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Hi, I'm Shaan. (Pronounced like "Sean," but spelled more intuitively.)

I love hiking, cooking, reading, and playing with my dog. I'm a Scorpio and an INFJ (I think). I can unicycle and I have a degree in Physics.

Professionally, however, I am a contractual theatre artist and a freelance creative. I'm a skilled writer (both creative and technical), project leader, collaborator, and content creator. The majority of my work lives on a stage, but in the following pages, you'll find some examples of my written work.

References and more samples are available upon request.

—S.

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# THE SWORD IN THE STONE

[version 6]

by

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## CHARACTERS

Merlin  
Actor 1  
Actor 2  
Actor 3  
Actor 4  
Actor 5  
Uther  
Igrayne  
Herald  
Arthur  
Kay  
Ector  
Morgan  
Urien  
Messenger  
Dragon  
Thomas  
Malory

## SUGGESTED MINIMUM CAST BREAKDOWN

Male 1 — Merlin  
Male 2 — Actor 1, Arthur  
Male 3 — Actor 2, Uther, Kay, Urien  
Female 1 — Actor 3, Morgan  
Female 2 — Actor 4, Igrayne, Ector, Malory  
Female 3 — Actor 5, Herald, Messenger, Dragon, Thomas

## NOTES

With a larger cast, filling out crowd scenes with townspeople could be useful.

The Dragon may be portrayed by multiple people. The play is tracked so that with the minimum cast, Actor 2 and Actor 4 should also be able to comprise the Dragon.

The Actors' lines are written for the suggested minimum cast, but may be divided among however many the director sees fit.

*(Lights are down.)*

MERLIN

Poof.

*(Lights up. MERLIN is onstage, examining a sword stuck in a stone.)*

“Whoso pulleth out this sword of this stone is rightways King born of all England.”

UTHER

*(From off.)* Find him, Merlin.

MERLIN

Uther? Is that—Uther?

*(UTHER enters. The other ACTORS filter onstage after.)*

But you’re dead. Why have you come?

UTHER

It is time, Merlin.

MERLIN

Time?

UTHER

England needs a king. It is time. And here we are.

ACTORS

Camelot.

ACTOR 3

Society.

ACTOR 1

Beauty.

ACTOR 4

Riches.

ACTORS

Camelot, capital city of England.

UTHER

England is without a king. The crown is empty, and has been for—



UTHER/MERLIN/ACTORS

Thirteen years.

UTHER

Since the last king and queen passed.

ACTORS

Thirteen years ago.

UTHER

Me—

MERLIN

—Uther—

UTHER

—and my wife—

ACTOR 4

—Igrayne.

*(ACTOR 4 becomes IGRAYNE.)*

ACTORS

The last King and Queen of England.

MERLIN

Thirteen years ago.

UTHER

Igrayne had a daughter from a previous marriage.

ACTORS

Morgan.

*(ACTOR 3 steps forward as MORGAN.)*

UTHER

And Igrayne and I had a son together.

ACTORS

Arthur.

*(ACTOR 1 hands UTHER a bundle of fabric — a swaddled infant.)*

UTHER

Igrayne died bearing Arthur into this world.

*(IGRAYNE walks away from UThER.)*

MERLIN

You were wracked with grief. Your heart began to fail. You knew you did not have long, and feared for your children's safety. You sent them away.

IGRAYNE

My daughter.

ACTORS

Morgan.

UTHER

The King of the Northlands asked for her hand in marriage.

ACTOR 1

Mountains.

ACTOR 4

Waste.

ACTOR 5

And a fearsome, fire-breathing dragon.

MERLIN

The Northlands.

UTHER

So I sent her to Carlisle—

ACTORS

Carlisle, capital city of the Northlands.

UTHER

—to be married to the King of that land.

MERLIN

To King Urien.

UTHER

I had to.

Then, my son.

ACTORS

Arthur.

MERLIN

You tasked me, your advisor, with finding the newborn a family in England—

*(UTHER hands the fabric to MERLIN.)*

ACTORS

—in Camelot—

MERLIN

—where the boy could come of age in peace.

*(MERLIN hands the fabric off to ACTOR 1.)*

You gave me one other task.

UTHER

Protect the crown. Let no one wear it until my son is ready to be king. Protect the crown.

MERLIN

So I placed a sword in a stone with a simple message.

MERLIN/UTHER/ACTORS

Whoso pulleth out this sword of this stone is rightways King born of all England.

MERLIN

And by this test, the crown is protected.

UTHER

Over the years—

ACTORS

Thirteen years.

UTHER

—many have tried and many have failed.

*(ACTORS 2, 4, and 5 pull at the sword. It does not budge.)*

And now, every year, people from all over England flock to Camelot to try their strength against one another for the chance to draw the sword from the stone, for the chance to wear the crown, for the chance to become the next king of England. For this chance, they compete in the Tournament of Camelot.

MERLIN

I know these things, Uther. Why are you here?

UTHER

Because now, now my boy is thirteen. Arthur has grown, Merlin. He is of age. It is finally time for a king. Time for a crown. Time for the tournament.

*(ACTOR 5 becomes the HERALD.)*

HERALD

Tournament. Time for the Tournament. It's time for the Tournament! The Tournament of Camelot! It's time for the Tournament!

*(All spring into action, readying for the Tournament. Shift to ARTHUR and KAY at the Tournament.)*

ARTHUR

I wish every day was the Tournament.

KAY

Every day is a tournament when you're a knight.

*(KAY assumes a knightly pose.)*

I, a knight, am the bone of my blade, so by its deeds my worth is made.

ARTHUR

You're not a knight, Kay. Nobody can be made a knight without a king or queen to do it.

KAY

Well I am finally old enough to compete in the tournament.

ARTHUR

We're the same age.

KAY

I'm older.

ARTHUR

By a few days!

KAY

Still older, so I get to compete.

ARTHUR

I don't see why—

KAY

And knight or not, I have practiced and practiced for this day and my worth will show through my—

*(KAY realizes something.)*

Arty, I've forgotten my sword.

ARTHUR

How did you forget your sword?

KAY

I left it at home and now I need it. Go fetch it for me.

ARTHUR

Why do I have to fetch it? You're the one who forgot it.

KAY

Because I am competing today which means I need to stay here preparing—

ARTHUR

Preparing? You're just watching the Tournament!

KAY

I'm studying.

ARTHUR

It's not going to help.

KAY

Would you just fetch my sword, squire?

ARTHUR

Squire?

KAY

I am in the Tournament and you are not. So that's what you are. My assistant. My squire. Go.

*(ARTHUR jumps at KAY. The two tussle. From off.)*

ECTOR

Kay! Arty!

*(ECTOR enters. KAY jumps up. ARTHUR remains on the ground.)*

Boys, what is this?

ARTHUR

Kay—!

KAY

Father, I left my sword at home and Arty won't get the lead out to go and fetch it.

ECTOR

Arty, would you please fetch your brother's sword?

ARTHUR

But I want to—

ECTOR

Arty, I will not ask again. Go.

ARTHUR

Fine.

*(ARTHUR sets off, tracing a path around the stage. KAY and ECTOR exit.  
ARTHUR reaches the sword in the stone and examines it.)*

This is what the whole Tournament is about. All that trouble over this sword.

*(ARTHUR goes to the sword. He grabs it and pulls it out of the stone with ease.  
Lights or music may embellish this moment.)*

Oh no. I didn't mean to— It was supposed to be stuck! What do I do? Kay needs a sword.  
This will have to do.

*(ARTHUR runs off as KAY enters from another direction, ECTOR behind him.)*

KAY

Where is he?

ECTOR

Give him a moment, son. I am certain Arty will show when he needs to.

KAY

If I get disqualified because of him—

ECTOR

Was it Arty who left your sword at home?

KAY

No, but still—

*(ARTHUR runs on with the sword. He extends the sword to KAY.)*

Finally! I thought you'd gotten lost.

*(KAY takes the sword.)*

Did you get lost? This isn't my sword, you idiot! What am I supposed to do with this? I haven't practiced with—

ECTOR

Kay, let me see that.

*(ECTOR examines the sword and thrusts it back to KAY.)*

Arty, where did you get this?

KAY

I bet he stole it from someone to get out of going all the way home.

ECTOR

Kay.

KAY

I bet that's why he was running.

ECTOR

Kay, —

KAY

Did you steal a sword to get out of your errand, you lazy worm?

ECTOR

Kay, enough! Arty, I need you to tell me where you got this sword.

*(ARTHUR points off where he came from. As he does so the HERALD enters.)*

HERALD

Master Kay, it is time for you to compete! You must make your way to—

*(HERALD sees the sword, screams, and runs off.)*

KAY

What's gotten into everyone?

*(KAY examines the sword.)*

No.

ECTOR

Arty, did you pull the sword from the stone?

*(ARTHUR nods as the HERALD enters with MERLIN in tow. ARTHUR hides behind ECTOR.)*

HERALD

Look!

MERLIN

My stars and comets. What a special thing to see.

ECTOR

Sir, the boy has done it. He—

MERLIN

Allow me, please, friend.

*(MERLIN turns to the HERALD.)*

Go. Assemble the town in the courtyard. They would like to hear the news, I am sure.

*(HERALD exits. MERLIN turns to KAY, who still has the sword.)*

Whose sword is this, young master?

KAY

Mine.

MERLIN

By what means did this sword come to find itself in your possession?

KAY

From the stone.

MERLIN

Exactly, precisely how?

KAY

Well...

MERLIN

I need for you to answer truthfully.



KAY

Well...

MERLIN

A knight's worth is made not only by the deeds of his blade, young master, but by his own as well.

KAY

Fine! My brother was sent home to fetch my sword, but he brought this one instead. But then he gave it to me so now it is mine.

MERLIN

Would you point out your brother for me?

*(ARTHUR emerges from behind ECTOR.)*

MERLIN

Ah. There you are, Arthur.

ARTHUR

I go by Arty. How did you—?

MERLIN

Arty. What a name. Come. Let us join the rest of the town.

## **Stay Sharp in Your Old Age - Wear Earplugs**

Do you love to blast the tunes in your car to cover up the sound of your (excellent) singing? Do you ever think about your ears when you mow your lawn? Loud noises are one of the primary causes of [hearing loss](#). Exposure to loud noises over time - along with factors such as aging, disease, and heredity - results in hearing trouble for about a third of adults from 65-74. That number only goes up with age.

## **Deafness and Dementia**

Loss of hearing means more than just the endearing “Huh?” and “What?” Grandma and Grandpa shout across the table at Thanksgiving in an effort to keep up. Seniors as a population are prone to isolation as is. Even further isolation as a result of the inability to effectively hear and engage in conversation can have extremely negative repercussions. Older people may withdraw and become depressed. They may feel embarrassed by the difficulty they have understanding.

All this confusion, shame, and depression is taxing on an individual's cognitive health. Studies have shown that, compared to patients with normal hearing, the risk of dementia goes up and cognitive abilities go down in those patients who struggle to hear.

Effectively, if you lose your hearing, you can lose your mind.

## **Listen Up!**

So what to do? First thing is to be aware of the signs and symptoms. These may include:

- Muffled sounds
- Background noise overwhelming speech
- Difficulty with phone calls
- Consonants losing clarity
- Frequently needing to ask others to slow down, repeat themselves, or speak louder
- Turning up the volume past your normal range
- Avoidance or withdrawal from others

If you notice these symptoms, it's important to notify your doctor. They may be able to return some of your hearing by medical procedure, slow the progression of loss, or provide you with devices to assist in hearing.

If you have yet to lose your hearing, take good care of it! Wear hearing protection such as earplugs or earmuffs around loud noises such as jet engines, guns firing, or jackhammers. And maybe turn down the volume on car karaoke.

# How To Protect Your Company From Flood Damage

Due to the loss of vegetation and changes to the landscape, areas not usually vulnerable to flooding risk heavy flood damage after a wildfire. Businesses, especially, can be harshly affected by a flood, as they may experience structural damage and the loss of expensive possessions. While you should invest in commercial insurance, it generally doesn't offer protection against flood damage, so you may have to protect your business in other ways. Here are some tips to help you prepare for a potential flood.

## How To Handle Flood Damage

Here are some steps to take against potential flood risks in **[City, State]**:

- **Plan:** Create an inventory of important possessions. Pictures should be taken inside and outside of the business. All important documents – your inventory, legal papers, business reports, and your commercial insurance policy – should be kept in a locked, waterproof, fireproof safe. Also, having an evacuation plan is crucial.
- **Prepare:** Gather safety materials – such as sandbags and flashlights – and keep them in good condition. Your commercial property may also be able to be fortified against flood damage. Any extra defense is valuable in protecting your property.
- **Repair:** Familiarize yourself with steps to take in case of incurred damage. [Flood damage restoration companies](#) are here to help with extensive repairs.

## Where To Get a Flood Policy

FEMA manages the National Flood Insurance Program. NFIP's purpose is to get commercial property owners affordable flood insurance. The sooner you're able to get insured, the better; a new plan generally takes 30 days to go into effect.

Before purchasing other insurance, you should check into your policy to see what is covered if there's a flood. Every commercial insurance company is different, and yours may offer unique coverage others don't.

You never know what nature has in store, so you should always be prepared for the worst-case scenario, especially if you're a business owner. If you don't have the proper arrangements in place, it may take a long time to get your company up and running after a disaster.

# Ink and Insurance: Coverage Either Way

Cover your body and cover your shop. You've got the greatest art and artists in the world all under one roof. Picking the right [tattoo shop insurance](#) will ease your mind so you can keep your focus where you want it: on the tattoos.

## Tattoo Shop Insurance Options

Depending on your shop's services, you'll want your insurance package to be personalized. Pick, choose, and breathe easy. You might look for coverage for:

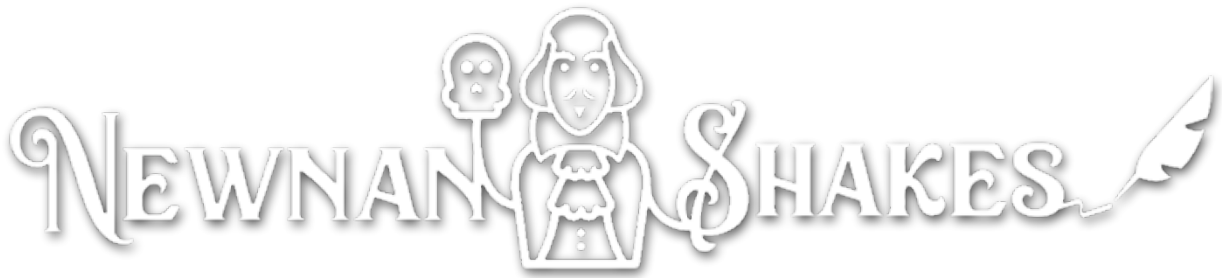
- Tattooing and body piercing
- Mobile tattooing (fairs, festivals, conventions)
- Guest artists
- Worker's compensation
- Property insurance
- Permanent cosmetics

Your insurance plan should uniquely serve you just like you uniquely serve your clients. In the event of an injury, a mistake, or even just a disgruntled customer, you and your business need to be financially protected.

## What To Expect

Tattoo shop insurance is fairly inexpensive. You can expect to pay around \$450 to \$750 per year for your coverage, depending on the underwriter, carrier, and package you need. Choosing the right underwriter and speaking to the right agent is crucial for getting the best out of what the market has to offer you.

As you can see, there's a lot to consider. Your shop needs the right coverage for the services you provide. Your insurance should be customized to help you do what you do worry-free.



## 2021 Virtual Programming: *Love at a Distance*

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Hello!

Thank you, intrepid team of virtual artists, for agreeing to tackle this project! Newnan Shakespeare has been providing quality Shakespeare programming for free to the public of Newnan, GA and the surrounding area each year since the summer of 2018. Even with the restrictions of the COVID-19 pandemic lifting and public gatherings beginning, we thought it best to continue forward with our plan to keep programming virtual this year.

The scope of the project bears repeating. We - as a team of artists scattered around wherever we happen to be - will be developing something of a virtual Shakespeare cabaret themed around "Love at a Distance." We'll be using a selection of scenes, sonnets, and monologues. Some of us are close together and able to rehearse and perform our pieces in a shared space, some of us will be performing over a video conferencing medium. Embracing the distance will be the name of the game.

The primary purpose of this letter is to get all of us on a similar page.

Either Rusty or I will meet with directors virtually at the beginning of your process to be able to have some face-to-face time to talk, answer questions, etc. The goal of this meeting is to help give you all the tools and resources necessary to springboard you into your rehearsal process. At this time we will also touch base with directors about coordinating a time for us to tune in for a general quality check and give any final notes we may have to the director before filming.

Rehearsal will be primarily individual. Actors will prepare independently, then meet with the other actors in your scenes and your director virtually to finesse the piece. These rehearsals may be as frequent or as long as your team agrees upon, we only ask that you meet as a group once or twice before your final rehearsal/filming day to rehearse together. Depending on the parameters of your cast and director, these rehearsals may be in person, over video conferencing, or a combination thereof. Your final rehearsal with your director will be when you film for submission.

The directors will be in charge of when and how rehearsals happen. You may want to meet up early in your process to get on the same page before a lot of independent work. Could be you

want to have a lot of independent time in order to develop your own vision, then the director can marry what the actors bring to the table. Either way, it is up to the director to coordinate communication between your team, schedule, and lead rehearsals. It is worth noting that time zones will need to be taken into account for many of these teams.

The highest priority to us is audience access to the pieces. We aren't doing the full plays, so we need a little guiding hand to help our audience know what we're doing and why. It will be the director's job to come up with and film a short introductory transition about the scene, monologue, or sonnet that we can insert between segments to give the audience the information they need for your piece. Useful info could be character names, their relationships with each other, societal status, and what has led them to this moment. It would also be nice to briefly tie it into the theme around which we are centering this event. Rusty and I can talk more to directors about this when we meet and are available for assistance or edits as the directors need. When everything is recorded, these clips will be sent to an editor to sew together into a cohesive final product for distribution in October.

There are a few things we are prioritizing with the cuts for our scenes. It may be that you don't want to cut your passage at all. It may be a little bit more of an involved cutting process is necessary for your piece. Again, Rusty and I will be available as resources as the director needs. The director may choose to make the cuts they deem necessary and deliver that script to their actors, or the team can come to their cut of the scene together in rehearsal. The director will have the final say about how the text will be cut.

Rusty and I will be meeting with our editor in the next week or so, and if there are any pertinent technical requirements (costumes, backgrounds, framing or filming requirements) we'll reach back out and let you know!

Finally, on a more personal note, Rusty and I wanted to talk a little bit about our and Newnan Shakespeare's approach to the work we produce. The shape of this project is a little bit more independent and scattered than a conventional production process, so we won't be there with you all the time to build a communal vision. We believe that theatre is a process through which you never arrive at a destination. We encourage you to take risks. Filming a piece can feel like a final product; like it "has to be" a certain way. We encourage you to find the parameters that make sense for your filming and to find freedom inside of those parameters. Every performance is just as much a rehearsal as the ones where you don't have an audience. Please continue to experiment and explore, all the way through to the end. And most importantly, please, please, please have fun.

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## CUTTING SHAKESPEARE'S TEXT:

You can do a few things when cutting Shakespeare. You can simply cut some words out that are inaccessible or irrelevant to what you are performing. You can move lines around to make things clearer. You, as a last resort, can also write some "Fakespeare" that scans the same as the original text to fill out a line you needed to cut.

As you are making these cuts, there are a few things to keep in mind:

**Clarity** - Clarity above all. If the audience is lost, the play dies. Make it as understandable and accessible as possible. Do you need to reference that character who isn't in your scene? Could that sentence that makes a reference that doesn't land in the modern day be cut? Is a character repeating themselves or making a point that doesn't pertain to your scene? Cut it.

**Scansion** - As you're cutting, make sure you're doing the scansion work to keep the poetry flowing as intended. There's a little bit of elasticity here (I'm not a hardcore purist. If a cut you make scans iambic when there was a trochee in the line you cut, I'll look away.), but keeping the rhythm of the poetry as written is useful for both the actors studying the text and the audience's experience with it.

**Rhyme** - Don't break up rhymes. If lines rhyme, there's a reason for it.

Below you'll find some quick and dirty examples from the first scene of *Twelfth Night*. They're not necessarily good examples, but they'll show you what is possible with text.

If any of the ideas above are unfamiliar to you or you feel you need a bit more explanation, please reach out to either Rusty or me! We will be happy to help you out!

### DUKE ORSINO

If music be the food of love, play on;  
Give me excess of it, that, surfeiting,  
The appetite may sicken, and so die.  
~~That strain again! it had a dying fall:~~  
~~O, it came o'er my ear like the sweet sound,~~  
~~That breathes upon a bank of violets,~~  
~~Stealing and giving odour! Enough; no more:~~  
~~'Tis not so sweet now as it was before.~~  
O spirit of love! how quick and fresh art thou,  
That, notwithstanding thy capacity  
Receiveth as the sea, nought enters there,  
Of what validity and pitch soe'er,  
But falls into abatement and low price,  
Even in a minute: so full of shapes is fancy

If you weren't going to provide environmental stimulus (like the music referred to here) it might be clearest to cut this passage.

That it alone is high fantastical.

**CURIO**

~~Will you go hunt, my lord?~~

**DUKE ORSINO**

~~What, Curio?~~

**CURIO**

~~The hart.~~

**DUKE ORSINO**

~~Why, so I do, the noblest that I have:~~

O, when mine eyes did see Olivia first,  
Methought she purged the air of pestilence!

~~That instant was I turn'd into a hart;~~

~~And my desires, like fell and cruel hounds,~~

~~E'er since pursue me.~~

*Enter VALENTINE*

How now! what news from her?

**VALENTINE**

So please my lord, I might not be admitted;  
But from her handmaid do return this answer:  
The element itself, till seven years' heat,  
Shall not behold her face at ample view;

~~But, like a cloistress, she will veiled walk~~

~~And water once a day her chamber round~~

~~With eye-offending brine:~~ all this to season

A brother's dead love, which she would keep fresh  
And lasting in her sad remembrance.

**DUKE ORSINO**

O, she that hath a heart of that fine frame

To pay this debt of love but to a brother,

How will she love, ~~when the rich golden shaft~~

~~Hath kill'd the flock of all affections else~~

~~That live in her;~~ when liver, brain and heart,

These sovereign thrones, are all supplied, and fill'd

Her sweet perfections with one self king!

Away before me to sweet beds of **flowers**:

Love-thoughts lie rich when canopied with **bowers**.

Curio may not be necessary in your presentation of the scene, but mentioning Olivia's name might be. You could cut to remove Curio and let Orsino's line continue.

Here's an example of something you would **not** want to do. This passage is metered verse. If you cut in the middle of the line like this, you break up the meter.

You could write a half line of "Fakespeare" to fill out that last line, if you deemed this cut necessary.

I wouldn't necessarily make this cut, but "when the rich golden shaft" and "when liver, brain and heart" have the same number of syllables.

As the scene ends with a rhymed couplet, you wouldn't want to cut here.



## Introduction

Michael Frayn<sup>1</sup>, said to be “the giant who bestrides the British arts,”<sup>2</sup> briefly discusses fractals in his book of philosophy, *The Human Touch*. Much of the book discusses the inherent limitations of our observations from our human perspective when the smallest component of any given object breaks down to nothing more realizable than indeterminate probabilities and wave formations. He details the human efforts to impose constructions upon a chaotic universe for the purposes of understanding and correlating observations, noting the successes and pitfalls of such approximations. Fractals, he says, are “an admirable attempt to come to terms with the irregularity of the world – the irregularity in this case being a function not of the subjective indeterminacy imposed by human observation, but of an objective feature of the universe...”<sup>3</sup> We will come to see how fractal geometry is a human construct, a conceptual shell imposed on observable irregular forms, but the necessity of this understanding is brought about by concrete, objective features of the universe.

These irregular structures that necessitate a fractal understanding of the world “were regarded...as a ‘gallery of monsters,’ kin to the cubist painting and atonal music that were upsetting the established standards of taste in the arts at about the same time.”<sup>4</sup> During the 20<sup>th</sup> century, we saw a development in both the sciences and the humanities to assimilate understanding of chaos into the standard image of the world. This expansion of the human

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<sup>1</sup> My concurrent project is a discussion of Frayn’s works, focusing on his scientific historical fiction play *Copenhagen*. The significance of this will be further discussed in our discussion of art.

<sup>2</sup> “There’s Still Life in the Old Stager; Profile.” *Sunday Times*. (London, UK): 15. 2002.

<sup>3</sup> Frayn, Michael. *The Human Touch*. (New York: Metropolitan, 2006), 104.

<sup>4</sup> Dyson, Freeman. “Characterizing Irregularity.” *Science*: 200. May 12, 1978. 677-678.

understanding into chaotic forms is integral to our understanding of how fractals both naturally and purposefully exist and what the trends towards either probabilistic naturalism or strict mathematical perfection mean about the nature of the element in question.

## Background

Fractals are something of a murky backwater of arithmetic, the applications of which are omnipresent. To most of the population, fractals are nothing more than a pretty desktop background or an elevated word to describe what one sees in a kaleidoscope, and geometry goes no further than eighth-grade trigonometric ratios and how to bisect a line with a compass. The true treatment of fractal math seems to live in this unnecessarily esoteric realm for how prevalent the forms are in natural systems. Euclidean and Newtonian approximations of complex and irregular mathematical and physical forms dominate conventional interpretation for the sake of simplicity. But filing objects into ill-fitting categories and seeing the world through classical eyes will only yield so much. “Clouds are not spheres, mountains are not cones, coastlines are not circles, and bark is not smooth, nor does lightning travel in a straight line.”<sup>5</sup> With a fuller understanding of the concepts and applications of fractality, they describe all manner of natural and theoretical systems that other mathematical interpretations of forms dismiss as amorphous or non-structured.

Symmetry and similarity are classifications of forms that we are intimately familiar with. The standard Euclidean symmetry we learn comes in three main forms: reflectional, rotational, and translational. If a form is reflected across a certain given axis, rotated by a discrete angle, or translated through space, it will appear as the same form. Another exhibition of symmetry arises

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<sup>5</sup> Mandelbrot, Benoit B. *The Fractal Geometry of Nature*. (San Francisco: W.H. Freeman, 1982), 1

when we speak of scale-invariance. The term is fairly self-explanatory – that the object or system in question does not vary or change as the scale changes. In other words, scale-invariant or self-similar objects appear the same at all scales.

However, this self-similarity is not the only qualification to classify an object or system as “fractal.” In a fractal, we must see self-similarity throughout the structure, not just around a single point. To illustrate this, compare a spiral to a snowflake. A spiral will appear the same if magnified, but only around its center; a snowflake will have complexity that may appear self-similar independent of where one varies the scale.

Fractals are what could be called a “soft concept” in math. The term “fractal” describes objects, shapes, quantities, etc. that display a self-similar construction on all scales. In the purest mathematical sense, this self-similarity would be exact on all scales; however, the coining of the term by Benoit Mandelbrot was intended as slightly more of a metaphoric concept to describe a phenomenon. In fact, in *The Fractal Geometry of Nature*, Mandelbrot says that “this work pursues neither abstraction nor generality for its own sake, and is neither a textbook nor a treatise in mathematics...it is written from a personal point of view and without attempting completeness”<sup>6</sup>. The father of fractal geometry thought of it less as a hard, closed subject, and more as an exploration of a new form of geometry altogether. Euclidian geometry fails when it attempts to discuss fractal forms, and would rather refer to them as amorphous, despite their distinctive organization and patterning. This alternative fractal geometry fills that void and lends order to the formerly unclassifiable chaos.

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<sup>6</sup> Mandelbrot. *The Fractal Geometry of Nature*. (2)

Mandelbrot delineated between concept and manifestation with qualifiers attached to the term fractal. “The combination *fractal set* will be defined rigorously, but the combination *natural fractal* will serve loosely to designate a natural pattern that is usefully representable by a fractal set. For example, Brownian curves are fractal sets, and physical Brownian motion is a natural fractal.”<sup>7</sup> Conceptual mathematical fractals conform perfectly to an established set of rules for the form, while natural fractals are more rough fittings of these conceptual forms in observable systems. For the scope of this paper, we are primarily interested in the difference between these two applications of the same term, where it arises, and if and how it is useful to use the same term with qualifiers to describe different systems.

It would be a fallacy to attempt to examine fractals purely from a cold, mathematical perspective. They were born of nature and nature is inherent in them. Nature is chaotic and difficult to classify perfectly, thus we must create and constantly redefine a dialect with which we can discuss and understand. As Galileo said, “[the universe] is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures, without which it is humanly impossible to understand a single word of it...”<sup>8</sup> Approaching the universe with a limited vocabulary of Euclidean forms and Newtonian motion is not sufficient to encompass the full picture. Likewise, examining purely scientific applications limits the world available and the language capable to express fractality in its myriad forms.

As discussed earlier, Mandelbrot’s work was part of a larger intellectual revolution in the 20<sup>th</sup> century. In mathematics, we see this revolution against strictly Euclidean interpretation

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<sup>7</sup> Mandelbrot. *The Fractal Geometry of Nature*. (4-5)

<sup>8</sup> Popkin, Richard Henry. *A Philosophy of the Sixteenth and Seventeenth Centuries*. (Free Press: 1966), 65

toward a more complex understanding of fractals. In physics, we see the same movement away from strictly Newtonian interpretations of the workings of the natural world toward quantum mechanics and chaos theory. The revolution extends further, into the artistic realm. In visual art, we see symbolism, expressionism, cubism, and Dadaism. In music, we see atonal and microtonal compositions, experiments with form and tonality with the modernists, and minimalism takes shape. In theatre, we find reactions against the naturalistic tradition in symbolism, theatre of cruelty, epic theatre, and absurdism. We will discuss the full implications of these developments in greater detail later on, but the common theme in all of these shifts is reconciliation with the form of chaos; taming the monsters. Dane Camp extrapolates upon Galileo's quote, saying in his review of Mandelbrot's life and work,

“Mathematics is a language, the language of the universe. Students who want to appreciate the poetry of the cosmos need to learn the vocabulary, grammar, and structure of the language. They must become articulate if they are to apply the language to practical discourse. Also, if they want to understand the interconnectedness of the universe, they must be acquainted with a wide variety of its literature.”<sup>9</sup>

In the same way that mathematics is the language of the universe, language itself, our usage of it, and artistic expression are the way in which we express our understanding of the universe. We impose form and constructions upon the world and by doing so develop our understanding. Our understanding of the world is in turn expressed through forms and constructions that we create. The continual two-way informative, influential process between

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<sup>9</sup> Camp, Dane. “Benoit Mandelbrot: The Euclid of Geometry.” *The Mathematics Teacher*: 93, 8. Nov, 2000. (708-712)

comprehension and creation makes understood forms in both synthesis and analysis perpetually relevant in all fields of both exploration and expression.

This discussion of fractal geometry has no pretense of being a rigorous mathematical or scientific analysis. Rather, we shall examine instances of application, demonstrating the advantages of the shift of perspective from looking at objects and systems through a fractal lens and the utility of the perspective outside of the realm of scientific and mathematical analysis. We have seen that a fractal set is a perfect, infinite representation of a form or pattern that abides by preset rules according to the human construction of a “fractal.” It is a purely conceptual creation that abides by a definition. Natural fractals, conversely, are stochastic and imperfect. Through the discussion of fractals exhibited in nature, man-made materials, and art, the tendency for materials to exhibit a natural, stochastic formation striving towards the perfect fractal set and for art to largely exist as a suggestion of the fractal set striving towards the natural (depending on the intended message) arises. Because of the multifaceted applications of the concept pertaining to both the fractal set and the natural fractal for all manner of disciplines, a universal dialect of fractality is necessary.