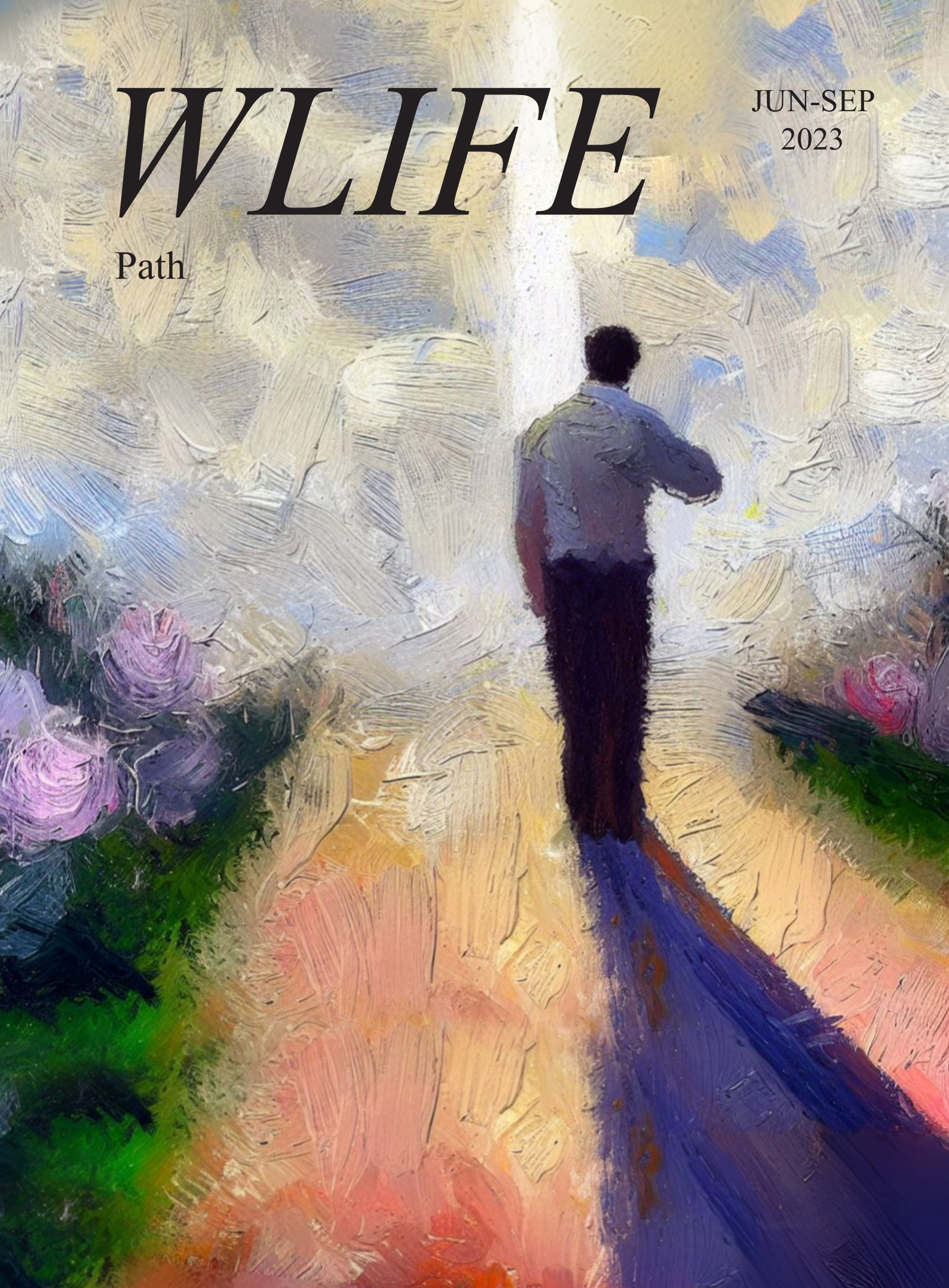


# *WILIFE*

JUN-SEP  
2023

Path







# ***WLIFE***

## ***Contributors***

### **Editor in Chief**

Thea Zhang  
Mike Chen

### **Managing Editors**

Lisa Li  
Michael Chen  
Lisa Shao

### **Director of Digital Media**

Eddie Fang

### **Cover Design**

Catarina Shi

### **Artwork**

Finnie Chen

### **Design**

Carina Zhang  
Catarina Shi  
Finnie Chen  
Rose Want  
Victoria Xu  
Reyna Feng  
Cecilia Shen  
Lisa Li  
Sophia Xu  
Ella Ye  
Helen Wu  
Eric Qian  
Ray Hu

### **Content Creator**

Hans Xu  
Athena He  
Sky Cao  
James Cai  
Myra Lu  
Jason An  
Steven Chen  
Alan Ji  
Victoria Wu  
Thea Zhang  
Patrick Yang  
Brittney Ren  
Alice Jiang

# Dear Readers,

We live in a world filled with journeys, both literal and metaphorical, and we constantly explore the diverse paths that shape our lives through making choices.

At *WLSA*, for example, some choose to focus more on academic pursuits, some choose to navigate extracurricular activities, and some may choose to explore friendship and cultural experiences. In this issue of *WLJF*, we invite you to take a closer look at the concept of “path”, contemplating the routes you take, the choices you make, and the destinations you seek.

Within the pages of this issue, you will find a rich tapestry of narratives. Our talented authors and reporters have shared their personal stories and inspirations gained from their navigation of the twists and turns of their own paths. From the memoirs of childhood to the reminiscence of a trip, from the exploration of belief systems’ dual nature to dialectical discussion of the new taxation system, each story, poem, and essay offers a unique glimpse into the myriad paths we encounter.

So, as you turn the pages of this journal, I encourage you to reflect on your own path. What choices have you made, and where have they led you? What new horizons await your exploration? We hope that this edition inspires you to embrace the diversity of paths that lie before you and to forge your own unique trail in the world. Thank you for joining us on this literary expedition. May the stories and insights within these pages illuminate your own path.

# CONTENTS

## 01 Art Gallery

*UNIT PAGE 1*

2-3 Art Pieces

## 02 Literature

*UNIT PAGE 4*

5 再别敦煌

6 It's Wednesday Again

7 Childhood

8 Childhood experience

9-11 Ebbs and flow

12 我总是在做梦

13 A Dark Room

14 Poetry Collection

## 03 Journal

*UNIT PAGE 15*

16 New York Times Book Review

17-19 What Would Happen If We Banned Billionaires?

20-23 Religion in the Aspect of Function, Facts, and Future

## 04 Science Lab

*UNIT PAGE 24*

25-29 ZnO Nanorod from structure, Properties to Applications

## 05 School Events

*UNIT PAGE 29*

30-31 Initial View College Fair

32-33 UChicago Info Session

34 CCA Fair

*PATH*  
*JUN-SEP 2023*

WLSA SHANGHAI ACADEMY  
JOURNAL



# *Art Gallery*

*"Art is not what you see, but what you make others see"*  
--- Edgar Degas

这幅山水国画展现了大自然的壮丽景象，以及隐居生活的悠闲自得。整幅画面侧重于对于山石和松树的刻画，以墨色为底色，通过深浅不一的墨色和硬朗的线条表现山石的纹理和质感。同时叠加藤黄和花青，为山石增加层次感的同时，表现山石存在时间之久，似乎已经存在了千百年。在画面的中心，一座巍峨的山峰高耸入云，山石嶙峋。与山石相辅相成的是松树，这些松树形态各异，有的挺拔，有的依偎在山石之间，它们的存在为画面增添了生气和活力。在山水之间，几所房屋若隐若现，聚集在一起形成一个小村庄。在近处的石头上，站着一位隐居的诗人，抬头眺望着宽广雄伟的前方。它的存在与雄伟的山脉形成了强烈的对比，突显出大自然的广阔和人类的渺小。



这幅国画描绘了一幅生动的花鸟画面，以鸚鵡和石榴为主题，描绘出自然界生命的生动活泼之感和自然和谐之美。鸚鵡栩栩如生地栖息在画面的中央，白色的羽毛细节栩栩如生，亮黄色的嘴和白色形成对比，仿佛可以听到它们在讨论如何把石榴果实带回家。画面的下方，几颗石榴沿着树枝下垂，满载着丰硕的石榴果实。石榴果实的红色与鸚鵡的羽毛相得益彰，形成了和谐的色彩搭配。整幅画面以淡雅的背景为衬托，突出了鸚鵡主体物的生动和色彩，体现出自然和谐之美。







## 1. Ribbon and Mud

Under the red carpet lies mud, beneath the glamorous gowns he lies a cage. In a consumerist society, showing off to satisfy vanity only brings an empty heart and a festering reality.

## 2. The boy behind the scenes

The boy stood behind the curtain and looked at the girls dancing on the stage. The pink ribbon cannot be tied to his short hair, just like his ballet dream has been hindered by public opinion. Stereotypes limit people finding their true selves, gender is not a boundary but prejudice is.



# *Literature Workshop*

*"Literature adds to reality, it does not simply describe it."*

*--- C.S. Lewis*



# 《再别敦煌》

by Steven Chen G12 Delta

轻轻的我走了，  
正如我轻轻的来；  
我轻轻的回眸，  
作别少年的层楼。  
那黄河的落日，  
是山坡上的绵羊；  
绿洲旁的迷雾，  
将它的过去隐藏。  
流沙里的舍利，  
静静地在佛前皈依；  
在敦煌的壁画里，  
我痴心做一株菩提！  
那月牙似的一潭，  
不是蜃楼，是天上歌；  
哼唱在黄土上，  
埋葬着翡翠般的梦。  
解梦？用一双眼睛，  
在玄之又玄处顿悟；  
满载一船星河，  
在佛法斑斓里歌唱。  
但我不能歌唱，  
因果是人间的赞歌；  
骆驼也为我沉默，  
沉默是今晚的敦煌！  
悄悄的我走了，  
正如我悄悄的来；  
我听一听梵音，  
不留下一颗凡心。





An impressionistic painting of a room. In the foreground, a dark brown piano is partially visible. To the left, a white rectangular object, possibly a book or a piece of paper, rests on a surface. In the background, a lamp with a white shade sits on a table. A window with a white frame is visible in the upper right. The overall color palette is muted, with greens, browns, and greys, creating a somber and nostalgic atmosphere.

# It's Wednesday Again

Hans Xu G12 Eta

It is Wednesday again  
The gloomy clouds of grey  
The cold breeze of the morning  
No sun, no blue, no sounds of laughter  
Just the coldness of a lonely day

It is Wednesday again  
The sounds of laughter and joy  
Have already left without looking back  
Leaving behind a cold breath of frost  
That leave shivers on a warm summer's day

It is Wednesday afternoon again  
I wonder what I used to do then  
Tis' a warm summer afternoon  
But the room is still cold without warmth

The room is still cold  
Even when it is summer  
The room is still silent  
Even though someone is there

No sounds of the bass  
No sounds of the drums  
No sounds of a beautiful singing voice  
Just the silence of a once happy piano  
And a stinging warmth as it trickles down my throat  
In my hand an empty bottle  
An empty bottle of joy  
Empty  
It is  
Wednesday afternoon  
A lonely Wednesday afternoon



# Childhood

Athena Han G12 Kappa

The young, in a white skirt, sitting beside the beautiful and nuanced ocean, is waiting for the last dish: a tiramisu.

Her hair, curled, waving with the rhythm of the wind, attempting to let the wind blow away all the nervous minds. The fork in her hand, trembling, couldn't even transmit a piece of cake.

The internal life-supporting heart, beating at the upper limit as it could, was so aggressive that she could even hear its strong vitality.

Everyone was chill in the southern part of China, except for her.

The call comes, the ring was louder than any of the loudest thing that exists in the world. Having let it ring for half a century, she picked it up. Everything and everywhere was tranquil, the only sound that could be heard was the breeze of the ocean.

“You got it.”

It was the best and most expected result. She started to sense the world beside her, salty smell, sweet cake, and crowded BBQ.

Three years of struggling finally ends, and she got into her dream school. Thousands and thousands of obstacles were now like steps of stones that get her to success.

She danced and walked like a fairy. It was the sweetest dream she had during that starry



# Childhood Experience - Writing

**Sky Cao**  
**G12 Eta**

Returning to the source of all my hopes and goals, I am pure and vulnerable, witnessing stars twinkling above me, unsure of where to go or what to do in the future. However, I continue my journey to the point when numbers and signs merge, lines form curves and turns, and the most beautiful patterns in the world emerge. I made a decision and took a step forward, hemmed myself in the sea, and chunked water repeatedly as the numbers and signs clung to me. To get out of the situation, I took out my pen and fought them. I was stuck between everything at first, like a child who couldn't walk on his own, falling multiple times while accomplishing seemingly basic things. I felt as if the entire world was rejecting me, and the door of permission was generally shut, with the surviving birds wailing pathetically outside. These challenges disturbed me, so I talked to my parents about it. They cheered me up and made me realize that mathematics is a difficult path. There is no reason for me to go back because it is a path I am committed to take and discover for myself. During that conversation, I

instantly realized that the motivation for me to pursue mathematics stems from my interest. I could overcome all of these snares with my own efforts. I immediately felt a sense of maturity, and I realized that I should be responsible for my own actions. The complete process that helps me find my way ensures that I am always resolute, that the spirit of never giving up built in my thoughts and became the water resource in a desert that is worth all my efforts to protect and treasure. I discovered the secret wealth on the island and will keep it forever.







# *Ebbs and Flow*

**James Cai G12 Sigma**

Ebbs and Flow  
“White waves, fearless,  
I’ll navigate  
Sailing steady,  
rowing with grace  
Casting my net into the schools of fish  
Reeled in the largest,  
we laugh in bliss”

Singing coming from a distance. Looking out to sea from the beach, the shimmering sea reflects the setting sun, wave after wave, pushing the returning fishing boats towards the shore.

East China Sea was rising tide: waves came in, silently creeping over my mounds of sand; wave passed, that small stepped terrace facing the sea will lose its contours into a slope. My right hand covered with seawater and mud, just two pats, the slopes again into steps; my left hand holding a branch, stabbing patterned round holes in the uppermost layer of those newborn steps.

“What are those?” A strange voice questioned from the front, I wiped my dirt-blurred eyes, looked up, and the man standing in front of me was clad in full black.

“Who are you?” I asked. He has long hair that reached his shoulders, windswept. This was the second time I encountered these hairs, the first time was at last night’s dinner gathering, besides my father and a group of elders. “Your hair is so long, I heard Grandpa say you can create those buildings on the mountain, are you a magician?”

“That’s called architect... Come on, I’m your uncle.” The man in black squats beside me, pondering for a minute. “I just returned from studying aboard, you might not be that familiar with me.” He points his finger to my stepped sand mounds - “What are those again?” “I don’t know, these are stuff I saw yesterday in the mountains. Grandpa told me that this is where people go after they die, I guess they are probably heaven.”

Sea breeze blowing into my cheeks. A long silence.

The waves come and go, still pounding my little structures. Seagulls pacing on the edge of the sea take off in the wind. They hover in the direction of the sun about to set.

Gazing into the man’s eyes. A long silence.

## 1.

“Do you know that we don’t originate here?”

He finally breaks the awkwardness.

“In my great-grandfather’s generation, which is your great-great-grandfather’s generation, famine and plagues forced us to flee to the deep mountains of the east. When faced with the raging waves of the East China Sea, the Cai family, unable to escape, established a town called Qingwandi on the top of the cliffs.”

“Then, people came from all around to build villages here. There were frequent wars between them, and your great-grandfather led the villagers of Qingwandi in a brutal victory for three generations, until the next plague killed two-thirds of the village’s young people.”

As the last glimmer of white lifts from the sky, night slowly covers the entire strait. Fishermen, arching their backs, pulled the fishing nets off the edge of boats, knots of nets rubbing against the rusted iron with the sound of death dragging its chains along the twilight beach. It was the Grim Reaper who had paced here many centuries ago.

Waves kept rising, roaming over my ankles and over Architect’s black leather shoes. Waves submerge my sand building, rows and rows of steps that slowly return to the plain under the wash of flowing water.

All my attempts to preserve these mounds failed, under the flowing of water, the “heavens” I built reach its eternity amidst wearing away into the boundless ocean.

“They buried their families who died in the plague. From the south side of the mountain to the north side, similar mounds with steps were installed throughout the place. Qingwandi has since become a necropolis... These mounds are not paradise, they are tombs, buildings commemorating deceased, not paradises of eternal life.”

“Although those who survived eventually left the strait, we still return to this place every year during the Qingming Festival on February 15th of the lunar calendar. Over time, Qingwandi has become an overgrown ruin. Every Qingming Festival, the first thing people do after traveling

through the mountain to this place is to remove the overgrown weeds on the graves... Nope, the first thing they do is to identify the location of the graves.”

“In nature, the way to mark the orientation is five steps in front of the tree and three meters to the right of the stone, it is the old man who passed down this designation from generation to generation based on his memory as his authority. After finding the location, we have to cultivate the soil, to delineate new edges, new steps for those mounds whose contours are gradually blurred by exposure to wind and sun.”

With the sea rushing past our knees, the sky over this strait has gone completely dark, and mountains that surround the bay’s beach begin to light up with small glowing yellow and white lights.

Rolling up our soaked pant legs, we stepped out of the territory occupied by the sea and headed towards the light.

## 2.

The next day, I attended my great-grandfather’s funeral with my father.

On the northern side of the bay, an enormous adobe structure was being tidied up. Black stones outlined the entire arch-shaped outer contour of the building, while three tiers of steps taller than me were chiseled out just a few days ago to fill that garden arch. A large cavity had been dug out of the vertical facade of the uppermost step, where people dressed in white fabric or dark suits were carrying the coffin of my great-grandfather into its entrance.

One of the elders delivered the eulogy - the legendary stories of how great-grandfather led the crowd to conquer the neighboring village on the next hill in his youth, how he built the port on the northern side of the strait in his prime to welcome foreigners with white skin and blue eyes from the other side of the East China Sea, how in his middle age he led everyone out of Qingwandi and into the mainland to establish a foothold in the city, and how in his old age he had numerous children and grandchildren throughout his honorable and satisfying life.

These legends are buried in the scars of



the earth with this funeral. The open entrance of the cave, as if the mouth of the dead who refused to cease his speech, was ultimately sealed with a boulder, unmoving.

Years later I thought, Life is too long beyond the grave it stretches wide.

The tapestry of life, woven with threads of time. Too much of the past for one to memorize, and too many words remained for one to read through the lines.

Egyptians left no architecture belonging to the living. Architects among them, in the most primitive desire - the desire to attempt to leave something behind, exercised the most primitive action in architecture - erection.

No, the most primitive action in architecture should be digging. An evacuated cavity, some leaves with a little dirt as a threshold, would allow a Homo sapien to survive the night infested with beasts. And the same time the people were digging, they were also erecting. Those who went out to forage for food in the daytime could easily get lost, thus they built something conspicuous to guide their way home - steles, houses, temples, and the Towers of Babel.

Remembering, retrospecting, tracing, signifying

In this way, we kept returning to Qingwandi, time and again, to clean up the earth's hyperplastic bulging scars that had been erected for the deceased.

On those forgotten graves, weeds and flowers sprout several inches high, with birds nesting on them. Those graves that have been forgotten eventually merged with nature as if they had never existed - a kind of prolonged sky burial. And those graves that have been remembered, in the process of being searched and cleaned and rebuilt repeatedly, are slowly approaching eternity in the process of heading towards oblivion. The act of constantly demarcating the boundaries for the graves is the very process of establishing the deceased's life over and over again - a growing grave it is in the watering of time, growing towards eternity.

On the way back to the city, Architect, who went along the way, got in my dad's car. They chatted on the way about Architect's

experience abroad over the years, China's policy of promoting private enterprise in recent years, with something about the government-led new rural construction project in Qingwandi, which my father said was a great opportunity for Architect.

Two-wheel-drive commercial vehicles move forward slowly and bumpily along the rugged hills. The overloaded engine sounded a crashing rumble, the wheels crushing the bumpy driveway that had been ground down day after day. I peered through the water and mud spots on the window towards the ocean on the left side of the driveway, the sun shining on the sea - ebbs and flows.

My father pointed to the scaffolding and cranes being built over the mountain, a city under construction. "Someday in the future, all those buildings made of the earth will become steel and concrete, and Qingwandi will change from a city of the past to a city of the future." Gazing in the direction of my father's pointing, Architect spoke.

"In fact, I chose to return to the country just to take a look at this land where I had grown up. Do you understand this feeling? The scenery here is not beautiful, but I miss it, I miss everything that has perished here. At every year's Qingming Festival, I fantasize that one day I can make all those stuff being erected, being commemorated, to reach true eternity."

Once in the township, the architect gets out of the car and leaves.



# 我总是在做梦

Myra lü 2023

我总是在做梦，  
梦见群鸟飞掠蓝天，  
梦见朝阳跃上云端，  
梦见花开，  
梦见执笔，  
梦见清风，  
梦见群星。

北征的英雄挺直身躯，  
接受群众的冠冕，  
他们欢呼，他们雀跃，  
英雄高举长剑，  
银白的剑光满是志在必得的意气风发。

“哦！船长，船长！”  
水手们以此追随南下的船长，  
他们无比期盼地向往，  
向往一望无垠的大海，  
和等待他们探索的群岛。

洁白无暇的天使默默祈福，  
贤明慈善的国王发放福祉，  
公私分明的法官裁决善恶。

我却又总是清醒，  
看到日落，  
看到花谢，  
看到叶枯，  
看到污浊，  
看到混沌，  
看到现实。



# A Dark Room

Hans Xu G12 Eta



A dark room, the presence of hundreds of entities silently judging. Faceless entities lurking in the darkness, judging my every move as I entered. Their eyes gazing into my soul, as they say, “If you gaze into the abyss, the abyss gazes back”. I felt the coldness of their gaze accompanied by the humming of the massive air conditioner in the back, amplifying the cold that had already seeped into my bones. But at the center of the stage was a light that seemed warm, unable to bear this cold, I strut towards the welcoming spotlight. When I reached this patch of light that was a safe haven within the darkness, I did not feel its warmth, but rather, the cold intensify. Nervousness began to settle in as I bowed as if it were my last, with utmost reverence for the shadows, I bowed until I felt the blood rushing to my head. As I turn to sit on the cold bench that was just slightly too tall for my still

growing legs, I felt the coldness dissipate even just a little and the gazes softening ever so slightly. Raising my hand to the board of black and white keys, I felt the abyss pull back as I created my own world from the tips of my fingers. From a trickling stream to a roaring river, to ocean waves crashing, notes flowed like waves, flowing and crashing, meshing together a story that I saw with my fingers. But all stories shall end, from my fingertips it came and to it, it returned, like a still lake, nothing seemed to move. There were no cheers, no shouting, no claps, just silence, but this time I felt the abyss smile, even if just a little.

### 蝶恋花

乾坤遍历事无数，大去时日，能有几留驻。年年案前韶华枯，仍怜毫下诗文素。  
日晚疏月残红路，遥望天际，又是一岁暮。欲知庸碌日何度，今来常思未尝悟。



### 渔家傲

青花石苔千树绕，翡翠茎蔓萦蕙草，古社零落欲寻遥，雾风到，幽幽森木迷驻脚。  
好得百磨终出刀，故日年少今未老。再还旧里嶂叠小，急行到，蝉鸣声声天暮了。

### 熬夜思

四更伏案未归榻，缸中芙蓉花已睡。  
料定人需有所钟，无期之朝难离被。





# Journal

*"Journalism can never be silent: that is  
its greatest virtue and its greatest fault.*

*--- Henry Anatole Grunwald*

***“Corral nimbly bridges the personal and political, evoking themes of migration to ask what it means to be unwanted.”***

***--New York Times Book Review***

by Victoria Wu G10 Omega

Eduardo C. Corral’s dad is a Mexican immigrant. In many of Corral’s poems, he portrayed an image of the life of undocumented immigrants who tied themselves with a contradictive change of assimilation and resistance, standing for the voices of those who moved away from their land on, and calling the unsayable problems of survival, identity, isolation, and belonging out in the known corner of great America.

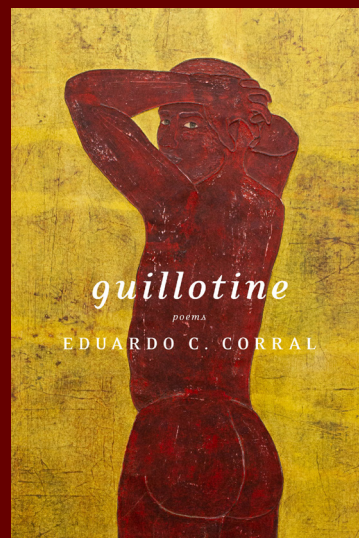
Working in the Mexican restaurant, it’s ironic that people there don’t know how to pronounce his Mexican name, so they “renamed him Jalapeño”. The first line formed an engulfing vortex somewhere inside my body, dragging my emotion down and trampling it again by the waves of my memories. I don’t know where it is but it immediately inflames a sensibility within my soul—I have the exact same experience.

When I moved to America, I also told my original name in the first class. My name is composed of multiple letters in my native language—it is special that nobody could own the same first name as me. It belongs to me. But nobody is able to pronounce it right. They felt it hard to pronounce so they just called me by my last name. To better fit in, I got myself an English first name—one that is commonly seen, easy to pronounce, and unique. Ever since then, I was called up more by my teachers and knew more people in my grade.

“Victoria”

But this name doesn’t belong to me. I belong to this name.

The renaming of his father is not the only irony in the poem. The poem didn’t



mention in a place that “my father” is a Mexican but Corral wrote, “He’s an illegal. I’m an Illegal-American”, revealing that they identify themselves as American, but didn’t even have illegal citizenship as undocumented immigrants—they were those rejected and unwanted. They devoted themselves as a member of the country and chase their American Dream hiding their unsayable hardship of survival and deprivation of belonging.

Sometimes I would think if we have inevitably lost something in the path of seeking to belong and wallowing in an illusion of fitting in when we moved to somewhere new. Name and identity are both examples I see from the poem that was left behind in the sea or dropped somewhere on the road unconsciously in the process of immigration and effort for assimilation in culture. And it happens not only in immigration but also takes place when we are seeking acceptance, such as to be popular. I wonder what have you lost as a consequence of attempting to be accepted? Is it worth losing them?

I got caught in lamentation after reading the poem because I seemed to see people coming to this land with great expectations struggling hard in a muddy quagmire filled with tons of troubles for their American Dream that was slowly buried by the unsayable hardship in the burning wood smoke. And they are still believing in “Jesus wasn’t a snowman”—God would be fair to every person on this land.



# What Would Happen If We Banned Billionaires?

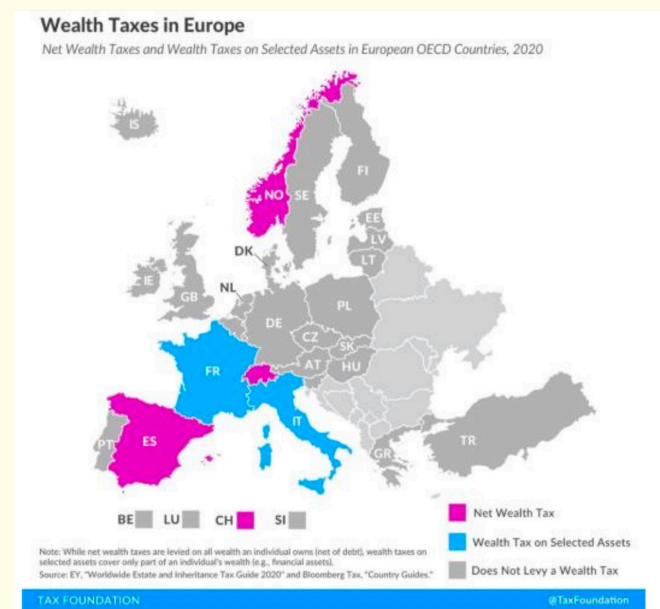
Thea Zhang G11 Eta

## 1. Introduction

“We do understand the direction we’ve been going...The people at the top are not barely hanging on by their fingernails.” On March 2nd, 2023, Senior U.S. Senator Elizabeth Warren publicly defended her proposal of the imposition of a wealth tax on billionaires<sup>i</sup>. Her aim was to address the wealth inequality exacerbated by the COVID-19 pandemic that pushed 120 million people into extreme poverty while propelling billionaires into unprecedented levels of wealth<sup>ii</sup>. The strong juxtaposition between billionaires’ skyrocketing wealth and ordinary people’s increasing struggles makes people’s desire to purge the billionaires’ wealth understandable. While some argue for banning billionaires to end the egregious imbalance, it is crucial to examine the consequences of such a measure. This essay argues against a ban on billionaires as a solution to social inequality, asserting that regulation to this effect would fail to address the root causes embedded within the capitalist system and have adverse effects including stifling innovation and hindering economic development.

Billionaires are individuals possessing a net worth exceeding one billion dollars.<sup>iii</sup> Presently, statistics indicate that there are approximately 2,640 billionaires worldwide, collectively possessing an estimated net worth of \$12.2 trillion.<sup>iv</sup> A ban on billionaires would prevent individuals from accumulating more than one billion dollars; such a prohibition could be realized through various forms, such as inheritance restrictions, corporate regulations, wealth caps, asset seizures, or a wealth tax. This essay will focus on the consequences and effects of the imposition of a wealth tax, as it’s regarded

This essay will focus on the consequences and effects of the imposition of a wealth tax, as it’s regarded by the majority of US citizens as a necessary measure to curb billionaires’ power.<sup>v</sup> A wealth tax is considered a type of progressive tax, exemplified by US President Joe Biden’s proposal of a “5% tax rate on income above \$10 million, and an additional 3% surtax on income over \$25 million,”<sup>vi</sup>. Notably, five countries within the Organization for Economic Co-operation and Development (OECD) have already implemented wealth-tax policies, including France, Spain, Norway, Switzerland, and Colombia.<sup>vii</sup>



## 2. Capital Flight and its Economic Consequences

However, reasonable as it may seem, a ban on billionaires through a wealth tax system could negatively affect the economy in several ways. The taxation could lead to a large portion of billionaires’ wealth being taken away, thereby encouraging tax evasion through capital flight—that

is, billionaires transferring wealth to jurisdictions with lower tax rates. France's experience provides an illustrative example, with Prime Minister Edouard Philippe estimating that the wealth tax system in France caused 10,000 people to leave, taking with them assets worth approximately 35 billion euros in 15 years.<sup>viii</sup> Capital outflows on such a large scale could weaken the economy and reduce tax revenue. Such large and sudden wealth departure would impede the accumulation of capital in the nations to which those billionaires' wealth originally belonged. Quantitative models estimate that an additional tax worth about \$260,000 can decrease wages by 5.2% and eliminate 1.1 million jobs,<sup>ix</sup> underscoring how consequential wealth tax can be to a country's economy.<sup>x</sup> Regarding tax evasion, increasing the penalty rate for it may seem like a solution. However, the famous Allingham-Sandmo (A-S) model proves the contrary. This model elucidates taxpayers' decision-making process when deciding on how much tax to evade, and it demonstrates that while a higher penalty initially reduces evasion, it also curtails people's "conscience tax," impeding the effects of penalty taxes.<sup>xi</sup> In other words, tax evasion is not a simple issue that can be combated easily through straightforward policies. Furthermore, billionaires' tax evasion would also be facilitated by the wealth tax system's low administrative efficiency. Enforcing a wealth tax necessitates governments to bolster their auditing capacity for assessing households' assets and tracking the taxation flows, which requires significant budgets that are hard to pay for.<sup>xii</sup> That is why many countries are unable to support this system and effectively collect tax revenue—dozens of European countries abandoned their wealth tax systems in 1990 due to the inefficiency and exorbitant administrative costs;<sup>xiii</sup> Even among the few countries that still employ this system today, the tax rates are significantly lower than those advocated by proponents of the policy, such as Bernie Sanders.<sup>xiv</sup> Both taxpayers' incentives for tax evasion and governments' inability to properly operate the tax system contribute to a heightened risk of capital flight.

Therefore, banning billionaires through a wealth tax may only serve as a false pretense for rich people's transfer of wealth, rather than tackling the underlying root causes of inequality.

### 3. Without Capital Flight: Problems with Allocation and Innovation

Even if a ban on billionaires were to be implemented smoothly, it still risks two negative consequences. First is the potential for misappropriation or underutilization of funds—the tax revenue may not meet the stated purpose of addressing the need created by wealth inequality. That is to say, tax revenue that enlarged government spending might not necessarily encourage more welfare. Data from the U.S. Department of Health & Human Services shows that states in the US had \$5.2 billion in unspent funds from the Temporary Assistance for Needy Families (TANF) program.<sup>xv</sup> Despite the growth in program funds, there has been a notable decrease in the approval rate of applications from families in dire need.<sup>xvi</sup> Those who lived below the poverty line were excluded from the programs due to the states' decisions to hoard the money or spend the money on large salaried staff. Therefore, the tax revenue that reached the capital may remain stagnant instead of being used in welfare to combat inequality.<sup>xvii</sup>

The second adverse consequence arises from the billionaires' standpoint, as their wealth loss diminishes both their incentives and capacity to make investments and foster innovation. Here, David Schmitz's diminishing marginal returns theory provides valuable insights into billionaires' investment motivations: as their wealth increases, the marginal utility of consumption spending diminishes.<sup>xviii</sup> Therefore, billionaires with substantial wealth tend to prioritize innovative and productive endeavors over consumption to maximize their utility. This can be backed up by statistics from the UBS Annual Report, which show that 94% of the billionaires in the "technology" industry were categorized as "innovators/disruptors."<sup>xix</sup> Innovations and technological progress are essential for economic development, as renowned Solow-Swan model emphasizes that sustained economic growth hinges on technological advancements.<sup>xx</sup> Consequently, banning billionaires would shift wealth



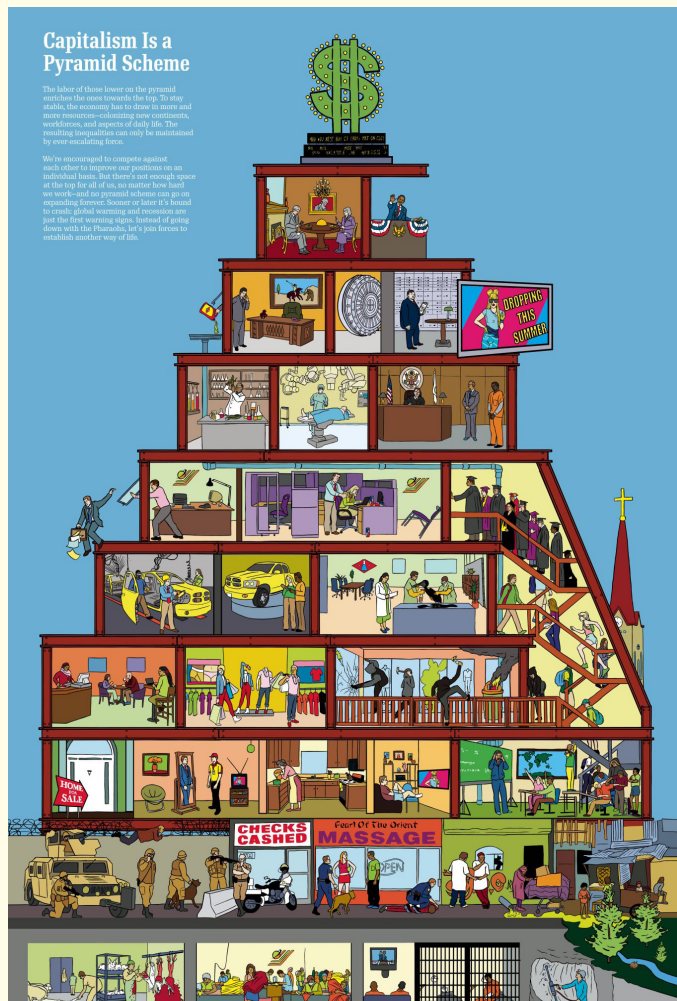
away from productive systems to individuals who may lack the same capacity to wisely utilize and invest those resources, thereby inhibiting innovation and hindering economic development.

## 4. The Intractable Inequality within the Capitalist System

Finally, the primary objective of this essay is to examine the potential for resolving social inequality following the banishment of billionaires. Although many were optimistic about the wealth tax's potential to reduce inequality,<sup>xxi</sup> its real effects are suspect, because the ban fails to address the underlying mechanisms of capitalism that perpetuate new forms of inequality. In his book *Capitalism Alone*, the author Branko Milanovic explains six key characteristics of capitalism that contribute to its creation of inequality: the rising share of capital income, high concentration of capital ownership, large income derived by capital-abundant individuals, co-existence of high capital and labor income, the tradition of assortative marriage, and intergenerational wealth inheritance. The intricate interplay among these factors renders the issue insusceptible to simplistic resolution through a wealth tax.

To better explain why the prohibition of billionaires cannot resolve the inequality within the capitalist system, it is important to address all of these six factors. First, consider the rising share of capital income. The mechanism proposed by Milanovic is straightforward: banning billionaires could reduce the levels of wealth accumulated, decreasing the share of capital income to rebalance the influences of billionaires and workers. However, prohibiting billionaires may inadvertently lead to a simultaneous decline in both capital and labor income. As previously discussed, banning billionaires would hinder innovation and impede economic development, resulting in a smaller economic pie for everyone. Estimations based on Thomas Piketty's wealth tax model

by the Tax Foundation indicate that a proposed 1% tax on net worth over \$1.3 million and 2% on net worth over \$6.5 million could eliminate 886,400 jobs.<sup>xxii</sup> Such unemployment exacerbates income inequality, as research shows a negative correlation between unemployment rates and average household income.<sup>xxiii</sup> Hence, a ban on billionaires cannot sustainably raise the share of labor income, allowing inequality to persist.



Regarding the second, fifth, and sixth factors that Milanovic discussed, one clarification is applicable to explain why banning billionaires would be ineffective to solve these three issues. These three factors revolve around the concentration of wealth among the rich, who tend to marry within their socioeconomic class and pass on their assets to future generations. It is essential to clarify that banning billionaires will not guarantee the attenuation of wealth. As the previous paragraphs have discussed, rich people may transfer their wealth to other jurisdictions or find ways to evade tax. Moreover, even if their wealth is effectively

# Exploring the Intersection of Faith and Reason

Written by: G12 Gamma Patrick Yang

## INTRODUCTION

In 2019, a total number of 1,750 terrorist attacks were registered in Afghanistan, climbing to the highest number of attacks since 2011. These attacks are quite similar to the crusades that happened in the Middle Ages since they share the same origin - their deep and firm belief. One of the people responsible for the Charlie Hebdo shooting has said to a journalist, **"we are the defenders of Prophet Mohammed"**.

Nevertheless, religion-related issues are not only a domestic matter but also a worldwide concern. With the increasing number of belief-related terrorist attacks all over the world, many non-religious people bring forward questions and doubts about the real functions of religions and cults. It might be possible that beliefs are nothing but common sense that suppresses critical thinking and creates short-circuits in our brains. Furthermore, they are probably provoking conflicts and terrorist attacks. In this essay, I will firstly explain how religion and cults can discourage people's critical thinking and short-circuit the process of doubt and investigation. Moreover, in order to prove it is very wrong and arbitrary to say that religions have only one function, I will discuss how the functions of religion have changed over time. In the end, I will present my thoughts on the future of religion and how religion can assist us develop ourselves.

## THE INITIAL FUNCTIONS OF RELIGION

people live at the same place, so there won't be much conflicts or problems happening in this village, which makes it easier for the leader to manage and control. Based on Dunbar's number, a person can only maintain relatively close relationships with no more than 150 people, otherwise the management by the village leader will eventually reach a finale; however, with the booming of human civilization, the number of people in a village has easily gone beyond 150 people. Under these circumstances, religions are created. Due to the belief in the supernatural entities, villagers will believe that there is a god constantly supervising, and making them go to hell if they commit crimes. Crime rate would gradually drop due to this belief, which would also ensure the safety and stability of the society. Moreover, religion can create a relationship that is far beyond blood, connect those who don't know each other originally, and prevent people's selfish behavior. When two people find out that they share the same belief, a sense of belonging and safety will likely be generated. This sense will later prevent people from generating mass conflicts and problems.

In Christianity, people believe that God created the different parts of the world in 7 days. In Chinese culture, people believe that Pan Gu sacrificed himself and turned his body into the world. Anyway, there are explanations for the fundamental existential questions in both western and eastern religions. These explanations are actually playing the role as a mental short circuit. Since the people at that time weren't able to explain the questions about existence, they have to rely on these stories. However, with the deepening of the belief in these explanations, the doubts toward these





explanations gradually disappeared, which later on causes people's mindset changes to be fixed. Moreover, the belief in god is also being used as an explanation of existence, which helps people better understand the world.

To sum up, religion has two original functions: one is to promote social stability, the other one is to give an explanation of the existence of human beings. However, when religion is playing the role as these two functions, it inevitably generates a by-product which is mental short circuit.

### **THE FACTS THAT SUPPORT THE SHORT CIRCUIT**

Undoubtedly, religion does serve as a tool that's restricts people's critical thinking at most time in the history.

Middle Ages, also known as the Dark Ages, included a lot of conflicts between Science and Christianity. The best-known one is the argument between Galileo Galilei with the church about Heliocentrism and Geocentrism. The church's inquisition towards Galileo was based on a claim in the Old Testament, which states that 'Earth cannot be moved' (Ofeni Afisi, 2016). This literally means that Earth is the center of the universe, which is opposed Galileo. After the inquisition, heliocentrism was banned and Galileo was under house arrest. Under this situation, the progress of science is actually being slowed down and delayed, because people are not brave enough to be curious toward the nature anymore. However,

this was not only caused by religion, but also by the members of church. These members crave to maintain the control over the people, because they want to be wealthy and powerful. Once people understand that these doctrines are all manipulated by only people rather than God, they will give up believing in it, which will later reduce the power of the church.

In Hinduism, there is a term called "Caste System", which refers to "something not mixed" and "pure". It is a system that classifies people into 4 different groups, which are Brahmins, Kshatriyas, Vaishyas and Sudras. The Caste System has been the fundamental basis of the Hindu society since the ancient times. (Arunoday Sana, 1993) In order to stop the caste system, the Indian government has applied a variety of methods, including reserving places for the low castes in the congress and establishing laws to prohibit the Caste System. Despite the effort made by the Indian government to diminish and destroy this system, but it is still deep-rooted in people's heart and mind, which slows down the development of India. Most of the entrepreneurs and politicians in modern India have caste backgrounds of upper castes, which means there isn't much lower caste people involved. (Arunoday Sana, 1993) This shows how unequal the Indian society is. People from the lower classes don't have the same opportunities and resources comparing with higher classes. It is nearly impossible for them to change their caste because there are absolutely no marriages between Brahmins and Sudras. Under this situation, many human resources are being wasted, because these low caste people simply can't get a job. They cannot contribute their value to the country. It is absolutely certain that India would be much stronger and powerful if there is no Caste System, because human resources will be efficiently allocated. There will be less people being forced to do the jobs that only contribute a little to the society. The most pathetic thing is that, people's belief in these made-up things is so firm and deep, even starting to impact the people who don't originally believe in this Hinduism. *It forms a thought in people's mind that they are born into these castes, diminish their will of resistance.* This is a mental short circuit because it stops people from questioning



circuit because it stops people from questioning the truth of life, while at the same time; reduce the difficulties in managing the country.

### **THE FUTURE OF RELIGION**

Time has passed, at the same time; religion has also changed its function. In modern society, religions focus more in people's self-development, and help people find inner peace. Due to the progress of science, people gradually start to understand religion in a rational way. With the discovering of the universe, a scientific way of explaining the birth of earth came into public's mind, causing the unique status of Genesis to fall. People try to take the essence from the belief. When people have a belief, they will be more likely to face life in a positive way, for they trust that god is constantly guiding them to the best destination. (William Hulme, 1951) A sense of mission arising in their mind which continuously generates intrinsic motivation helps them to overcome all the challenges and difficulties in life.

In fact, religion does have a lot of benefits for our society, such as Buddhism. Many scientists believe that among all belief systems, Buddhism is the one which is most compatible with science, which has even led to the progress of science sometimes. (Klaus Klostermaier, 1991)

In Buddhism and many other religions, meditation is often mentioned and used. Meditation is defined as a conscious mental process that induces a set of integrated physiological changes termed the relaxation response (Ramesh Manocha, 2010). It facilitates us with a calm mind and provides us with chances to listen to our hearts. In the contemporary days, information technology is highly developed; we are facing temptations every day. Thanks to social media, we get the chance to share our life and see other person's sharing of their life. Therefore, we are taking in too much information, which will, later on, change into desires while no introspections. Inevitably, we get anxious, stressed, and feel like our body is separated from our soul. This is actually very harmful to our mental and physical health. Under this situation, people who believe in religion are more likely to maintain healthy because they do meditation.

meditation. Meditation actually connects our brain with our sub-consciousness, which promote the potential of sub-consciousness (Robert Fish, 2006). There are two very famous examples about the potential of sub-consciousness, which are the discovering of the buoyancy theorem and the periodic table. They are able to maintain a calm mentality when being away from the reality for a short period of time (Elizabeth, 2003).

When our mind is in clarity, we get better observation and perception. Our minds are like computers, we tend to think swiftly when we are not multi-tasking, owing to the limited attention and vigor we have. Also, carefulness and rationality may take the lead, which is the opposite of mental short circuit. Moreover, religion can help us maintain a better relationship with the nature and the Earth. Currently, we are suffering from the pandemic. Some religious people will likely to take this pandemic as a punishment from God. This belief is beneficial because it can encourage us to respect nature and protect it. It is undoubtedly that our actions have left so much harmful impact for the environment. Probably, the pandemic is caused by human's over-exploitation of the environment, and the nature is warning us through the pandemic.

### **CONCLUSION**

In conclusion, the function of religion and belief systems is not only to short-circuit the common sense and discourage people's ability to think critically, but also to promote self-development, to provide us with a chance to listen to our heart and create an inner peace. Even though religion did play the role during most part of human history, positive sides and functions of religion can still be observed. The outcome depends on how we apply it to our life and who is using it. People who believe in conservative religions are tending to get health problems. Also, they are in relatively low social status (Kenneth Ferraro, 1991). Overall, in the future, we should view religion in a more comprehensive and balanced way. This can ultimately help us acquire the wisdom and the true meaning of religion.



## Bibliography

- [1] Afisi, Oseni T. "Conflicts between Science and Religion: The Popperian Critical Rationalist Resolution."
- [2] Ferraro, Kenneth F., and Cynthia M. Albrecht-Jensen. "Does religion influence adult health?." *Journal for the scientific study of religion*(1991): 193-202.
- [3] Fisher, Robert. "Still thinking: The case for meditation with children." *Thinking skills and creativity* 1.2 (2006): 146-151.
- [4] Hulme, William E. "The Student Idea Group IN THE DEPARTMENT OF RELIGION." *Religious Education*46.2 (1951): 107-110.
- [5] Klostermaier, Klaus. "The nature of Buddhism." *Asian Philosophy*1.1 (1991): 29-37.
- [6] Manocha, Ramesh, et al. "Changing Definitions of Meditation-Is there a Physiological Corollary?: Skin temperature changes of a mental silence orientated form of meditation compared to rest." *Journal of international society of life information science*28.1 (2010): 23-30.
- [7] Monk-Turner, Elizabeth. "The benefits of meditation: experimental findings." *The Social Science Journal*40.3 (2003): 465-470.
- [8] Sana, Arunoday. "The caste system in India and its consequences." *International Journal of Sociology and Social Policy*(1993).
- [9] Sivasankaran, Satish, et al. "The effect of a six - week program of yoga and meditation on brachial artery reactivity: Do psychosocial interventions affect vascular tone?." *Clinical Cardiology: An International Indexed and Peer - Reviewed Journal for Advances in the Treatment of Cardiovascular Disease*29.9 (2006): 393-398.
- [10] Turner, Léon. "ISOLATING THE INDIVIDUAL: THEOLOGY, THE EVOLUTION OF RELIGION, AND THE PROBLEM OF ABSTRACT INDIVIDUALISM: with Lluís Oviedo, "Challenges, Opportunities, and Suggestions for a Renewed Program in the Scientific Study of Religion"; Robert N. McCauley, "Recent Trends in the Cognitive Science of Religion: Neuroscience, Religious Experience, and the Confluence of Cognitive and Evolutionary Research"; Connor Wood, "Antistructure and the Roots of Religious Experience"; Konrad Szocik, "Critical Remarks on the ...." *Zygon*®55.1 (2020): 207-228.

# *Science Lab*

*"Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world."*

*--- Louis Pasteur*



# ZnO Nanorod from Structure, Properties to Applications

Alan Ji G11 theta

*Abstract. This paper aims to review current understandings of ZnO Nanorods (NRs) and summarizes them into a clear pathway from structure to properties and to applications. The crystal structure of ZnO NRs is a hexagonal wurtzite structure with asymmetry giving rise to its prominent piezoelectric property. Using methods such as AFM, researchers have confirmed and modeled the piezoelectric potential generated by ZnO NRs in deformation, and the intensity of the potential is strongly correlated with resistivity and dimensions of NRs. Several techniques, such as doping, are invented to enhance the piezoelectric intensity of ZnO NRs, suppressing the screening effect of ZnO NRs. Recent research has shown potential applications based on the piezoelectric property of ZnO NRs or nanowires (NWs) as nanogenerators (NGs) or nanosensors for self-powered devices in a range of areas.*

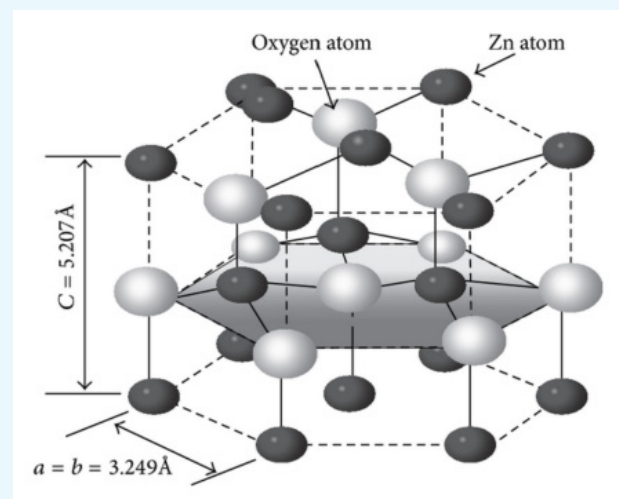
## 1. Introduction

There is an increasing number of reviews on ZnO nanomaterials (ZnO NMs) because of their wide range of properties based on doping, possessing high transparency, a range of conductivity, wide band gap, and notably piezoelectricity [8]. Various ways are suitable for growing ZnO NMs, although they might differ in cost and quality. Many papers may have demonstrated a precise understanding of a particular property of ZnO NMs but seldom emphasizes the connection within the pathway. Also, many edging applications on the properties of ZnO NRs might be neglected. This paper aims to clearly state how the structure of ZnO NRs leads to the piezoelectric property which paves the way for many applications.

## 2. The Structure of ZnO Crystal

There are two main types of zinc oxide crystal structures: cubic zinc-blende and hexagonal wurtzite structures. The hexagonal

wurtzite structure exists in ambient temperature and pressure and is widely studied [1]. The hexagonal wurtzite structure could be seen as tetrahedral shapes inlaid with each other. Each zinc ion forms the tetrahedral geometry with four oxide ions and vice versa (Fig. 1). This structure possesses a net charge of zero, due to the coincidence of the center of mass of anions and cations in the absence of stress. When stress is exerted upon the structure, polarization of charges on the surface of the ZnO structure occurs; it is known as the piezoelectric property.



## 3. The Piezoelectric Property of ZnO Nanorods

The piezoelectric property of ZnO materials is due to the polarization at the atomic scale. When mechanical stress is exerted on ZnO crystal, the elongation or contraction causes a separation of the center of mass of cations and anions

### 3.1 The Growth Method of ZnO Nanorods

The piezoelectric property of ZnO NRs is heavily related to the method of synthesis. There are three main methods: chemical vapor deposition (CVD), hydrothermal, and electrochemical deposition, each presents its strength and weakness [2]. The CVD method with a relatively high synthesis temperature can readily synthesize vertically grown ZnO NR along the [0001] direction with high crystal quality [4]. However, the drawbacks are high costs and high synthesis temperature deforming polymeric substrates. Alternatively, the

hydrothermal and electrochemical deposition approaches are both two step-process with relatively low synthesis temperatures allowing flexible substrates. Consequently, the low synthesis temperature had a hard time assuring good crystal quality ZnO NRs [2].

### 3.2 Basic Understandings of the Piezoelectric Effect

In the first study on piezoelectric ZnO NGs, Wang and Song investigated the piezoelectric properties of ZnO nanowires grown on the c-plane [5]. Using the AFM contact mode with a constant normal force of 5 nN between the tip and sample surface, they measured both the topography and voltage output of the nanowire arrays. When the tip of AFM is scanned over an individual nanowire and caused it to deform, a strain field is created (Fig. 2). The outer surface being stretched, having a positive strain, and the inner surface being compressed, having a negative strain. Thus, an electric field is created. Again, the electric potential created is based on the relative displacement of Zn<sup>2+</sup> to O<sup>2-</sup> ions. Unless the strain is released, the ionic charges cannot freely move.

Fig. 2. Methodology to measure piezoelectric intensity by AFM. (A) Schematic definition of a NW and the coordination system. (B) Longitudinal strain distribution in the NW. (C) The corresponding longitudinal piezoelectrically induced electric field distribution in the NW. (D) Effects of the piezoelectricity on the potential field. (E and F) Contacts between the AFM tip and the sample at two reversed local contact potentials [5].

Furthermore, researchers found a strong correlation between individual NRs' resistivity and piezoelectric response [6]. Using AFM to measure the out-of-plane vibrations induced by single NR, they found variances in piezoelectric intensity among the ZnO rods grown at the same time on the same sample. Calculating the resistivity of each NRs through their height and cross-sectional area, Scrymgeour and Julia graphed the relationship between the piezoelectric response and the resistivity of ZnO NRs (Fig. 3a).

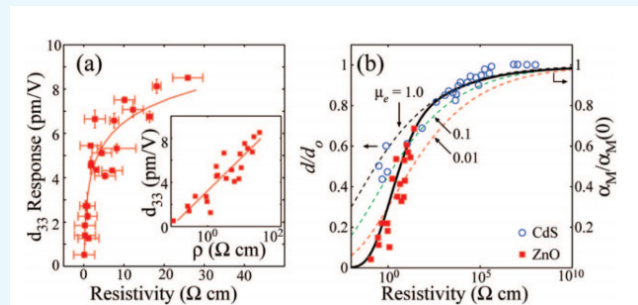
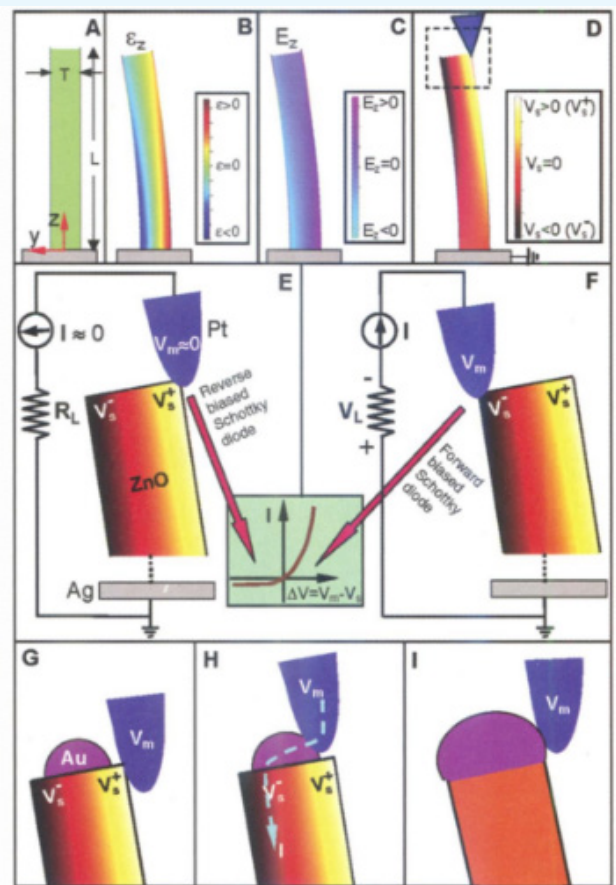


Fig. 3. (a) Correlation of resistivity to piezoelectric response in ZnO NRs. (b) Comparison between normalized data in (a) and CdS data (open blue circles) reported by Ogawa [13]. The dashed lines represent Madelung constant calculation corresponding to constant mobility on the right axis. The constant mobility of  $\mu_e$  equals to 1.0 (black), 0.1 (green), and 0.01 cm<sup>2</sup>/Vs (red). The solid line represent the calculated resistivity dependent mobility [6].

### 3.3 The Challenge and Solution of ZnO Piezoelectric Performance.

Although evidence has shown the excellent performance of ZnO piezoelectric property, there remains a main problem: the screening effect. There are two types of screening effects that reduce the performance of ZnO NRs: internal



and external screening effects. First, the internal screening effects have resulted from excess free charge carriers or crystal defects acting as donors [2]. Free electrons tend to balance the piezoelectric potential when they move to the positive potential area of the NRs. Thus, the stored electrons in this area would prevent the subsequent flow of electrons generated by the piezoelectric effect [2]. Second, the external screening effect has resulted from charge leakage through the metal-semiconductor interface to an external load [10].

There are multiple targets to overcome screening effects and enhance the performance of ZnO NRs: doping, areal density, surface treatment, interfacial modification, and a combination of the above techniques [2]. One recent research has argued doping can essentially improve piezoelectricity while approaches fail to reach the maximum piezoelectric performance [11]. This research team deduced that rear earth metal ions ( $RE^{3+}$ ) doped ZnO NMs could effectively reduce the screening effects, by regulating the free carriers, and substantially increase the piezoelectric performance 53.8% higher. Exogenous ions would switch with endogenous ions (Fig. 4a), potentially improving the electromechanical properties of ZnO NRs by either acting as holes (Fig. 4c) which can decrease the concentration of free carriers, or forming more lattice defects (Fig. 4d) which limit the migration of free carriers [11]. The team investigated ZnO NRs doped by a series of RE ions,  $La^{3+}$ ,  $Ce^{3+}$ ,  $Pr^{3+}$ ,  $Sm^{3+}$ ,  $Eu^{3+}$ ,  $Gd^{3+}$ , and

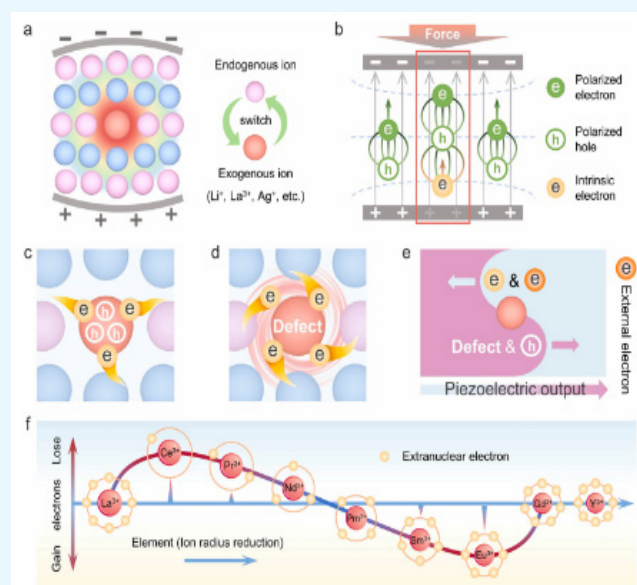
$Y^{3+}$ , all having the same valence state but varied extranuclear electrons. Ultimately, the team characterizes its results through the feedback from the tip of piezoresponse force microscopy and the output of the ZnO-based piezoelectric NGs.

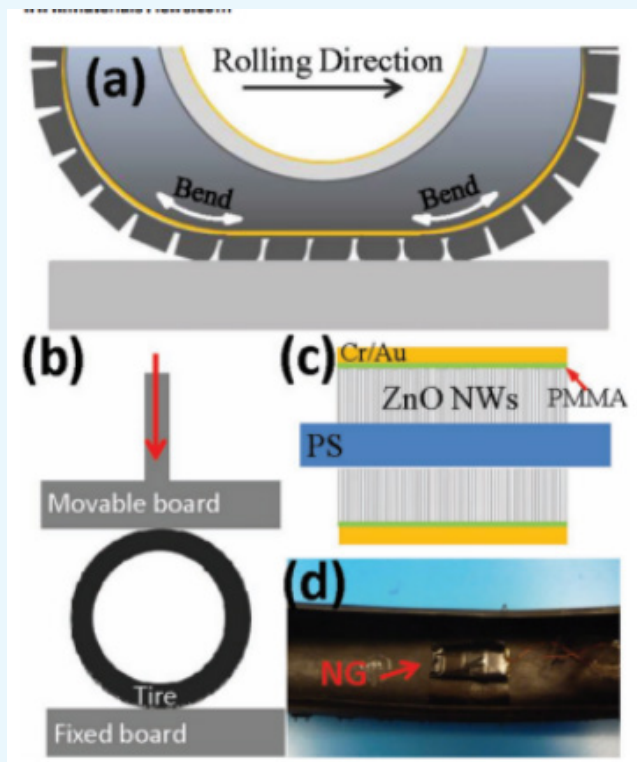
Fig. 4. (a) Illustrative diagram of ion-doped piezoelectric semiconductor. (b) Illustrative diagram of the internal screening effect model in ZnO NRs. (c) The suppression of screening effect by hole recombination. (d) The suppression of screening effect by defect binding. (e) Effect of doping on piezoelectric output. (f) Tendency of extranuclear electron gain-and-loss stability of RE ions [11].

## 4.Applications of ZnO Nanorods

### 4.1Self-powered LCD Screen and Nano-sensors

Energy harvesting from the environment has been a crucial point for self-sustained energy resources. As electronic devices could be properly made in the size of nano-scales, they require much less power and energy than those of macroscopic size. By simply harvesting energy from mechanical vibrations in the environment, the small size electronic device could power itself without wires. By adopting the piezoelectric potential created by the deformation of ZnO NRs, Hu proved the feasibility of self-powered LCD screens or nano-sensors on bicycle tires [7]. They targeted the bending of bicycle tires as the trigger to induce the piezoelectric effect of ZnO nano-material: the position of touching or retouching the road quickly induces or withdraws the bending (Fig. 5a). The NG was designed to consist of five layers: a flexible polyester (PS) substrate, ZnO nanowire (NW) textured films on its top and bottom surfaces, and electrodes on the surfaces (Fig. 5c). The results of a single NG on a tire traveling a distance of 12 mm with an acceleration of  $30 \text{ m s}^{-2}$  were 1.5 V measured voltage and 25 nA, which was enough to power a commercial LCD screen. Furthermore, they showed the achievement of higher output voltage of two NGs connected in parallel than that of a single NG. Moreover, the device could also be a nano-sensor for pressure and speed which are positively correlated with the output voltage of the NGs.





#### 4.2 Self-powered Photoelectrochemical Sensing Platform

Furthermore, Jiang et al. designed a new sensitive self-powered photoelectrochemical (PEC) sensing platform by integrating the piezoelectric effect with the localized surface plasmon resonance (LSPR) effect of ZnO-WO<sub>3-x</sub> [9]. It has two parts: a ZnO NRs-WO<sub>3-x</sub>/FTO photoanode and an aptamer for recognizing elements. The team first fabricated ZnO NRs array-modified FTO by hydrothermal method and then fabricated dWO<sub>3</sub>·H<sub>2</sub>O nanocomposite via a one-pot hydrothermal method. Using SEM, TEM, and XPS, the team was able to confirm the desired product ZnO-WO<sub>3-x</sub>. Then, the team confirmed the presence of oxygen vacancies in WO<sub>3-x</sub> nanosheets, which could extend the light absorption range and promote charge transfer. While the WO<sub>3-x</sub> portion excelled at absorbing a wide range of light, the ZnO NRs part shows piezoelectric properties for powering the system. Similarly in the previous application, the dipole moment is induced by the movement of Zn<sup>2+</sup> and O<sup>2-</sup> positions. The difference is that the team chose the action of the fluid eddy, with adequate stirring in the experiment, to be the source of bending ZnO-WO<sub>3-x</sub> nanocomposite. Moreover, when the aptasensor reacted with ENR, the target for sensing, the output of electric power density significantly decreased, suggesting the success

to reach a consistent result in sensing Enrofloxacin in a sample of RuoYu Lake at Changzhou University [9].

#### 5. Summary

This article reviewed the pathway from ZnO NRs structure to piezoelectric property to its application. Notably, ZnO NRs' piezoelectric properties are well-studied by many researchers. Although there remain some challenges to achieve the maximum piezoelectric intensity of ZnO NRs, several methods such as doping could effectively enhance the performance, which proves ZnO NRs' feasibility in the field of piezoelectronics. Further research may incorporate ZnO NRs, as the source of power, into nano-scale systems.

#### 6. Acknowledgements

The authors gratefully acknowledge the academic teachings from Professor Jiang from National Center for Nanoscience and Technology, China.

#### References

- [1] Barzinjy, A. A.; Hamad, S.; Azeez, H. Structure, Synthesis and Applications of ZnO Nanoparticles: A Review. ResearchGate. [https://www.researchgate.net/publication/342347708\\_Structure\\_Synthesis\\_and\\_Applications\\_of\\_ZnO\\_Nanoparticles\\_A\\_Review](https://www.researchgate.net/publication/342347708_Structure_Synthesis_and_Applications_of_ZnO_Nanoparticles_A_Review).
- [2] Le, A. D.; Mohsen Ahmadipour; Pung, S.-Y. A Review on ZnO-Based Piezoelectric Nanogenerators: Synthesis, Characterization Techniques, Performance Enhancement and Applications. 2020, 844, 156172–156172. <https://doi.org/10.1016/j.jallcom.2020.156172>.
- [3] Lu, Y. J.; Shi, Z. F.; Shan, C. X.; Shen, D. Z. Chapter 4 - ZnO nanostructures and lasers. ScienceDirect. <https://www.sciencedirect.com/science/article/abs/pii/B9780128141625000042?via%3Dihub> (accessed 2023-07-13).
- [4] Ghosh, M.; Rao, M. G. Growth Mechanism of ZnO Nanostructures for Ultra-High Piezoelectric D 33 Coefficient. Materials Express 2013, 3 (4), 319–327. <https://doi.org/10.1166/mex.2013.1134>.
- [5] Wang, Z. L.; Song, J. Piezoelectric Nanogenerators Based on Zinc Oxide Nanowire Arrays. Science 2006, 312 (5771), 242–246.
- [6] Scrymgeour, D.; Julia. Correlated Piezoelectric and Electrical Properties in Individual ZnO Nanorods. 2008, 8 (8), 2204–2209. <https://doi.org/10.1021/nl080704n>.
- [7] Hu, Y.; Xu, C.; Zhang, Y.; Lin, L.; Snyder, R. L.; Wang, Z. L. A Nanogenerator for Energy Harvesting from a Rotating Tire and Its Application as a Self-Powered Pressure/Speed Sensor. Advanced Materials 2011, 23 (35), 4068–4071. <https://doi.org/10.1002/adma.201102067>.
- [8] Schmidt-Mende, L.; MacManus-Driscoll, J. L. ZnO - Nanostructures, Defects, and Devices. Materials Today 2007, 10 (5), 40–48. [https://doi.org/10.1016/s1369-7021\(07\)70078-0](https://doi.org/10.1016/s1369-7021(07)70078-0).
- [9] Jiang, Jinghan. Ultrasensitive Self-Powered Photoelectrochemical Sensing for Enrofloxacin Detection by Coupling Piezoelectric Effect with Nonmetallic Surface Plasmon Resonance Based on ZnO Nanorod Arrays/WO<sub>3-x</sub>. Analytica Chimica Acta 2023, 1273, 341557. <https://doi.org/10.1016/j.aca.2023.341557>.
- [10] Jung, D.-Y.; Baek, S.-H.; Hasan, M. R.; Park, I.-K. Performance-Enhanced ZnO Nanorod-Based Piezoelectric Nanogenerators on Double-Sided Stainless Steel Foil. Journal of Alloys and Compounds 2015, 641, 163–169. <https://doi.org/10.1016/j.jallcom.2015.03.066>.
- [11] Sun, Y.; Shen, S.; Deng, W.; Tian, G.; Xiong, D.; Zhang, H.; Yang, T.; Wang, S.; Chen, J.; Yang, W. Suppressing Piezoelectric Screening Effect at Atomic Scale for Enhanced Piezoelectricity. Nano Energy 2023, 105, 108024. <https://doi.org/10.1016/j.nanoen.2022.108024>.
- [12] Sabir, S.; Arshad, M.; Chaudhari, S. K. Zinc Oxide Nanoparticles for Revolutionizing Agriculture: Synthesis and Applications. The Scientific World Journal. <https://www.hindawi.com/journals/tswj/2014/925494/>.
- [13] Ogawa, T.; Hideo Oikawa; Kojima, A. Decrement of Piezoelectric Constants Caused by Screening Effect of Conduction Electrons on the Effective Charge



# *School Events*

*"The roots of education are bitter, but the fruit is sweet"*

*--- Aristotle*

# College Fair -InitialView

On September 11th, WLSA, together with InitialView, held a grand college info session in the Baoshan Campus. Students were presented with opportunities for face-to-face interactions with admission officers from over 30 prestigious American universities.

Students sought out their dream schools and formed orderly queues at each booth. They raised questions to learn about various academic programs, international students' accommodation, internship opportunities, etc. to establish meaningful connections with the admission officers from esteemed institutions.







In addition to answering inquiries, the officers provided insight into the unique facets of the universities, enabling more informative conversations. Moreover, the officers offered crucial, tailored suggestions, such as the recommendation of specific majors and programs, to individuals seeking personalized guidance.

As the clock struck 7:30 p.m., the College Fair drew to a close. This event, far more than a mere knowledge exchange, opened doors for students to build connections with different admission officers and learn more about the institutions they are interested in. This meaningful activity will undoubtedly benefit all students, guiding them toward future success.

# UChicago -Info Session

Photoed by Eason Kong G12 Kappa

On September 7th, the buzzing halls of High School Affiliated to Fudan University were graced with the presence of a prestigious institution - the University of Chicago. This university info session was not an average run-of-the-mill event; it was a gathering of inquisitive minds, thirsting for knowledge about future academic pursuits. The air crackled with anticipation as student volunteers, hosts from WLSA, and our esteemed teachers all gathered in one place, eager to absorb every morsel of information about this renowned college.



The info session commenced with an air of excitement, as students took their seats, their eyes alive with curiosity. The Vice President of the University of Chicago took center stage, armed with a wealth of knowledge about the school. His aim was clear - to enlighten us about the endless possibilities that awaited us at the University of Chicago. The room was filled with a palpable energy, as eager students leaned forward, hanging on to every word.

One after another, questions about majors, campus life, and extracurricular activities were fired at the speakers with fervor. The university representative, the seasoned veteran of the scope, gracefully fielded each query, leaving no stone unturned. It was as if a symphony of knowledge was being orchestrated, with the students as the zealous spectator, soaking in every melodious note.

Beyond the mere acquisition of information, this info session proved to be a transformative experience for all in attendance. The students, like sponges, absorbed valuable life lessons, discovering the power of curiosity and the importance of asking the right questions. They learned that the path to success is paved with proactive measures and a thirst for knowledge. It was a moment of realization, a turning point in their academic journeys.

As the session concluded, the hall was abuzz with animated





discussions. The students, now armed with a fresh perspective and a newfound understanding began to envision their futures, inspired by the possibilities presented to them. The walls of the hall seemed to echo the ambitious dreams and aspirations of these young minds.



From start to finish, this university info session was not simply an event to be marked on the calendar; it was a catalyst for personal growth and enlightenment. WLSA Shanghai Academy, in collaboration with the University of Chicago, had orchestrated an extraordinary opportunity for its students. As the session came to an end, one could almost taste the contentment and merriness, as students actively ventured forth on their academic journeys, ready to make a difference even in the future armed with the lessons learned from this info session.





# CCA Fair

Photoed by Eason Kong G12 Kappa



At the beginning of September, as one of the most exciting and uplifting events of the year—the CCA fair was successfully held. This year, WLSA is delighted to accept more than 50 clubs focusing on academics, art, community services, and a variety of aspects. After elaborative and creative introduction videos kicked off the event, eye-catching and wonderful performances including dance shows and dramas led to enthusiastic cheers and screams.

After that, various showcases brought the atmosphere to the climax. Club leaders try countless ways including demonstrating and interacting activities to attract new members, not to mention colorful leaflets and creatively designed small gifts. They exhibited WLSA students' goals of becoming community leaders. For example, Mock Trial Club provided scripts based on the hot movie 'Lost In the Stars'. 'The interesting program is really engaging and meaningful' said Leven (one of the participants), 'Not only can I learn rich legal knowledge, but I can also practice defense skills, as well as critical and logical thinking.' In addition, everywhere, you can see students hurrying to different tables with full expectations, immersed in the programs, and signing up due to common pursuits and hobbies.

CCA, serving as a platform for communication and cooperation, a window for extracurricular practices, and an opportunity for leadership development, enables WLSA students to learn through innovation and explore their talents.









## **WLSA SHANGHAI ACADEMY**

*(G11-12) 2 Zhengxi Road, Yangpu District,  
Shanghai, 200243*  
*(G10 & A Level) 299 Tongji Road, Baoshan District,  
Shanghai, 200940*

