of internal deliberation. It is when these conditions are satisfied that the man is said to have gone "by chance."

THEOTECNOS: *(To Athanasios)* Crocodiles. Ibex. Cats. Lions. Hyenas.

HYPATIA: If he had gone of deliberate purpose and for the sake of this—if he always or normally went there when he was collecting payments—he would not be said to have gone "by chance."

It is clear then that chance is an incidental cause in the sphere of those actions for the sake of something which involve purpose.

ATHANASIOS: *(To Theotecnos)* Slaves and servants. Pets. Physical adornment. How to wear your hair.

HYPATIA: Intelligent reflection, then, and chance are in the same sphere, for purpose implies intelligent reflection.

THEOTECNOS: (*To Athanasios*) Tanning leather. For drumskins. Or for shoes.

HYPATIA: And the causes of the man's coming and getting the money (when he did not come for the sake of that) are innumerable. He may have wished to see somebody or been following somebody or avoiding somebody, or may have gone to see a spectacle. Thus to say that chance is a thing contrary to rule is correct. For "rule" applies to what is always true or true for the most part, whereas chance belongs to a third type of event.

ATHANASIOS: (*To Theotecnos*) Net, line and hook. Fishing techniques.

HYPATIA: Yet in some cases one might raise the question whether any incidental fact might be the cause of the chance occurrence, e.g. of health, the fresh air or the Sun's heat may be the cause, but having had one's hair cut cannot; for some incidental causes are more relevant to the effect than others.

Yes. And what of the motions of astronomy, of how the spheres move, and the planets in their epicycles, of the Moon and Mercury, of Venus rising with the Sun on some days and setting with the Sun on others. We know these are not by chance. Or are they? What purpose does the Sun have in rising? Is it an incidental cause to some other purpose that gives us light for our journey?

(*Motions outward*)

And, see the ships in the distance, moving slowly away. As they sink below the horizon, their cargo safe, will they find an influence for good or ill along the way?

(*Addresses Synesios*).

And you, Synesios, will you be safe in your conversion to Christianity? Where will your stars take you?

SYNESIOS: Safe? No. But at home, very much at home. Christianity is the future, Hypatia, and does not look backward to antiquity, but very much finds its root in the emanations of the world, like you, with the foundation of geometry to bring it forward.

For example, the Trinity, as the Spirit (*gesture signifies that by Spirit he means the intellect*) . . . is an emanation from Life . . . which again is an emanation from the Unmoving God? Yes, with intention, as you and Aristotle say. And I am only looking to the world, to the future, as you see—The future will be bright, infused with the past and present light to lead the way to a better place, carrying precious cargo.

GAIOS: Yes, precious cargo!

(Athanasios and Theodosios and Gaios pick up Synesios and try to carry him a pace or two.)

THEOTECNOS (*To Hypatia*) More Aristotle? The view is so nice here.

Act II Scene V – Hydrometer

Scene: Hypatia's workshop.

Characters: Hypatia, Disciples: Synesios, Athanasios, Theodosios, Theotecnos and others.

(Hypatia is working adjacent to a large urn and table, scribing the side of a metal device shaped like a very long hollow tube with closed ends. Athanasios and Synesios are present, talking. Other disciples enter.)

HYPATIA: *(To the newcomers)* Hail! Hail! Father Theotecnos. And Theodosios! Is it not cold today? Yes, extra cloaks *(She points to some on the wall)*. Please!

(To Athanasios and Synesios, bringing over the device she'd been working on.) What do you make of this? Tell me?

ATHANASIOS: Remarkable! Synesios, see how these demarcations are arranged! Hypatia, I can see why people come from so far away to learn from you.

HYPATIA: Thank you, Athanasios! But you could do the same! Synesios, how do you think the spacing was devised? What do you think I used?

SYNESIOS: Ptolemy's tables of chords? Yes?

HYPATIA: Of course! What gave it away?

SYNESIOS: The spacing of the lines. See? *(Holding it up for all to see.)* They are arranged much like the latitudes are on an astrolabe. Amazing, Hypatia!

HYPATIA: And do you know what this is for?

SYNESIOS: A weapon? Surely not. It is an astrolabe for tight spaces? When you are under water, and can only see the stars through a veil? Or, wait, I have it. Something with the Sun? It is to set a sundial. It is for positioning a sundial. For a sundial?

HYPATIA: Oh, Synesios, you are so creative. I know. Yes, it's for liquids, not for the Sun. You put it in a liquid. Here *(Takes back the device and places it upright in the urn, so that it bobs a bit.)* Like this. See? *(Disciples gather.)* It shows the internal weight of the liquid. Truly. Truly.

(Hypatia takes a large container of salt, puts it into the urn so that it dissolves, and the device raises up slightly.)

ATHANASIOS: Eureka!

HYPATIA: Eureka, indeed! Thank you! . . . Ok, now what? What do we use this for? Why do you need to know the internal weights of waters and other liquids? Think . . .

ATHANASIOS and SYNESIOS: (*Looking to each other and then to the audience, in unison.*) Wine?

HYPATIA: (*Moving to a group of other urns.*) You can tell how far the fermentation . . . has progressed. Come.

(*Hypatia and disciples engage in sampling wines, and using the hydrometer with each. Gesture continues, but no more dialogue.*)

Act II Scene VI – Music, Harmony and Healing

Scene: Hypatia's workshop.

Characters: Hypatia, Disciples: Synesios, Theodosios, Gaios, Theotecnos and others.

HYPATIA: Come, bright men. Let us talk about music. What do you think Synesios? Athanasios? Will we be able to make some progress with wedding Ptolemy and Pythagoras?

SYNESIOS: What say you? Noble Hypatia? Yes! I see it!

ATHANASIOS: Do tell? Oh, yes, the tables?

SYNESIOS: (*To Hypatia*) My teacher, you have a kithera? Hereabouts somewhere?

(*Gaios finds a kithera and brings it forward.*)

(*Synesios indicates the string lengths, and how they are diminishing in a geometric fashion.*)

Here? Yes, Hypatia! Have you? Have you really used Ptolemy's tables to devise new musical notes?

(*Suddenly Theodosios bursts in. All pause.*)

THEODOSIOS: (*To Hypatia*). Wait! Wait!... Forgive me, Blessed Hypatia!... Forgive me... The door has a man who has a plan for a wedding to you. So he says. Anger is not for me, but what shall I say in reply?

(*Hypatia jumps.*)

HYPATIA: (*To Theodosios*) And you know him not?

THEODOSIOS: I know him not.

(*Hypatia runs to a basket, pulls out two clean cloths, runs back to Theodosios and hands him the cloths.*)

HYPATIA: Could you give him these—these cloths, bright Theodosios? And, if you don't mind, could you tell him that he has much more travel ahead of him. These are ... apparently what he is after. Tell him ... that a clean marriage awaits him with some other woman, and that to her the Philosopher has given a kindness. He can give these cloths to that lady as a token of his love.

And that if he ever comes back here again, the cloths I send him won't be so clean as these. No. The world is not kind to women. Such nonsense.

THEODOSIOS: Thank you, Hypatia. Yes, I will. (*Exit Theodosios with the cloths.*)

HYPATIA: (*To all*) My friends, I think we ought to take a moment and change the pace, to apply the learning that will make for healing of ourselves in the face of the immodesty that sometimes enters into this world of humans. If I might . . . (*Hypatia takes the kithera, or some other stringed instrument that can be tuned, as the production wishes.*) Thank you.

THEOTECNOS: (*To Gaios, looking at fingers*) Ink stained fingers?

HYPATIA: Pythagoras. In his own temple, he might have prescribed a mode of music. Then illness would be healed with melody and harmony. He was a doctor of harmonies . . . Yes. You don't mind?

SYNESIOS: No, of course not. Let us hear you play, Noble Hypatia. Yes.

HYPATIA: Ok. The tuning is meant for healing. Four-thirds I'll replace with eleven-eighths. It will be a healing mode. (*Hypatia tunes the instrument.*)

GAIOS: (*To Theotecnos*): Yes, from mixing berries and bark tea.

HYPATIA: A Homeric Hymn. To the Mother of all the Gods. (*All hush. Theodosios returns. The instrument is tuned to Lydian mode, i.e. fi instead of fa. Hypatia sings.*)

(*lyric*) I Pray you, clear-voiced Muse,
daughter of mighty Zeus,
sing of the mother of gods all and men.

She is well-pleased
with the sound of rattles
and of timbrels,
with the voice of flutes
and the outcry of wolves and lions, bright-eyed,
with echoing hills and wooded places.

And so hail to you
with this, my song
and to all goddesses as well!

μητέρα μοι πάντων τε θεῶν πάντων τ' ἀνθρώπων
ὔμνει, Μοῦσα λίγεια, Διὸς θυγάτηρ μεγάλοιο.

Transliteration:

*metera moi panton te theon panton t' anthropon hymnei, Mousa ligeia, Dios
thygater megalioio.*

Act II Scene VII – Socrates and Duty

Scene: In the city square adjacent to the marketplace.

Characters: Hypatia, Disciples: Synesios and others, Townspeople, Dancers.

(Hypatia and Synesios are in a prominent place, a bit removed from other people.)

HYPATIA: Will this work for you, Synesios? I think you will be in good form.

SYNESIOS: Of course, Hypatia.

(Hypatia hands Synesios a scroll, and then addresses the marketplace generally.)

HYPATIA: Good friends! Alexandria. I give you Synesios, who will take the part of Socrates. The text is Plato. Crito. The Duty of a Citizen. I will take the part of Crito.

TOWNSPERSON1: *(To another.)* Are you tired of sitting already? Come.

(Townsperson2 rises and stretches.)

HYPATIA: Noble gods, in praise we are your servants, your heart, your hands. You are worthy of praise. Alexandria.

(Synesios is in character, and addresses Hypatia as Crito.)

SYNESIOS: Why have you come at this hour, Crito? Is it not very early?

HYPATIA: It is.

SYNESIOS: About what time?

HYPATIA: Scarce day-break.

SYNESIOS: I wonder how the keeper of the prison came to admit you.

HYPATIA: He is familiar with me, Socrates, from my having frequently come hither; and he is under some obligations to me.

DISCIPLE1: *(To Disciple2)* Are you not tired from all the writing? Let me see your hands.

SYNESIOS: Have you just now come, or some time since?

HYPATIA: A considerable time since.

SYNESIOS: Why, then, did you not wake me at once, instead of sitting down by me in still silence?

DISCIPLE2: (*Showing hands to Disciple1*). No. It's the work of cutting papyrus that has me in pain. (*Rubs hands.*)

HYPATIA: By Jupiter! Socrates, I would not like myself to be awake so long, and in such pain. But I have been for some time marveling at you, perceiving how sweetly you slept; and I purposely did not awake you, that you might pass your time as pleasantly as possible.

DISCIPLE2: (*To Disciple1*) It is a lot. Cutting papyrus. Splitting papyrus. Arranging papyrus. Pressing papyrus. Drying papyrus.

HYPATIA: And, indeed, I have often before throughout your whole life considered you happy in your disposition, but in the present grief, so much more so, seeing how easily and sweetly you bear it.

SYNESIOS: But ... Crito, it would be dissonant for a man at my time of life to be distracted because he must die.

HYPATIA: But ... others, Socrates, at your age have been involved in similar calamities, yet their age has not hindered their grieving at their present fortune.

SYNESIOS: So it is. But ... why did you come so early?

DISCIPLE2: (*To Disciple1*) But ... it could be worse. Instead of papyrus, I could have been working with parchment. For scrolls. Scraping animal skins. And scraping. And then curing them. And again. And again.

HYPATIA: I bring sad tidings, Socrates, not sad to you, as it appears, but to me, and all your friends, sad and heavy, and which I, I think, shall bear worst of all.

SYNESIOS: What tidings? Has the ship arrived from Delos, on the arrival of which I must die?

DISCIPLE2: (*To Disciple1*) And all the blood. Lots of gore. No, thank you. Papyrus is just fine.

HYPATIA: It has not yet arrived, but it seems to me that it will come today, from what various persons report who have come from Sunium, and left the ship there. It is clear, therefore, from these messengers, that it will come today, and consequently it will be necessary, Socrates, for you to die tomorrow.

DISCIPLE1: (*To Disciple2*) Yes, and the stains on your hands would be of a different color. And the look in your eyes as well, I guess.

SYNESIOS: Yes, to die. But ... with good fortune, Crito; and if so ... it please the gods, so ... be it. I do not think, however, that the ship will come today.

HYPATIA: From where do you form this thought?

SYNESIOS: I will tell you. You know that I must die on the day after the ship arrives?

HYPATIA: So they say who have the control of these things.

DISCIPLE2: (*To Disciple1*) You know, I would not trade my life in. I love what I do.

SYNESIOS: I do not think that the ship will come today, but, rather, tomorrow. I think this because of a dream which I had last night, not long ago, and you seem very luckily to have refrained from waking me.

DISCIPLE1: (*To Disciple2*) Yes, me too.

HYPATIA: But what was this dream?

SYNESIOS: A beautiful and majestic woman, clad in white garments seemed to approach me, and to call to me and say, "Socrates, three days hence you will reach fertile Pythia."

HYPATIA: What a strange dream, Socrates!

SYNESIOS: Very clear, however, as it seems to me, Crito.

HYPATIA: Very much so, as it seems. But, my dear Socrates, even now be persuaded by me, and save yourself. For if you die, not only this singular calamity will befall me, but, besides being deprived of such a friend as I shall never meet with again, I shall also appear—to many who do not know you and me well, when I might have saved you had I been willing to spend my money—appear to have neglected to do so. And what character can be more disgraceful than this—to appear to value one's riches more than one's friends? For the generality of men will not be persuaded that you were unwilling to depart hence, when we urged you to it.

(The action of the scene is interrupted by Dancers, who join the stage. At their entrance, those onstage start to disperse. The scene ends with a brief dance.)

HYPATIA: Depart hence? I'm urging you to it.

Act II Scene VIII – Synesios is a Bishop

Scene: 411 AD. A church. Ptolemais, the capital of Cyrenaica (part of the Pentapolis of North Africa).

Characters: Synesios, Bishop, People.

BISHOP: (*To all*) I give you Synesios of Cyrene. Soon to be Bishop of Ptolemais.

(*There is a general cheer*).

BISHOP: So wise. So intellectual. Bringing learning from Alexandria. Wisest among the wise.

(*There is another general cheer. Ceremony of the Eucharist is performed silently, with wine and cracker, between Bishop and Synesios.*)

BISHOP: (*To all*) The body of Christ. The blood of Christ. The Bishop of Christ. Synesios. I give you the Bishop Synesios

(*Synesios rises, smiles broadly*).

Act III Scene I – Cyril Succeeds Theophilus, Closes Novatian Churches

Scene: 412 AD. Novatian church in Alexandria.

Characters: Dancers, Monastics.

(The “Church” is made from the dancers. They greet each other peacefully and begin to dance. After some time, Monastics arrive.)

MONK1: *(Reading from a scroll).* Following the decree of Cyril, Bishop of Alexandria, Father of Light, beneficent leader of all that is Christian, the new Theophilus, a young beacon, a great light unto us all.

The followers of Novatian are not saved from death. They are heretical. There is no need for their creed. Their beliefs are unkind and too severe. They are not welcome. There is a Living God. What use is there to persecute Christians, even those who have made temple sacrifices? Let the Novatians themselves be persecuted.

DANCER1: Why does he not speak to us directly?

M1: There is now no need for Novatian churches. No need for the work of this sect.

There is no need for keeping other Christians at bay. No need for reciting a person’s religious history. There is no need for persecuting Christians who have made temple sacrifices. There is no need to set a different date for Easter. There is no need for this. These Novatian beliefs are all heretical. They lead one from life, from a Living God. They lead only to oppression.

M2: We have been oppressed! *(Wails.)* Beaten.

M3: How many recent beatings of Christians have there been? How many of us were gathered up and beaten within these very walls?

M4: And for years, and years. Put in the ropes and given a beating ... because we had one time made sacrifice to idols, to their joys, their light.

M2: Beaten.

(M1 and other Monks start to build a bonfire. More wailing ensues.)

D1: Why are you destroying us?

D2: Speak to me, people, of a river, of blood.

(Scene ends in cries of misery.)

Act III Scene II – Synesios Dies

Scene: 413 AD. A simple home. Ptolemais, the capital of Cyrenaica (part of the Pentapolis of North Africa.)

Characters: Synesios, Cleonios (a servant), Trypho (a scribe).

(Synesios is in bed moving fitfully, half awake. Cleonios opens a window and then brings a wet cloth to Synesios, to wipe his forehead, arms, etc. Synesios' speech is labored.)

SYNESIOS: Oh. Thanks be to heaven and to you, Cleonios. In truth. I am not well. A letter. You can call Trypho. Trypho.

CLEONIOS: Yes, of course. Rest, bright Synesios.

(Exit Cleonios.)

(Enter Cleonios and Trypho.)

TRYPHO: *(To Synesios)* My lord. My lord! Oh, my . . .

SYNESIOS: Thank you. Yes. Thank you. Trypho. To the Philosopher, a letter. To Hypatia.

(Synesios waits until Trypho has gotten out his writing materials and starts to write.)

To the Philosopher. I am in such evil fortune that I need a hydrometer.

CLEONIOS: *(To Synesios)* Will she know? Will she know what you mean, that you have lost your children, your friends, the goodwill of everyone? And now your health . . . from wine, from drinking wine.

(Synesios groans and starts to wail.)

And now you aim to have more, more wine, more suffering. I gather this is to be your deathbed. May your life be long, my bishop.

SYNESIOS: Thank you, Cleonios. *(To Trypho, who is writing.)* For me, bodily weakness has followed in the wake of mental sufferings. The remembrance of my departed children is consuming my forces, little by little. Only so long should Synesios have lived as he was still without experience of the evils of life. It is as if a torrent long pent up had burst upon me in full volume, and as if the sweetness of life had vanished.

TRYPHO: . . . the sweetness of life had vanished.

SYNESIOS: Yes. Let me see, Trypho.

(Trypho brings scroll for Synesios to look over.)

Act III Scene III – Disciples Discuss

Scene: The city square. Daytime. Alexandria.

Characters: Disciples: Athanasios, Theodosios, Theotecnos, Gaios. Townspeople.

(The scene starts with the four disciples walking together.)

GAIOS: What is the most beautiful thing you see?

THEOTECNOS: With my mind or here—here outside as we walk? Or perhaps you wish to know what is a common answer? I will tell that in all my years it is family—a happy family is the most beautiful thing I see. Consider the sacrifices of each one for the other, the shared joys, of gentleness and humility that reside in the home when it is filled with dignity and kindness, the respect that reaches far beyond the walls of home. The sense inside your heart—of duty well-fulfilled after one has made the effort. And this beauty is inside us all, as we are a family, discipled of Hypatia, united in study.

THEODOSIOS: Well said, Holy Father Theotecnos. Perhaps it is an axiom that sacrifice brings beauty. Like a number. Sixty, for example. It has so many other numbers inside itself. It has so many ways it can lend itself—if sixty is the basis of a fraction. My friends, what are the divisors of sixty?

GAIOS: Sixty?

ATHANASIOS: One, three, five, ten.

THEOTECNOS: Two. Also, two.

ATHANASIOS: And six, twelve, fifteen, thirty.

THEODOSIOS: And dividing a thing into sixty, you could easily find two—of thirty, or three—of twenty, or four—of fifteen, or five—of twelve, or six—of ten? Sixty is very easily divided, a willing sacrifice to many fractionations. It is a large number, a calendrical number, with six periods of sixty days making up the year, a full circle of three hundred sixty days, leaving but five days to celebrate the winter sacrifice at the year's end . . . as winter is a time of sacrifice. And beauty is found in the seasons. And the cycles of time are always filled with beauty as life and death again find new homes.

GAIOS: And so on, forever?

THEODOSIOS: And so on, forever. Even when the hymn is done and the music stops . . . the cycles of the song may come to you again.

THEOTECNOS: That is beautiful, friend Theodosios. It brings my thoughts back to the first time I saw Hypatia, with her clarity and joy, making numbers play with words—and in so doing spoke with the world as none other I had ever heard. I hear her voice whenever I think of a challenge ahead, and imagine that I will inscribe those mathematical forms in brass—to make an estimate of all the outcomes.

THEODOSIOS: Outcomes or no, we are running late. To the Philosopher let us go?

GAIOS: Yes, no . . . wait. What beauty do you see here ... really . . . ?

THEODOSIOS: For me? I love Alexandria, with its mixing of old and new. Look around. We are more than individuals. There is a spirit here, a common cause, a majesty that is hard to describe, even as the city has new leadership, and again new leadership, and again. Come, let us not wait any longer. Hypatia will be waiting for us.

(Exit disciples.)

Act III Scene IV – Jews Riot

Scene: 414 AD. The city square. Evening. Alexandria.

Characters: Jews, Hierax, Dancers (Women).

(Jews are present. A melody is sung by all. A prominent Jew stands. Hierax is hidden.)

JEWISH1: Friends. Shabbat shalom. It is a peaceful night. Yes. I know what you are thinking. Yes. Our noble prefect, Orestes, has decreed a curfew on dancing. And this sacred dance is our custom, our habit on Shabbat, our habit on the Festivals. What are we to do? What should we do?

J2: *(Aside, to J3)* Are you sick?

J1: I can tell you that Prefect Orestes will not be here. Has he ever been? No. He will not know of the dance. And thus, we must celebrate. Let us celebrate life. Let us celebrate Shabbat.

J3: No. Just tired. Issachar, my child was up all night.

(Woman dancers enter, and the dancing commences, and is both raucous and suggestive. Jews are going wild. Then, Hierax is found. There is an outcry. The dancing stops.)

J4: *(Indicating Hierax.)* Who is he? A messenger of Orestes?

J2: *(To J4)*. No. He is a messenger of Cyril, the new Bishop. This is not good. The Christian world upsets itself, choosing two dates for its Easter celebration, and accuses us of great dissent as we follow our observances. What have we to do with the solemnity of their feasts? We are caught in the mix, in the pit of some horror. We observe our full Passover moon on the fourteenth, and now cannot observe.

(The crowd becomes increasingly incensed with Hierax. They commence to torture him amid accusations and insults. The dancers leave in disarray.)

Act III Scene V – Hypatia's Dance

Scene: Veiled chamber in Hypatia's home.

Characters: Hypatia, Dancers (Women).

(There are no words in this scene, simply dance. The scene starts with two dancers dancing, then Hypatia joins, then other dancers. Themes of the dancing reprise dance motifs from earlier in the play. An additional new dance motif suggests disarray.)

Act III Scene VI – Assassination Attempt on Orestes

Scene: 414 AD. Daytime, Alexandria

Characters: Orestes, Heliodoros (a minister), Guards, Monastics: Ammonios and others.

(Orestes is dressed as befits his office of Prefect. The entrance of Orestes, Heliodoros and Guards is by walking via the aisles to the stage. Ammonios and Monks are not present yet.)

ORESTES: Heliodorus. Heliodorus. It is good to walk. I have so much on my mind.

HELIODORUS: Yes. Prefect Orestes. Feel free. I'm here to listen.

ORESTES: Well, you know. You know what it is to be bothered. The Bishop Cyril convinced me to prohibit dancing here as Easter approaches. And then the community of Jews in Alexandria took offense at his messenger, Hierax, and killed him nearly.

HELIODORUS: Yes. Go on.

ORESTES: This is history. You know ... then Bishop Cyril became incensed. He threatened to expel the Jewish community and things were not looking well.

HELIODORUS: Yes. Go on, Orestes.

ORESTES: Truly ... And then the massacre. You know how it started. A few hot headed Jews called out that the churches were on fire. When Christians came out to see what was happening, they were slaughtered by these Jews.

HELIODORUS: Yes. Go on. Please go on.

ORESTES: Truly ... You know what happened. Cyril foments. He expelled all the Jews and then seized the synagogues, as he had done with the Novatians. Homes and synagogues were looted. There was violence. Now ... Bishop Cyril seeks a reconciliation with me. To make peace in the city. To make a stable Alexandria again. Really, to gather power to his side.

HELIODORUS: Yes. Go on, Orestes.

ORESTES: Truly ... It comes down to the festival date. I have spent time and more conferring with the Philosopher. She is to set the day for Easter based on her astronomy, her observations. She has the technical skill. She is

the professional in this good world. And if it is a different day from what Cyril wants, Cyril wishes me to ignore that one and promote his.

HELIODORUS: Yes. Go on. Please go on.

ORESTES: Truly . . . The seasons have been changing. The growing seasons are shorter. There is some difficulty in the seasons. I cannot in good faith leave behind the strength of observation. I fear unrest if the timing is so far removed from . . .

(Enter monks. They move with violence.)

MONK: *(To Orestes)*. You. Orestes. You! Pagan! Idolater! Destroyer of Christian peace!

ORESTES: *(To Monk)*. Kind sir. Forgive. Follow Christ's words. No? Like yourself, I am Christian. "Be kind to the widow and stranger among you" is my . . .

(Ammonios throws a rock that strikes Orestes in the head. There is blood. And a lot of chaos. Heliodoros and Guards succeed in gathering Prefect Orestes and flee.)

Act III Scene VII – Hypatia's Murder

Scene: 415 AD. Hypatia's home.

Characters: Disciples: Gaios and others, Heliodoros, Guards.

(Disciples are engaged in quiet study. Gaios enters with Heliodoros and Guards.)

GAIOS: My friends, my life. I give you Heliodoros, with a message from the Prefect Orestes.

HELIODOROS: My good sirs. *(Pause.)* The news is not good. I speak of your lady. *(Pause.)* The Philosopher. Your teacher, Hypatia, is dead. *(Various reactions of shock and horror.)*

She was making observations of the Sun beside the coastline. There, she was beset by a group of Nitrian monks and tried to take refuge in a church, the Caesarium. She was not successful. The monks. They stripped her. They beat her. They took sharp shells lying nearby, bound her, and tore her skin off. They killed her.

Once she was dead, they butchered her like an animal and took her body to the Cinaron. Her body was burned. Ash. Smoke. Gone. Hypatia is gone. Your Hypatia is gone. I'm sorry. I'm sorry.

My lords, the Prefect Orestes has sent me to ensure your safety. And to express his sadness. We will be here for some time. Please, continue with your work. My Lord Orestes wishes that you will continue your work. Continue. It is important. It is important for a unified Alexandria. It is important to make your observations. I'm so sorry.

(Guards move in. Disciples are still. And then slowly leave. Offstage they wail.)

Act III Scene VIII – Edict Forbidding Destruction of Synagogues

Scene: 423 AD. The city square. Alexandria.

Characters: Heliodoros, Guards, Disciples: Athanasios, Gaios, Townspeople.

(Guards and Townspeople are present. Townspeople are engaged in market activities. Heliodoros gathers the attention of the Townspeople.)

HELIODOROS: By the order of Theodosios, Emperor of the East, Father of Light, beneficent leader of all the world, and his servant Orestes, Prefect of Alexandria, peaceful ruler of a peaceful people. An edict. No Children of Israel in the Empire may be prevented from their religious practice. Synagogues may not be destroyed. Peace must be maintained. The Jews may not be persecuted. All communities of this city must feel safe. That is all. Orestes wishes you well.

TOWNSPERSON1: Well?

TOWNSPERSON2: Well ... well.

(Exit Heliodoros and Guards.)

ATHANASIOS: You don't look at all well.

GAIOS: Well? Tell me. Where can I go?

ATHANASIOS: That herbalist, just over there, down that sidestreet? I've been there. He is very good.

GAIOS: Will you come with me?

ATHANASIOS: Don't I look well?

GAIOS: Well ...

ATHANASIOS: Well?

GAIOS: You look well enough, I guess.

ATHANASIOS: You guess. Do I look unwell?

GAIOS: Sad. You look sad.

ATHANASIOS: Come.

(Exit Theotecnos and Gaios. Music plays. Townspeople continue with their work of buying and selling in the marketplace. Exit Townspeople.)

Act III Scene IX – Dead Hypatia Recalls Her Life

Scene: Fifth century Alexandria, a palatial home.

Character: Hypatia's Ghost.

HYPATIA'S GHOST: (*Flitters around the scene*) . . . (*Looks in a mirror*) But alas! No reflection. . . . It's hard to see what would or could not be as I am not myself, I am not me. . . .

(*Draws a circle in the air, then a triangle superimposed on the circle, then reaches through and pulls out an imaginary rose, and brings it to her nose*)

. . . The smell of flowers, how I miss them so, but better me to have had the light of mathematics, and of circles and geometry?

(*Makes large frown*)

But . . . no nose for flowers. No head for thoughts. No life at all is left in me. All's quiet upon the waters of infinity.

(*Flitters around the scene some more, then stops to face the audience. Stomps.*)

Oh what slow, sullen times are these, when darkness comes. I can gaze upon the past, perhaps for solace, but never without thinking of the good that ultimately there could be. Oh what tangible threat is here and strong, when mathematics and learning are forsaken. Dead and immodest passions take hold. I am cold. Cold.

I recall that I now do not recall. But . . . in the past it was true. I did see that which was unseen. I did dream. I did apply forms within the world. I brought learning to Alexandria. I made a difference.

Remember me?

(*Holds up an astrolabe. Looks up and then at the instrument. Looks up again.*)

END

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Production History*Flagstaff Festival of Science:*

Mike Levin: Producer-Director

Chase Coleman: Music

Flagstaff Arts & Leadership Academy, Flagstaff, AZ

September 24-25, 2016

Maryland STEM Festival:

Alice Stanley: Director

Fuzz Roarke & Elena Kostakis: Co-Producers

Michael Tan: Music

Spotlighters Theatre / Strand Theater, Baltimore, MD

November 11-12, 2016

(staged reading)

Virginia Arts Festival:

Andy Wynn: Director

Joel Bassin: Producing Artistic Director

Firehouse Theatre, Richmond, VA

April 1-2, 2017

This production (staged reading) was cancelled after the director became ill.

The dances in the Flagstaff production were choreographed by the actors themselves at the direction of Mike Levin. The music was developed separately by Chase Coleman and Michael Tan, respectively, for the Flagstaff and Baltimore productions.

Author Notes: Play as Process: A First-Time Playwright on Method

I've just written the first draft of a first play, and it made sense to me to put down some of my thoughts about the process while it is still fresh in my mind. The play itself will probably go through a few more drafts but I am happy with it as it stands—I think it would be fun to act in. And that is how the play had gone. I had an idea and thought it would be fun to write about, and also that writing a play would be feasible.

At the time I was a graduate student at a public state university in California. I was renting a house with the help of my parents and working on a masters degree in geology, which culminated in a 500+ page thesis on earth electricity and metamorphism.

Somewhere in mid-2011 I realized that I wouldn't have time to finish the play I had started that year, that Hypatia would have to wait. That's what the play is about, the life of Hypatia. She's the oldest woman mathematician in history whose name we know of.

Hypatia lived in fourth and fifth century Alexandria, in Roman Egypt, and practiced Greek philosophy and mathematics. Her father Theon compiled the copy of Euclid that was passed down to Europe in the late medieval period. She helped to promote the use of the astrolabe. She was the last head of the Museum (not the Library) of Alexandria and for her troubles was killed by a mob of Christian monks. It was a dark time, and I thought that writing about her life would be useful to the world we live in now, and that there might be some parallels that would make for a powerful work. But . . . my graduate studies got in the way, and I put the play down. I had done tens of hours of research, and fleshed out some of the characters, and also decided on which historical events ought to be included in the play. I had written the structure of the play, in three acts, plus all the major events for each of the scenes. The dialogue for four of the scenes was already done. Taking geophysics meant that I really wouldn't have any time for the play.

Four years later, with masters degree in hand, I was in PhD program that wanted me to create some independent study courses for myself, and I created a course wherein I would get to finish the play. I was thrilled. I found a mentor in Meron Langsner, who is both a PhD and a playwright. I set out deadlines for myself, and found the scenes I'd written and the notes that had been generated. When I finished the first scene after such a long hiatus, I was elated. I really wasn't sure it would come about.

I adore the method I used to write the play. It was so pleasant. I still have the twenty plus pages of notes that I took during my first stage of the process, as a souvenir. These included everything from the historical narrative surrounding the play's setting to the call numbers at the college library where I could find relevant philosophy and math books to generate the context, to lists of names that were used in some fourth

century letters by one of Hypatia's disciples, to conceptual diagrams. I read and wrote and delved as deeply as I could into the subject.

The next stage was to organize the action of the play. Hypatia was a well-renowned teacher, and I wanted to give the audience a sense of her skills. I thought about what kinds of things she might teach to convey her mastery and her strengths. I generated lists of smalltalk she could make with her students and they with each other, to demonstrate the connection that was being built in Hypatia's presence. I looked at the technology she had improved upon (i.e. the astrolabe and a device to measure the density of fluids) and planned to include these. Then I arranged the historical and other dramatic markers into scenes and acts, so that the play itself would have a dramatic arc. The ending would be brutal, but the journey uplifting. I included the settings where each of the scenes would occur, and also the characters that would be present. I divided up the smalltalk subjects that I had devised into several of the scenes so that they made sense. I planned out the actions of the non-historical scenes, and made myself a key diagram for the acts and scenes. It didn't seem onerous. I was enjoying myself.

I wrote the first scene in the evening, before the hiatus, and spent several tens of minutes pacing through the rental while trying to gather the spirit of the action. Once I had a very clear idea of that spirit, I started writing, and the dialogue came out easily. I'm trained as an ESL teacher, and I imagine that my experience with teaching English to immigrants was helpful here. It took about an hour.

The next night I did the same. I was pleased, and the following day I started to tell people that I was writing a play. I found encouragement: People are generally excited for this kind of endeavor, and want you to feel nurtured. It was joyful.

My experience in 2015, writing the remaining scenes, was a bit more of a challenge, but not so very taxing. The major obstacles were (1) becoming familiar again with the story and what my concepts had been; and (2) finding a peaceful place to work. I set myself a deadline which meant that I had to write two scenes a day if I was to be successful. The deadline was tied to a new-science-play competition, and I really wanted to finish in time. I wondered if there were too many scenes, but these are mostly very short, and I decided that it was feasible.

Constructing the pedagogical scenes was the most difficult. How do you teach math on stage? I settled into some arithmetic constructions, and presented the teaching much as my ESL teaching experiences had been. The class on stage is very fluid and dynamic.

There is a lot of joy there, and humor. The concepts are in no way too hard for the uninitiated. And the timing is fast.

For other pedagogical scenes, I was able to incorporate translated excerpts of actual philosophical texts into the action. I wasn't planning on doing this, but it made for such an interesting mood and verisimilitude that I couldn't resist. The translations are all from the 19th or very early 20th century texts and are in the public domain, which has made this option possible. I spent a good amount of time planning for interruptions and other side-dialogues to make the pacing quick, and rewrote a little bit for clarity. The result was so much greater than anything I could have imagined. I find the play itself enthralling.

Somehow, I have hit upon a process that has worked for me. It has allowed both for creativity and a research-depth that has produced art I am proud of. Note that I wasn't writing to become a playwright. It wasn't a lifelong dream or even a short-term career aspiration. I simply saw an opportunity in the culture and took it. My training as a teacher and in the arts helped me create a simple (and successful) process. I can't emphasize that enough. The process I used made it a real joy.

Author Biography

Daniel S. Helman is a geoscientist and artist. He publishes articles on sustainability, geology, mental health and other issues. His two most cited works at the time of this publication are "Earth Electricity: A Review of Mechanisms which Cause Telluric Currents in the Lithosphere" and "Seismic electric signals (SES) and earthquakes: A review of an updated VAN method and competing hypotheses for SES generation and earthquake triggering." His planned future book projects include a popular book on using forestry (including urban forestry) plus biochar production to combat climate change, and a book about pedagogy and student-centered classroom discipline. In addition, he founded and affiliates with The Winkle Institute: A Group of Independent Scientists, which exists to allow for more creativity in the sciences.