

Young Scholars Journal

Nº 8 – 9 2021

Young Scholars Journal

Scientific journal

№ 8 – 9 2021

ISSN 2519-9331

Editor-in-chief

Bersirova Saida Halidovna, PhD of Economics

International editorial board

Abdulkasimov Ali, Doctor of Geography
Adieva Aynura Abduzhalalovna, Doctor of Economics
Arabaev Cholponkul Isaevich, Doctor of Law
S.R. Boselin Prabhu, Doctor of Engineering Sciences
Zagir V. Atayev, Ph.D. of Geographical Sciences
Akhmedova Raziya Abdullayevna, Doctor of Philology
Balabiev Kairat Rahimovich, Doctor of Law
Barlybaeva Saule Hatyatovna, Doctor of History
Bestugin Alexander Roaldovich, Doctor of Engineering Sciences
Bogolub Tatiana Maksimovna, Doctor of Economics
Bondarenko Natalia Grigorievna, Doctor of Philosophy
Bulatbaeva Aygul Abdimazhitovna, Doctor of Education
Chiladze George Bidzinovich, Doctor of Economics, Doctor of Law
Dalibor M. Elezović, Doctor of History
Gurov Valeriy Nikolaevich, Doctor of Education
Hajiyev Mahammad Shahbaz oglu, Doctor of Philosophy
Ibragimova Liliya Ahmatyanovna, Doctor of Education
Blahun Ivan Semenovich, Doctor of Economics
Ivannikov Ivan Andreevich, Doctor of Law, Doctor of Political Sciences
Jansarayeva Rima, Doctor of Law
Khubaev Georgy Nikolaevich, Doctor of Economics
Khurtsidze Tamila Shalvovna, Doctor of Law
Korz Marina Vladimirovna, Doctor of Economics
Kocherbaeva Aynura Anatolevna, Doctor of Economics
Kushaliyev Kaisar Zhalitovich, Doctor of Veterinary Medicine
Lekerova Gulsim, Doctor of Psychology
Melnichuk Marina Vladimirovna, Doctor of Economics
Meymanov Bakyt Kattoevich, Doctor of Economics

Moldabek Kulakhmet, Doctor of Education
Morozova Natalay Ivanovna, Doctor of Economics
Moskvin Victor Anatolevich, Doctor of Psychology
Nagiyev Polad Yusif, Ph.D. of Agricultural Sciences
Naletova Natalia Yurevna, Doctor of Education
Novikov Alexei, Doctor of Education
Salaev Sanatbek Komiljanovich, Doctor of Economics
Shadiev Rizamat Davranovich, Doctor of Education
Shahutova Zarema Zorievna, Ph.D. of Education
Soltanova Nazilya Bagir, Doctor of Philosophy (Ph.D. of History)
Spasennikov Boris Aristarkhovich, Doctor of Law, Doctor of Medicine
Suleymanova Rima, Doctor of History
Suleymanov Suleyman Fayzullaevich, Ph.D. of Medicine
Tereschenko-Kaidan Liliya Vladimirovna, Doctor of Philosophy
Tsersvadze Mzia Giglaevna, Doctor of Philology
Tolochko Valentin Mikhaylovich, Doctor of Medicine
Vijaykumar Muley, Doctor of Biological Sciences
Yurova Kseniya Igorevna, Ph.D. of History
Zhaplova Tatiana Mikhaylovna, Doctor of Philology
Zhdanovich Alexey Igorevich, Doctor of Medicine

Proofreading

Kristin Theissen

Cover design

Andreas Vogel

Additional design

Stephan Friedman

Editorial office

Premier Publishing s.r.o. Praha 8
– Karlín, Lyčkovo nám. 508/7, PŠČ 18600

E-mail:

pub@ppublishing.org

Homepage:

ppublishing.org

Young Scholars Journal is an international, German/English/Russian language, peer-reviewed journal. It is published bimonthly with circulation of 1000 copies. The decisive criterion for accepting a manuscript for publication is scientific quality. All research articles published in this journal have undergone a rigorous peer review. Based on initial screening by the editors, each paper is anonymized and reviewed by at least two anonymous referees. Recommending the articles for publishing, the reviewers confirm that in their opinion the submitted article contains important or new scientific results.

Premier Publishing s.r.o. is not responsible for the stylistic content of the article. The responsibility for the stylistic content lies on an author of an article.

Instructions for authors

Full instructions for manuscript preparation and submission can be found through the Premier Publishing s.r.o. home page at:
<http://ppublishing.org>

Material disclaimer

The opinions expressed in the conference proceedings do not necessarily reflect those of the Premier Publishing s.r.o., the editor, the editorial board, or the organization to which the authors are affiliated.

Premier Publishing s.r.o. is not responsible for the stylistic content of the article. The responsibility for the stylistic content lies on an author of an article.

Included to the open access repositories:



© Premier Publishing s.r.o.

All rights reserved; no part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the Publisher.

Typeset in Berling by Ziegler Buchdruckerei, Linz, Austria.

Printed by Premier Publishing s.r.o., Vienna, Austria on acid-free paper.

Section 1. Astronomy

<https://doi.org/10.29013/YSJ-21-8.9-3-11>

*Mucheng Ma,
New Hampton School, New Hampton, New Hampshire,
E-mail: USA mamu022@newhampton.org; 3313617810@qq.com*

*Advisor: Dr. William H. Waller,
IAU/OAE – U.S. Astronomy Education Coordinator,
The Galactic Inquirer – Co-founder and Co-editor*

SURFING THE AURORAL CASCADE – QUANTITATIVE CONSTRAINTS ON OXYGEN FORBIDDEN-LINE EMISSIONS AND EXCITING ELECTRON VELOCITIES

Abstract. Observations of auroras have been documented over hundreds of years. Currently, the cause of auroras still remains unknown. Acceleration of exciting electrons by Alfvén waves, one of the most currently accepted mechanisms, was simulated on Earth recently. Further modelings are extremely difficult, because of the wide-ranging parameter space, and in-situ demonstrations of auroras are hardly possible on Earth in the short future. The formula for collisional excitation of the atoms responsible for auroral emission can explain why green auroras from excited oxygen atoms can occur at relatively low altitudes, but red auroras from these same atoms are constrained to higher altitudes of lower density. The same formula, however, also suggests much lower electron velocities (~ 100 km/s) than are required to excite the oxygen atoms to the required metastable levels for subsequent emission (~ 1000 km/s). Observations of the [OI] 630 nm spectral line profile support these low electron velocities. However, other observations at higher altitude point to much higher electron velocities of 20,000 km/s that would require significant acceleration by Alfvén waves.

Keywords: aurora – auroral acceleration, plasma – Alfvén waves, atomic physics – collisional excitation, ionosphere

Introduction:

1.1 Aurora Basics:

Auroras, also called polar lights, northern lights or southern lights, are natural luminous spectacles. Most auroras appear in higher-latitude regions, within an interval called “the aurora zone”, which is 3° to 6° wide in latitude and between 10° and 20° from the geomagnetic poles, and is most clearly seen at night

(see Figure 1). Early evidence for a geomagnetic connection was noticed due to the statistical correlations between geomagnetic events and auroral observations. Auroras are caused by disturbances in the Earth’s magnetosphere that are produced by the variable solar wind. Trajectories of the charged particles, mainly electrons and protons, in the magnetospheric plasma, are altered by these magnetohydrodynamic

(MHD) disturbances. The resulting collisional ionization and excitation of the atmospheric gases at altitudes of 100–300 km leads to the emission of light of various colors and complexity. The form of

auroras is dependent on the amount of acceleration imparted to the exciting particles. Auroras were also discovered in many planets, natural satellites, brown dwarfs, and even comets in the solar system [1].



Figure 1. An auroral display near Tromsø Norway, showing the green [OI] emission at lower altitude and red [OI] emission at higher altitude. (Credit: wikivoyage.com)

1.2 Basic Observations and Proposed Causes:

Aurora was named after the Roman goddess of morning, Aurora, when Galileo Galilei coined the term «aurora borealis» as early as 1619 A.D. He had the misconception that the auroras were a result of sunlight reflecting from the atmosphere. In 1790, Henry Cavendish made quantifiable observations of the aurora by using triangulation to estimate that the auroral light is produced around 100–130 km in altitude (about 60 miles above Earth’s surface). In 1902–1903 Kristian Birkeland, a Norwegian physicist, concluded from his “terrella experiment” that auroral light was caused by currents flowing through the gas of the upper atmosphere [2].

While the color of auroras varies, the cause also shifts. Red auroras are usually seen at the highest altitudes (200–500 km), where excited atomic oxygen emits at 630 nm (red). The lower concentration of atoms lead to less emissions, and lower sensitivity of our eyes towards red make this color visible only under intense solar activity. When it comes to lower altitudes (100 km or less), more frequent collisions suppress the 630 nm (red) mode, and it is dominated by the 557.7 nm emission (green). These changes are consistent with the “forbidden” nature of the atomic emissions, where electronic transitions from their excited metastable states can be quenched by collisional de-excitations (see Figure 2).

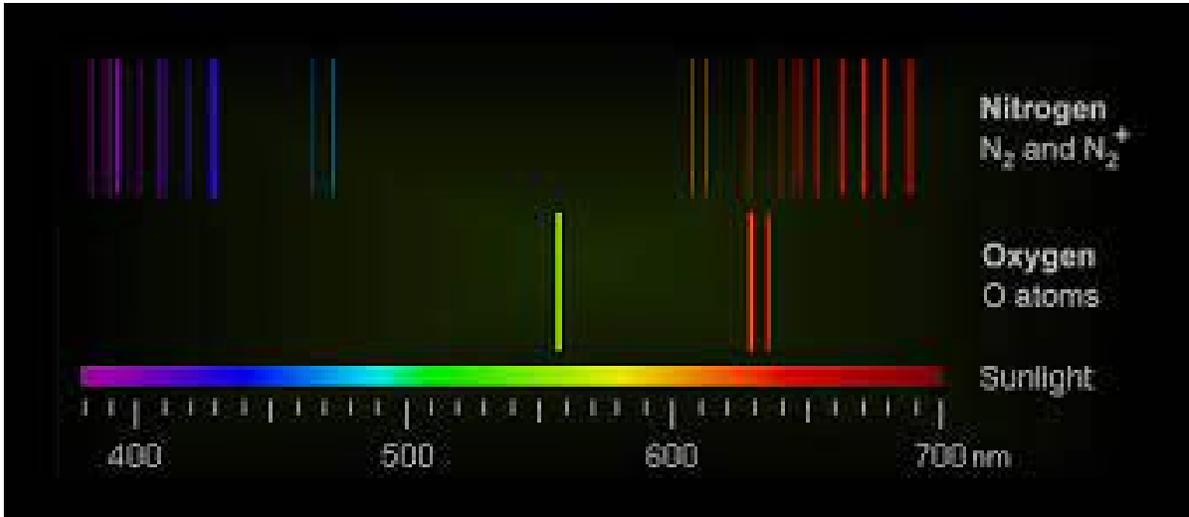


Figure 2. Spectra of auroras showing the emission lines from atomic oxygen and diatomic nitrogen. Auroras always involve these emissions, either separately or in combination (*atoptics.co.uk*)

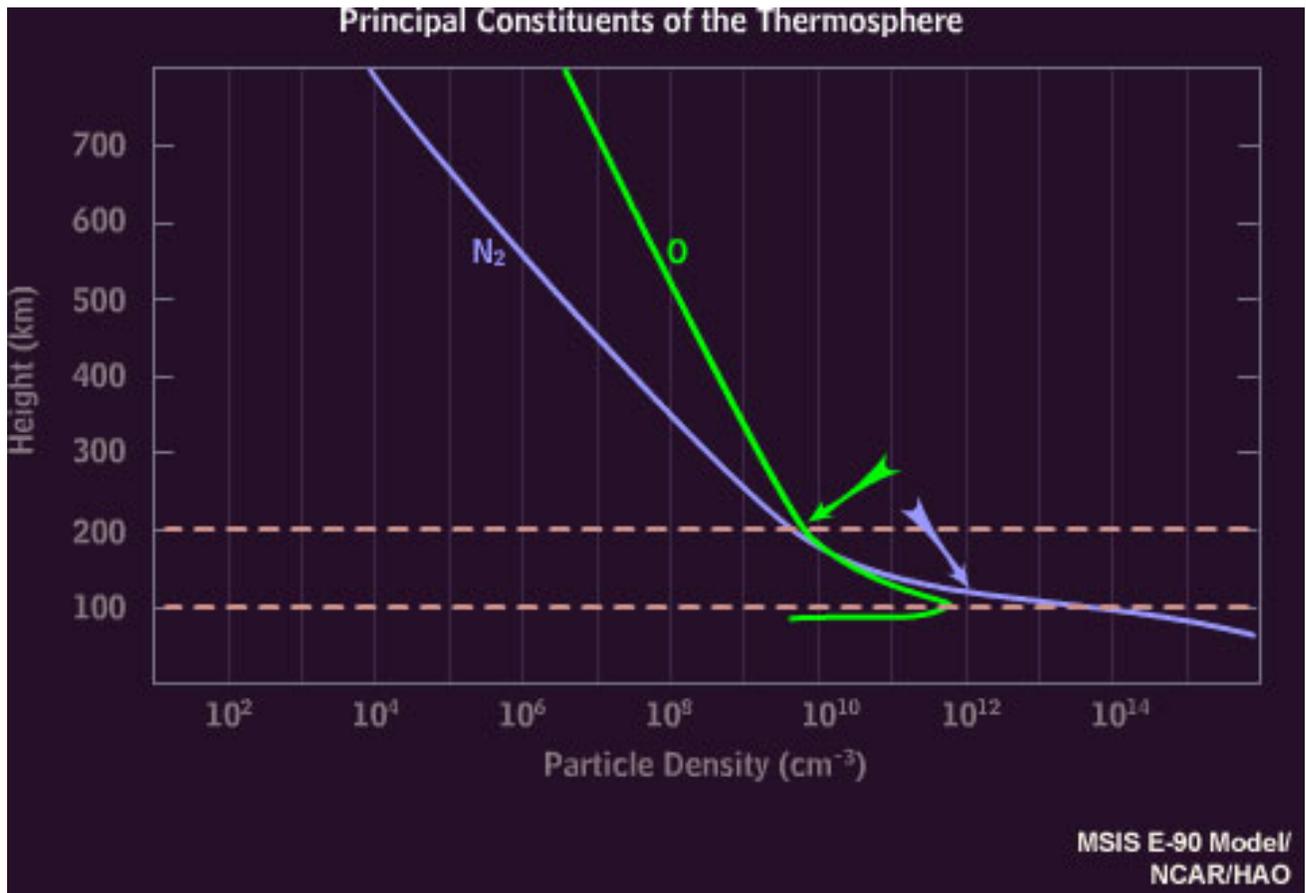


Figure 3. Plots of oxygen and nitrogen densities vs. altitude show that both species have uniquely different densities at altitudes of 100 km vs. 200 km, respectively [3]

For example, the red [OI] emission at 630 nm wavelength involves an electronic transition from the atom's longest-lived metastable state (with a 107s

spontaneous transition time) and so is most subject to quenching via collisional de-excitations. Only at the higher, less-dense altitudes can it effectively radiate. By

contrast, the green [OI] emission at 557.7 nm wavelength has a much shorter spontaneous transition time of 0.7 s and so can make the jump and radiate despite the higher-density and higher collisional-rate environments that prevail at lower altitudes. The higher concentration of atomic oxygen at these altitudes and higher eye sensitivity in green lead to the common appearance of green auroras (see Figure 3).

Excited molecular nitrogen also contributes to the observed green color. It can transfer the energy by collision to an oxygen atom, which then radiates the energy away emitting the color of green. Sometimes red and green also mix together to produce auroras with rarely seen colors such as pink or yellow. As altitude increases and density decreases, atomic oxygen is uncommon, and molecular nitrogen and ionized molecular nitrogen dominate in producing visible light emission, radiating at a large number of wavelengths in both the red and blue parts of the spectrum, with 428 nm (blue) being taken over. Blue and purple emissions appear at the highest levels of solar activity. Compared with the atomic oxygen transitions, molecular nitrogen transitions are much faster [4].

1.3 Modeling Auroras:

Auroras are caused by multiple factors, including direct collisional excitation of atmospheric gases by electrons which are thought to have “precipitated” downward from the magnetosphere, where they had been accelerated to 20,000 km/s speeds via MHD waves such as Alfvén waves. A thorough understanding of the electronic cascade leading to different types of auroras is still incomplete, yet most models invoke the interaction of the solar wind with the magnetosphere of Earth. The Alfvén wave model, a theory first introduced in 1946 by Russian physicist, Lev Landau, could provide a major key to the excitation of auroral gases [6]. These waves could accelerate charged particles toward Earth’s lower atmospheric altitudes, thereby exciting the ambient oxygen and nitrogen atoms at these altitudes to sufficient energies for subsequent emission. The Alfvén wave refers to the type of magnetohydrodynamic (MHD) wave

in which charged particles oscillate in response to a restoring force provided by an effective tension on the magnetic field lines. The formula used to calculate the speed of Alfvén waves is stated below:

$$v = \frac{v_A}{\sqrt{1 + \frac{v_A^2}{c^2}}}$$

where

$$v_A = \frac{B}{\sqrt{\mu_0 \rho}}$$

Here V is the phase velocity of the wave, V_A is the Alfvén wave group velocity, c is the speed of light, B is the magnetic field strength, μ_0 is the permeability of the vacuum, and ρ is the mass density [5].

For example, typical magnetospheric values of $B \sim (50-100) \times 10^{-9}$ Teslas, $n(\text{ion}) \sim 1/\text{cm}^3 \Rightarrow \Rightarrow \rho(\text{ion}) \sim 2.7 \times 10^{-20} \text{ kg/m}^3$, and $\mu_0 = 1.257 \times 10^{-6} \text{ m kg s}^{-2} \text{ A}^{-2}$ will yield an Alfvén speed of $V_A = 270-540 \text{ km/s}$. Kim, Kim, and Kwon (2018), using data from the Themis satellite, got slightly higher values of $V_A = 400-800 \text{ km/s}$, where their density referred to an average amu that was smaller (3) than what I used assuming all oxygen (amu = 16) [6].

A simulation of electron acceleration via Alfvén waves was completed in a lab at the Large Plasma Device (LPD) in UCLA’s Basic Plasma Science Facility recently, and the measurement matched the predictions from a computer simulation and associated mathematical calculations. According to the description by Greg Howes, co-author of the study, “Measurements revealed this small population of electrons undergoes ‘resonant acceleration’ by the Alfvén wave’s electric field, similar to a surfer catching a wave and being continually accelerated as the surfer moves along with the wave,” and that “Alfvén waves can accelerate the electrons (up to speeds of 45 million miles per hour, which is about 72 million kilometers per hour) that cause the aurora” [7].

1.4 Research Goals and Strategies:

The first question I will address is whether or not the forbidden [OI] emission properties can be understood in terms of modeled collision probabili-

ties vs. transition probabilities within the changing auroral environment. Here, I intend to quantitatively explain the altitude dependence of the green vs. red [OI] emissions with reference to the quantum states of these transitions.

The second question I will address is what sorts of electronic speeds are evident from the auroral phenomena themselves? I will focus on the Doppler-broadened 630 nm spectral line of [OI] observed at high-resolution. From this measurement, I derive the velocity dispersion of the oxygen atom and then infer the velocity dispersion of the colliding electrons. That quantification will determine whether or not additional acceleration of the electrons (beyond what the

solar wind provides) is necessary. This determination is key to assessing the relevance of the Alfvén wave model – and to further assess the emission properties that were quantified in addressing the first question. This latter assessment leads to a discrepancy that is discussed further in the Conclusions.

2.1 Plausible Modeling of Alfvén Wave Electron Acceleration:

As mentioned earlier in the Introduction, the aurora phenomenon has a high dependence on spectral-line emissions from atomic oxygen. Below is the energy level diagram of atomic oxygen showing different spectroscopic transitions, from where I acquired my data.

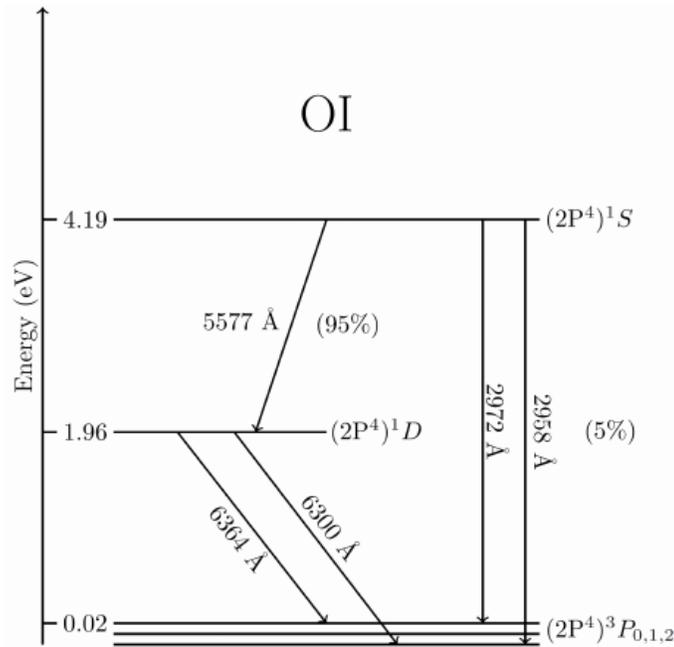


Figure 4. The Grotrian diagram of atomic oxygen. As labeled in the diagram, the energy required from the ground state of atomic oxygen to enable the green [OI] emission at 5577 Angstroms (557.7 nm) wavelength is 4.19 eV, while the energy required for the red doublet emission at 630.0 and 634.4 nm wavelength is 1.96 eV [8]

Red auroras are usually observed at the higher altitudes of about 200 km, where excited atomic oxygen emits at 630 nm (red). For such emissions, the excitation energy E_e equals 1.96 eV. This should equal the kinetic energy that is transferred to the oxygen atom by charged particles, mainly electrons. The velocity of the electrons, therefore, would be $V_e = \sqrt{(2 \times \text{K.E.}/m_e)} = \sqrt{(2(1.602 \times 10^{-19})(1.96)/m_e)} = 830 \text{ km/s}$. Based

on a similar calculation, the excitation energy from the ground state to the metastable level for green 557.7nm emission, which usually occurs at lower altitudes, is $E_e = 4.19 \text{ eV}$, and the velocity of the exciting electrons leading to the emission is $V_e = 1214 \text{ km/s}$.

Compared with the speed of the solar wind, usually between 300 and 700 km/s, there must be other acceleration mechanisms responsible for the inferred

exciting electron velocities, such as Alfvén waves. Scientists have demonstrated in the laboratory that Alfvén waves can accelerate the electrons to as much as 45 million miles per hour, which is about 72 million kilometers per hour or 20,000 km/s, far above the threshold of 200–700 km/s provided by the solar wind, meaning that such Alfvén waves could be possible for the necessary acceleration. Recent direct detections of such high-energy electrons in Earth’s magnetosphere have been made by the Japanese Exploration of Energization and Radiation in Geospace (ERG) satellite [9; 10]. In this paper we present evidence for “secondary low energy electrons” with energies much less than 1 keV at the lower auroral altitudes.

2.2 Modeled Collision Probabilities vs. Transition Probabilities:

Collisional excitation and transitional de-excitation (with the emission of a photon) are two

mechanisms for changing the energy of an electron that is bound in an atom. In the case of auroras, collisional excitation is the major cause of the excitation of atomic oxygen’s electrons to higher energy levels. The rate of collisional excitation should not greatly exceed the transition probability. Otherwise the collisions will de-excite the electron before it has a chance to make its photonic transition. The formula to calculate the probability for collisional excitation is $P_c = n\sigma v$, where P_c is the probability of collisions (in units of collisions/s), n is the density of particles (in units of particles/cm³) in this case atomic oxygen, σ is the cross-sectional area of interaction (in units of cm²), and v is the velocity of the colliding particles (in units of cm/s). In the next step, I’ll calculate the probability for the collisional excitation of [OI] at altitudes of 100 km (favoring the green emission) and 200 km (favoring the red emission).

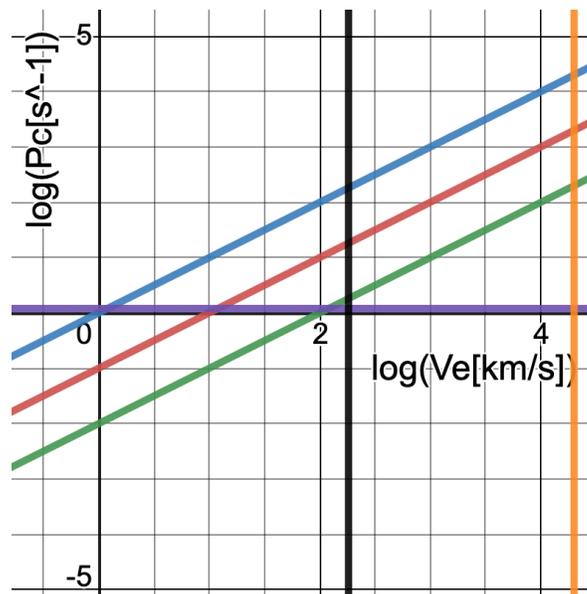


Figure 5(a). Relation between collision probability (P_c) and electron velocity (V_e) for different interaction cross sections (σ) in log-log format for the atmospheric situation at 100 km altitude

The horizontal line (purple) corresponds to $P_c = P_t = 1.2 \text{ s}^{-1}$ for an altitude of 100 km and corresponding density of 10^{12} . Two vertical lines (black and orange) respectively correspond to $V_e = 182 \text{ km/s}$ as found from the [OI] spectral line and $V_e = 20,000 \text{ km/s}$ as indicated by magnetospheric observations cited by the Alfvén-wave modelers. The lower-velocity line

intersects the choices for sigma at values of P_c that are 1–100 times P_t , with the likely value of $\log(\sigma) = -18$ (red) having P_c about 10 times greater than P_t , falling within the acceptable range. The higher-velocity line intersects the choices at values of P_c that are 100–10,000 times greater than P_t which should be unfeasible.

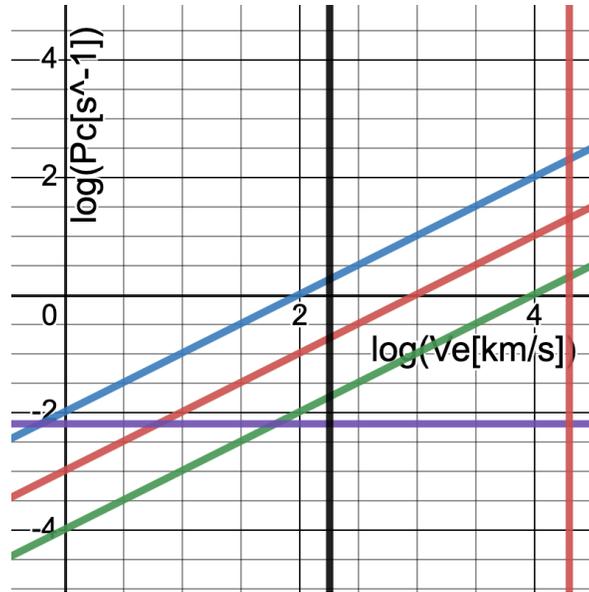


Figure 5(b). Relation between collision probability (P_c) and electron velocity (V_e) for different interaction cross sections (σ) for the atmospheric situation at 200 km altitude

The horizontal line (purple) corresponds to $P_c = P_t = 6.3 \times 10^{-3}$ for the red emission line of [OI]. The vertical lines (black and orange) are respectively from the [OI] spectral line measurement and magnetospheric observations cited by the Alfvén-wave modelers. The intersection of the lower-velocity line with the choices for σ yields P_c values that are 1–100 times greater than P_t . Note that these P_c values are another 100 times lower than those in the 100 km altitude situation (Figure 5(a)), thus explaining why the red line is suppressed at those lower altitudes

From these calculations and corresponding plots, one can see that for electron velocities of 10^1 to 10^2 km/s, the collision probabilities in Figure 5(a) are much too high for the red transition, thus explaining why the red emission is not seen at the lower altitude. The green transition at the lower altitude still has low enough collision probabilities to justify its presence there. However, at both altitudes, the required electron excitations require colliding electron velocities that well exceed 10^3 km/s, thus presenting a perplexing dilemma.

Based on figure 5(a), when the altitude is around 100 km, $n[\text{OI}]$ is around 10^{12} cm^{-3} . $V_e = P_c / (n\sigma) = P_c / (10^{12} \sigma)$. For $P_c = 1$ and $\sigma = 10^{-19}$, $V_e = 1 \times 10^7 \text{ cm/s} = 10^2 \text{ km/s}$. However, for the velocity

of Alfvén waves which is as much as 20.000 km/s, the P_c would be much greater than 1. Furthermore, if P_c is calculated based on the previous data, $P_c = n[\text{OI}] \sigma V_e = 10^{12} \times 10^{-18} \times (2 \times 10^4) \times 10^5 = 2 \times 10^3 \text{ s}^{-1}$. Compared with the transition probability, which is 1.2 s^{-1} , there's an excess factor of 1.7×10^3 [11]. Yet the collision probabilities are supposed to be similar to the transition probability. The same issue applies to an altitude around 200 km, where $n[\text{OI}]$ approximates 10^{10} cm^{-3} . At the high electron velocity of $2 \times 10^4 \text{ km/s}$, $P_c = 20 \text{ s}^{-1}$, whereas $P_t = 6.3 \times 10^{-3}$. An excess factor of 3.2×10^3 appears, while they are supposed to be similar to each other. This important discrepancy has yet to be resolved. Indeed, the next section gives further support to electron velocities near 200 km/s rather than 20.000 km/s, thus underscoring the problem of discrepantly high collision probabilities found via the latter value.

2.3 Spectroscopic Measurement of Velocity Dispersions:

High-resolution optical spectroscopy of the airglow above Berkeley, California and an aurora above Alaska was carried out by Wark (1960) [12]. The auroral observations gave a spectral linewidth of the red [OI] 6300 Angstrom (630 nm) emission of

305×10^{-4} Angstroms. The corresponding Doppler velocity dispersion of [OI] would be $V_{\text{[OI]}} = 1452 \text{ m/s} = 1.452 \text{ km/s}$. And if the [OI] is in energy equipartition with the electrons, the electron velocity dispersion would be $V_e = 248 \text{ km/s}$. Wark interpreted the observed line's half width as thermal broadening at a temperature of 734 K. Converting this temperature to a velocity dispersion would yield a somewhat lower value of 182 km/s. Both of these values are well below the excitation energy needs of the [OI] 6300 Angstrom transition ($1.96 \text{ eV} \Rightarrow 830 \text{ km/s}$) and even the solar wind velocities of 200–700 km/s. But at least they are more consistent with the collision probabilities that have been plotted.

For example, at an altitude of 200 km, $P_{\text{Collision}} = n\sigma v = (10^{10})(10^{-18})(182 \times 10^5) = 1.82 \times 10^{-1}$. This is about 29 times greater than the transition probability of 6.3×10^{-3} , as compared to an excess of 3175 if one adopted an electron velocity of $2 \times 10^4 \text{ km/s}$ based on the Alfvén modeling. If the collision probability should not greatly exceed the transition probability in order to minimize collisional de-excitations, then the lower electron velocity inferred from Ward's spectral-line profile should be regarded more favorably.

The lower electron velocities are difficult to reconcile with the excitation energy needs, however. They also reduce the need for significant acceleration by Alfvén waves which is supported by the literature. For example, Truman, Baumjohann & Pottelette (2011) found from FAST spacecraft observations of the kilometric auroral zone velocities of several 10^3 to several 10^4 km/s [13].

These and other measurements relating to the electrons themselves confirm the high electron velocities that are present in the high-altitude auroral zone, further challenging one to account for the unusually high inferred collision probabilities with respect to the transition probabilities. We can only conclude that the electrons colliding with the oxygen atoms at 100–200 km altitudes must be traveling at significantly lower velocities than those detected at

much higher altitudes. Investigators of pulsing auroras have noted that these phenomena are driven by “low-energy, secondary electrons” that are responding to the much higher-energy electrons in the Earth's disturbed magnetosphere [9; 10]. The pulsations, themselves, and other wave-like behavior in the auroras may be responding to the higher-energy, higher-velocity Alfvén waves that are extant.

3.1 Conclusions:

- The simple model of collision probabilities explains why the green emission predominates at lower altitude, while the red emission is restricted to higher altitudes where the density and collision probabilities are less.

- The simple model supports electron velocities of 10^1 to 10^2 km/s , consistent with measurements of the [OI] 630 nm emission line, but well below the velocities near $\sim 10^3 \text{ km/s}$ needed to excite the electrons to their metastable levels for subsequent emission. Further support for much higher electron velocities of $\sim 10^4 \text{ km/s}$ comes from spacecraft observations of the electrons themselves at higher altitude, from the Alfvén-wave model for accelerating these electrons, and from laboratory simulations that confirm the feasibility of this type of electron acceleration.

- These high electron velocities yield collision probabilities that greatly exceed the transition probabilities for the green and red [OI] transitions. This disparity remains unresolved.

Perhaps the evidence for high electron velocities in the auroral kilometric radiation zone (at altitudes of three Earth radii) does not apply to the electrons banging into the [OI] at the relatively low altitudes of 100–200 km. This interpretation is supported by the “low-energy, secondary electrons” that are thought responsible for driving the pulsing aurora phenomenon [9; 10]. Alternatively, the transfer of kinetic energy from the electrons to the oxygen atoms could involve inefficiencies of order 10^3 . To test these propositions, one would have to directly sample the electrons and their velocities at these lower altitudes.

References:

1. “Aurora.” Wikipedia, Wikimedia Foundation, 22 July, 2021. URL: <http://en.wikipedia.org/wiki/Aurora>.
2. Dunbar Brian. “The History of Auroras.” NASA, NASA, 7 June, 2013. URL: http://www.nasa.gov/mission_pages/themis/auroras/aurora_history.html
3. “Charged Particle Motion in Earth’s Magnetosphere.” Auroral Colors and Spectra – Windows to the Universe. URL: http://www.windows2universe.org/earth/Magnetosphere/tour/tour_earth_magnetosphere_09.html.
4. “Info about Magical Sky.” Magical Sky Iceland, 5 Apr. 2017. URL: <http://magicalskyiceland.com/photo-info/info-about-magical-sky>
5. “Alfvén Wave.” Wikipedia, Wikimedia Foundation, 4 July, 2021. URL: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2015JA021292en.wikipedia.org/wiki/Alfv%C3%A9n_wave
6. Kim Khan-Hyuk, et al. “Distribution of Equatorial Alfvén Velocity in the Magnetosphere: A Statistical Analysis of THEMIS Observations.” *Earth, Planets and Space*,– Vol. 70.– No. 1. 2018. Doi:10.1186/s40623-018-0947-9
7. Gray Jennifer. “The Mysterious Origin of the Northern Lights Has Been Proven.” CNN, Cable News Network, 8 June, 2021. URL: <http://edition.cnn.com/2021/06/07/weather/aurora-borealis-creation-mystery-solved-scni/index.html>
8. Bhardwaj Anil & Susarla Raghuram. Coupled Chemistry-Emission Model for Atomic Oxygen Green and Red-doublet Emissions in Comet C/1996 B2 Hyakutake. *The Astrophysical Journal*. 748. 10.1088/0004-637X/748/1/13. 2012.
9. Kelly James. “NASA Scientists Reveal the Role of Electrons in Pulsating Auroras.” *Sci Tech Daily*, 8 Oct. 2015. scitechdaily.com/nasa-scientists-reveal-the-role-of-electrons-in-pulsating-auroras, with reference to Samara M., Michell R. G. and Redmon R. J. “Low-altitude satellite measurements of pulsating auroral electrons”. *Journal of Geophysical Research*,– Vol. 120.– Issue 9. 2015.– P. 8111–8124. URL: <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2015JA021292>
10. “Scientists directly observe electron dynamics of the Northern Lights”. University of Tokyo press release, Feb. 14, 2018. URL: https://phys.org/news/2018-02-scientists-electron-dynamics-northern.html?utm_source=TrendMD&utm_medium=cpc&utm_campaign=Phys.org_TrendMD_1 and reference therein
11. Osterbrock Donald E. and Gary J. Ferland. *Astrophysics of Gaseous Nebulae and Active Galactic Nuclei*. University Science, 2006.
12. Wark D. Q. “Doppler Widths of the Atomic Oxygen Lines in the Airglow”. *Astrophysical Journal*,– Vol. 131. 1960.– 491 p. URL: <http://articles.adsabs.harvard.edu//full/1960ApJ...131..491W/0000491.000.html>
13. Treumann R. & Baumjohann W. & Pottellette R. “Electron-cyclotron maser radiation from electron holes: Downward current region.” *Annales Geophysicae*. 2011.– 30 p. Doi:10.5194/angeo-30-119-2012.

Section 2. Pedagogy

<https://doi.org/10.29013/YSJ-21-8.9-12-16>

*Li Qing,
graduate student of Sumy State
Pedagogical University named after A. S. Makarenko
E-mail: ancin6877@gmail.com*

PEDAGOGICAL CONDITIONS FOR THE FORMATION OF READINESS FOR PROFESSIONAL AND CREATIVE SELF- REALIZATION OF FUTURE TEACHERS FINE ARTS

Abstract. The article considers the pedagogical conditions necessary for the formation of readiness for professional and creative self-realization of future teachers of fine arts, including: organization of self-improvement of future teachers-artists in the context of future professional activity; creation of a reflective-educational environment in the educational process of higher education institution.

Keywords: pedagogical conditions, professional and creative self-realization, artistic and pedagogical activity, professional training, future teachers of fine arts, fine arts.

*Ли Цин,
аспирант Сумского государственного
университета им. А. С. Макаренко
E-mail: ancin6877@gmail.com*

ПЕДАГОГИЧЕСКИЕ УСЛОВИЯ ФОРМИРОВАНИЯ ГОТОВНОСТИ К ПРОФЕССИОНАЛЬНО-ТВОРЧЕСКОЙ САМОРЕАЛИЗАЦИИ БУДУЩИХ УЧИТЕЛЕЙ ИЗОБРАЗИТЕЛЬНОГО ИСКУССТВА

Аннотация. В статье рассматриваются педагогические условия, необходимые для формирования готовности к профессионально-творческой самореализации будущих учителей изобразительного искусства, среди которых: организация самосовершенствования будущих педагогов-художников в контексте осуществления будущей профессиональной деятельности; создание рефлексивно-образовательной среды в учебно-воспитательном процессе учреждения высшего образования.

Ключевые слова: педагогические условия, профессионально-творческая самореализация, художественно-педагогическая деятельность, профессиональная подготовка, будущие учителя изобразительного искусства, изобразительное искусство.

Педагогические условия формирования готовности к профессионально-творческой самореализации будущих учителей изобразительного искусства мы рассматриваем как один из компонентов педагогической системы, отражающей совокупность возможностей образовательной и материально-пространственной среды, влияющих на ее личностный и процессуальный аспекты.

Ведущими педагогическими условиями этого процесса были избраны: организация самосовершенствования будущих педагогов-художников в контексте осуществления будущей профессиональной деятельности; создание рефлексивно-образовательной среды в учебно-воспитательном процессе учреждения высшего образования.

Так, процесс формирования готовности к профессионально-творческой самореализации у будущих учителей изобразительного искусства зависит не только от внешнего воздействия, но и от самостоятельной работы над собой, которая выражается в целенаправленных усилиях, направленных на самоизменение, от самосознания, критического отношения к собственному профессиональному становлению, волевых качеств, выработки устойчивых установок на постоянное профессиональное самосовершенствование. Поэтому первым педагогическим условием в нашем исследовании является организация самосовершенствования будущих педагогов-художников в контексте осуществления будущей профессиональной деятельности.

Под самосовершенствованием будущих учителей изобразительного искусства в контексте осуществления будущей профессиональной деятельности понимаем сознательную и целенаправленную деятельность будущих педагогов-художников над собой, которая направлена на получение необходимых знаний, выработки умений и навыков, необходимых личностных черт, способствующих готовности к профессионально-творческой самореализации, и преодоления негативных.

Структурно процесс самосовершенствования состоит из четырех основных логических взаи-

мосвязанных этапов: самосознание и принятия решения на самосовершенствование; планирование и выработка программы самосовершенствования; непосредственная практическая деятельность по реализации поставленных задач в работе над собой; самоконтроль и самокоррекция этой деятельности.

Началом работы будущих педагогов-художников по самосовершенствованию в аспекте осуществления будущей профессиональной деятельности выступает этап самопознания. Организация самопознания осуществляется по трем направлениям: самопознания себя в системе социально-педагогических отношений, в условиях учебно-профессиональной деятельности и тех требований, которые предъявляет к нему эта деятельность; самоизучения уровня компетентности и качеств собственной личности, которое осуществляется путем самонаблюдения, самоанализа своих профессиональных действий, поведения, результатов деятельности, критического анализа высказываний в свой адрес, самопроверки себя в конкретных условиях деятельности; самооценка, которая производится на основе сопоставления имеющихся знаний, умений, качеств личности с предъявляемыми требованиями; адекватная самооценка, на основе которой обеспечивается самокритичное отношение будущего специалиста к своим профессиональным достижениям и недостаткам.

На основе самопознания и самооценки у студентов начинает выработываться решение заниматься самосовершенствованием. Процесс принятия такого решения происходит, как правило, при глубоком внутреннем переживании положительных и отрицательных сторон личности. По сути, именно на данном этапе создается своеобразная модель работы над собой. Здесь важно волевым путем преодолеть самовлюбленность, а порой и определенную растерянность перед новыми сложными задачами. Решение о самосовершенствовании конкретизируется на этапе планирования.

Эффективность самосовершенствования студентов значительно возрастет, если они приложат достаточно усилий на этапе самоконтроля и самокоррекции. Сущность их деятельности на данном этапе заключается в том, что они контролируют работу над собой, постоянно держат ее в поле своего сознания и на этой основе своевременно устанавливают или предотвращают возможные отклонения реализованной программы самосовершенствования от заданной, вносят соответствующие коррективы в план дальнейшей работы.

Считаем, что самосовершенствование предполагает не простое приспособление к внешним требованиям, а активное развитие качеств личности в процессе профессиональной подготовки. Именно на эту особенность обращает внимание известный польский педагог В. Оконь [3], выделяя в любой деятельности адаптивную и творческую стороны. По его мнению, адаптация позволяет человеку ознакомиться и ассимилировать уже имеющиеся наработанные знания, умения и навыки из арсенала своей будущей профессии, а самостоятельная творческая деятельность дает ему возможность развивать собственные силы путем выхода за рамки сложившихся стереотипов и на основе этого «продвинуть себя вперед».

Именно творческая сторона деятельности является определяющей в процессе самосовершенствования. Поэтому считаем, что на аудиторных занятиях целесообразно использовать активные формы, методы и педагогические средства, раскрывающие и формирующие творческий потенциал личности будущего учителя изобразительного искусства, стимулирующие систематическую и целенаправленную работу над собой.

Целесообразно выделить следующие направления эффективного воздействия на процесс развития мотивов профессионального самосовершенствования: формирование положительных мотивационных установок на профессиональное самосовершенствование; формирование прочных знаний, умений и навыков в работе по

профессиональному самосовершенствованию; актуализация потребностей профессионального самосовершенствования у студентов в процессе организации их познавательной деятельности.

В процессе самосовершенствования будущих учителей изобразительного искусства в контексте осуществления будущей профессиональной деятельности важная роль принадлежит программе самосовершенствования, воплощение которой происходит двумя путями: подчинение собственной деятельности мотивам и мотивации самосовершенствования и превращения их в эту деятельность; реализация программы самосовершенствования путем совершенствования профессиональных умений и навыков, приобретение необходимых профессиональных знаний, работы над эмоциональной устойчивостью, адекватной самооценкой.

Формирование готовности к профессионально-творческой самореализации будущих учителей изобразительного искусства невозможно без преодоления их сомнений в себе и своих профессиональных возможностях, без необходимой работы над своими недостатками. Значительную роль в формировании исследуемой готовности будущих педагогов-художников занимает самооценка и самоотношение к себе как будущего профессионала. Поэтому считаем, что для эффективной работы в направлении формирования готовности к профессионально-творческой самореализации будущих учителей изобразительного искусства важны результаты углубление рефлексивных процессов.

Рефлексия является предметом исследования многих наук, среди которых ведущее место занимают философия и психология. Термин «рефлексия» происходит от латинского «*reflexion*» и означает обращение назад, отражение. В философии рефлексия рассматривается как «принцип человеческого мышления, направляющий его на осмысление собственных форм и предпосылок, предметное рассмотрение знания, критический анализ его содержания и методов познания, деятельность самопознания, раскрывающая вну-

треннее строение и специфику духовного мира человека ...» [4, С. 499].

Понятие «рефлексия» и «сознание», которые используются в философской литературе, тесно взаимосвязаны. Так, А. Спиркин связывает рефлексию с самосознанием, которая «будучи и самосознанием, и самоотношением, и самооценкой, формируется на определенном уровне развития личности под влиянием социального образа жизни» [5, С. 46].

В современной психологии используются понятия рефлексии и рефлексивности. Так, рефлексивность рассматривается как психическое свойство личности, на основе которой формируется предготовленность к рефлексии как процессу. Рефлексия включает в себя такие процессы, как самопонимание и понимание другого, самооценка и оценка другого, самоинтерпретация и интерпретация другого и тому подобное.

Признание рефлексии как механизма самосознания послужило основой изучения ее роли в процессах формирования и развития личности. Так, Л. Выготский определил теоретические подходы к изучению рефлексии как важного компонента самосознания с позиции теории психического развития. Среди выделенных им трех групп условий формирования личности, рефлексию он выделяет как одну из важных теоретических условий, подчеркивая при этом, что «влияние рефлексии не исчерпывается только внутренним изменением самой личности. В связи с возникновением самосознания становится возможным более глубокое и широкое понимание других людей» [2, С. 232].

Б. Ананьев первым выделил рефлексивные черты характера, выражающие отношение к самому себе [1, С. 159]. В настоящее время рефлексия является предметом изучения социальной, инженерной, педагогической психологии. С явлениями рефлексии связывают формирование теоретического мышления и развитие творчества; рефлексия рассматривается как важнейший механизм межличностного познания, понимания и ре-

гуляции поведения в ситуациях межличностного и группового общения; рефлексивный подход становится одним из центральных при изучении самосознания, развития деятельности и личности.

В последние годы категориальный аппарат психологии расширился и углубился за счет понятий «рефлексивная способность», «рефлексивная готовность», «рефлексивная компетентность», «рефлексивная культура». Так, под рефлексивной способностью С. Степанов и Г. Катрич понимают способность субъекта осуществлять рефлексию по отношению к различным видам и областям собственной активности, профессиональной деятельности и социальной практики. Рефлексивная готовность представляет собой готовность к актуализации и реализации рефлексивной способности, которая позволяет «включить» рефлексивность в текущем состоянии человека.

Сущность рефлексивной компетентности субъекта А. Полищук определяет как профессиональное личностное качество, что позволяет эффективно и адекватно осуществлять рефлексивные процессы; реализацию рефлексивной способности, что обеспечивает процесс развития и саморазвития, способствует творческому подходу к профессиональной деятельности, достижению ее максимальной эффективности и результативности. Рефлексивная культура включает в себя: возможность творчески, по-новому осмысливать и преодолевать проблемные ситуации, выходить из внутренних и внешних конфликтных состояний; умение найти новые силы, смыслы и ценности; привлекать и привлекаться к непривычным системам межличностных и деловых отношений, ставить и решать неординарные практические задачи.

Таким образом, рефлексивные свойства сознания являются необходимым компонентом психogramm многих профессий, имеющих отношение к сфере межличностных отношений и совместной деятельности. В полной мере это касается и профессиональной деятельности учителя, что дает нам основания утверждать о важности

и необходимости введения указанного педагогического условия в процесс формирования готовности будущих учителей изобразительного искусства к профессионально-творческой самореализации.

Список литературы:

1. Ананьев Б. Г. Избранные психологические труды: Проблемы современного человекознания. – Т. 2. – Москва: Педагогика, 1980. – Т. 1. – 230 с.
2. Выготский Л. С. Собр. соч. в 6 т. // под ред. А. Р. Лурия. – Москва: Педагогика, – Т. 3. 1982. – 328 с.
3. Оконь В. Основы проблемного обучения. – Москва: Просвещение, 1968. – 208 с.
4. Философский энциклопедический словарь / редкол.: Л. Ф. Ильичев (гл. ред.) [и др.]. – Москва: Сов. энцикл., 1983. – 836 с.
5. Спиркин А. Г. Сознание // Философская энциклопедия / редкол.: Е. Ф. Губский [и др.]. – Москва: Советская энциклопедия, 1970. – Т. 5. – 46 с.

Section 3. Psychology

<https://doi.org/10.29013/YSJ-21-8.9-17-21>

*Khalilova Khalida,
Junior researcher, Institute of Philosophy of National
Academy of Science of the Republic of Azerbaijan
E-mail: xalida-83@rambler.ru*

SOCIAL AWARENESS MEASURES FOR RELEASED YOUNG PRISONERS

Abstract. Prisoners in Azerbaijan face a number of difficulties in reintegrating into society after their release. Ex-prisoners face stigma and many other social barriers, making it increasingly difficult for them to find work, housing, re-engage with their families and the community, and return to a normal life in general. They often have difficulty accessing legal and psychological assistance, although it is easier for non-convicts to access these services. Convicts are often denied access to higher education and careers because they are viewed with suspicion when interviewing potential employers. All of these barriers, combined with prejudice and stigma, have a negative impact on the mental health and general well-being of convicted persons and may even lead to recidivism. Hence, a group of studies focus on possible ways of reintegrating them to the society in line with their psychological well-being.

Keywords: prisoners, social awareness measures, basic social rights, international organizations.

Introduction

According to our research, most studies came up with a similar set of problems faced by young prisoners from the first day of their release. The primary challenge of ex-prisoners is the denial of access to higher education and employment opportunities due to previous conviction records. Such limitations influence their financial conditions as well; the unemployed youth fails to find adequate sources of income. This, in its turn, leads to barriers in getting legal assistance as well. Most of the convicted persons admit being denied some legal procedures and basic rights. Moreover, the influence of stereotypes and psychological pressures is widely felt in many aspects of their lives, which decreases their desire and motivation to reintegrate and return to work

environment. The fear with regards to the society's perception do necessarily hinder their healing, and unfortunately, many of them feel the lack of adequate psychological support from their families too. All these factors play an important role in postponing and hindering their process of being re-accepted to the society.

There has been launched and implemented several projects and programs for social rehabilitation and reintegration of ex-offenders to the society in the past 10 years. Nevertheless, there is a lack of sustainable chain of effective and comprehensive rehabilitation and reintegration programs designed for the released ex-offenders throughout the country. Although there are legislations concerning the rehabilitation of released prisoners, their

implementation is not carried out in a responsible, effective and regular manner.

Measures taken to solve the above-mentioned problems in Azerbaijan

The government of Azerbaijan has been working on some plans towards resolving, or at least, alleviating the most common challenges faced by this group of young people. Considering the burden financial and psychological difficulties impose on them, the projects are principally designed in the direction of financial and psychological support.

At present, **the state pays a one-time allowance** to this category of people in the amount of 4 times the minimum wage. Also, measures are taken by the employment agencies to ensure their employment allocated under the quota in workplaces, and to organize the vocational training of persons on the verge of serving their sentences.

In addition to the financial assistance, according to the decision of the Cabinet of Ministers of the Republic of Azerbaijan No. 434 dated October 17, 2017, the Center for Social Adaptation for persons released from penitentiary institutions was established under the State Social Protection Fund under the Ministry of Labor and Social Protection. At the same time, the 50-seat Social Adaptation Center for convicts in penitentiary institutions in Gobustan region was planned to start operating in 2018.

In order to ensure basic social rights of ex-prisoners are met, several Public Unions have organized projects to provide legal and social support. As majority of ex-prisoners face barriers in their access to legal procedures, In 2015, the Public Union “Young Lawyer Women for Legal Reforms” implemented the project “Legal support for ex-prisoners and the elimination of discrimination against them” to assist the social adaptation and rehabilitation of young people released from prisons. Other than local organizations, UNDP was also active in this regard. In 2016, UNDP launched a two-year project to provide legal assistance, rehabilitation and reintegration support to prisoners in Azerbaijan through close cooperation

with the Sheki Regional Department of Justice of the Ministry of Justice of the Republic of Azerbaijan and the local NGO Uluchay Socio-Economic Innovation Center (UNDP Azerbaijan, 2019 [5]). The work was reported in the media as a successful example of cooperation with international organizations.

Global initiatives were continued in other directions as well. On May 8, 2019, the Council of Europe organized a conference in Baku to announce the launch of a new joint EU-Council of Europe 24-month Project entitled “Additional Support for Penitentiary Reform in Azerbaijan-2” (SPERA 2) (Council of Europe, 2019 [5]). Within the framework of this programme, on 11 May 2020, an online workshop was organized for a number of Azerbaijani NGOs receiving grants to implement reintegration programs to support released prisoners.

Ministries paid special attention to working together with organizations of different scope and specialized in this sphere. In July 2020, “Observation of places of deprivation of liberty” Public Union with the financial support of the Council of State Support to Non-Governmental Organizations under the President of the Republic of Azerbaijan has launched the project “Measures to integrate ex-prisoners into society and ensure their social rights”. On the other hand, the Ministry of Justice and the Ministry of Labor and Social Protection of Population signed an “Action Plan on the work to be done in penitentiaries in 2020”. In accordance with the plan, various seminars and workshops were held in penitentiaries.

Accordingly, articles of the national legislation of the Republic of Azerbaijan are legally binding and determined to balance relations based on internationally accepted principles. The articles are intended to protect social, economic and legal rights of prisoners and ex-prisoners, and ensure their protection under the law.

International Conventions to which Azerbaijan can be a party

Although the constitution and legal system of Azerbaijan are designed in line with the most updated

principles and international guidelines, there are several more steps that can be taken for effectiveness. The United Nations proposes a group of rules with regards to prisoners that protects and ensures fair treatment. Below are some of the international conventions that Azerbaijan can take into consideration.

- The United Nations Standard Minimum Rules for the Treatment of Prisoners;
- UN Standard Minimum Rules for Non-Custodial Measures 1990 (“Tokyo Rules”);
- The UN Convention on the Rights of the Child sets out 11 fundamental binding principles to be reflected in sentencing all juvenile offenders;
- The UN Standard Minimum Rules for the Administration of Juvenile Justice 1985 (Beijing Rules);
- The UN Guidelines for the Prevention of Juvenile Delinquency 1990 (Riyadh Guidelines);
- The UN Rules for the Protection of Juveniles Deprived of their Liberty 1990.

Furthermore, following project and programmes launched in different countries may also be implemented in Azerbaijan. The chosen cases from Singapore, Canada, UK and Estonia have demonstrated big success in terms of the rehabilitation and reintegration of prisoners.

Singapore

The Singapore Prison Service’s Rehabilitation Framework was first developed in 2000 as a deliberate operating model that guides our offender reformation effort. With a Through-Care approach in mind, the rehabilitation framework consists of three distinctive stages: 1) In-Care; 2) Halfway Care; 3) Aftercare. The “In-Care” phase involves three procedures to go through at each step. The first step is the assessment and classification, in which every prisoner will be assessed and classified according to their security risks and rehabilitation needs at admission. The classification is later used to chart the “Personal Route Map” (PRM) for every prisoner.

A prison officer will be assigned as a Personal Supervisor to the prisoner on admission, to monitor and review the “Personal Route Map”. Accordingly, rehabilitation programs are defined; prisoners are allocated programmes according to their needs identified in the PRM. Some of the key rehabilitation programmes include: Specialized Treatment Programmes (STPs), Education, Employment and Vocational Training and Family-focused Services and Programmes.

The last one is “Aftercare” phase; Community Aftercare Programme (CAP) is provided for these prisoners at the Aftercare phase. This voluntary post-release programme is aimed at supporting ex-prisoners in their reintegration journey, up to a period of six months. Prisoners who sign up for CAP will be assigned Aftercare Case Managers to help them deal with their reintegration challenges in the five domain areas, including employment, financial, accommodation, coping skills and family/social support.

Canada

The Ministry of Community Safety and Correction Services of Canada offers Offender Programs and services. Four main types of programmes intended to affect positive inmate and offender change are offered: 1) life skills programs, 2) rehabilitative programs to address issues such as substance abuse, anger management, etc., 3) education and literacy programs, 4) work programs.

Furthermore, the Ministry of Community Safety and Correction Services of Canada offers a program that they call Trilcor Industries in which offenders can work while they are in prison to provide service while gaining some of the skills they will need for re-integration into society (Anderson [1]).

Latvia

‘**Breaking waves**’ was a training programme for young inmates of four prisons in Latvia, which ran from December 2012 to June 2013. The Latvian and Russian participants, aged 14-30, of both genders, had learning obstacles, language obstacles or mental disabilities. The project organised long-

term non-formal learning activities to develop social skills and attitudes that would ease resocialisation and employability in the target group. Participants received Youthpass certificates that described the competences acquired (European Union [6]).

Europe-wide

“HERO: Health & Education Support for the Rehabilitation of Offenders 2001-2003” project is aimed at contributing to the rehabilitation of offenders within the European Criminal Justice system. The key activities of the project were to develop two sets of support services: a health promotion and health monitoring module, and a learning and skill support module, for two groups of users: 1) young and first offenders, 2) prisoners preparing for re-entry into society.

The HERO (Health & Educational Support for the Rehabilitation of Offenders [17]) addresses two key problems that most societies face: 1) how to improve conditions in prisons, 2) how to reduce levels of re-offending (The Tavistock Institute, n.d).

“Emma’s Acres” is an agricultural social enterprise in Mission, B.C. where victims and violent offenders work side-by-side on a 3.2-hectare farm. Together they grow vegetables that are sold at farmers’ markets or given freely to the families of homicide victim (Donato, n.d.).

The Family Outreach and Response Program of the Canadian Mental Health Association in Toronto offers recovery-oriented mental health support services to families. “The Family Association for Mental Health Everywhere” offers support to families where any mental illness is an issue by providing one-on-one supportive counselling, education, resources, peer support groups and coping strategies to family members in the Greater Toronto area (John Howard Society of Ontario [8]).

Additionally, during the Multiplier Event partners promote the intellectual outputs (IO) (EPEA [5]).

United Kingdom

The UK worked on “Capacity Building through Prison Education” project. A review of the prison education system in the UK in 2016 concluded that all ar-

reas of the prison regime should be considered suitable for education, but a number of specific criteria have been identified. Firstly, development of basic skills in the field of literacy, computing and information and communication technologies, Personal and Social Development (PSD) including behavioral programs, family relationships, necessary support for the needs of prisoners with learning disabilities and disabilities (LDD) is needed. Also, art, music and sports activities, job and career options and mentoring support for the development of young prisoners can be offered.

Estonia

Estonia proposes a social Rehabilitation Program for Criminals in Estonian Penitentiaries. This project is designed with different programs and trainings.

The first program is about nerve management. This program is designed for young prisoners to control their nerves and self-control. Secondly, a social skills development training is offered. Prisoners learn to express themselves, analyze their thoughts, and control their behavior in daily life. There is also an aggression transformation training for students to learn using positive social skills instead of aggressive behavior.

A lifestyle training for prisoners is also considered. The program identifies the exploiters and addicts of addictive substances and the addictions that lead to illegal behavior.

United Kingdom

The British volunteer organization “Step Together” plans to recruit young prisoners to help them find employment after their release from prison. It provides inmates with coaching, build self-confidence, explore individual skills and interests, challenge volunteer thinking and attitudes, and help identify future goals and aspirations.

Conclusion

As we have seen throughout the paper, there are many social, economical and psychological difficulties and obstacles to receiving a decent education and job. These problems are widely faced by prisoners who are released from the penitentiary institutions in Azerbaijan. Alongside the Azerbaijani

legislation adopted on this matter, the research also presented the international conventions on the treatment of prisoners, juvenile delinquency, protection of juveniles to which Azerbaijan can be a party in the near future to ensure a better organization and implementation of the rehabilitation and reintegration measures. The final and the most significant part of

the research is the section about reintegration and rehabilitation projects and frameworks developed and implemented in different countries. The successful implementation of these projects is very promising, because it can lead to the launch of similar project and programs by the responsible state institutions and organizations in Azerbaijan.

References:

1. Anderson W. Reintegration of Ex-Convicts into Canadian Society. 2020.
2. Retrieved from: URL: <https://schoolworkhelper.net/reintegration-of-ex-convicts-into-canadian-society>
3. Retrieved from: URL: <https://www.coe.int/az/web/baku/-/-further-support-to-the-penitentiary-reform-in-azerbaijan-2-project-launched-in-azerbaijan>
4. Donato A. (n.d.). From Puppies to Farming: Canada's Most Innovative Prison Rehab Programs. Retrieved from: URL: <https://www.cbc.ca/keepingcanadasafe/blog/from-puppies-to-farming-an-in-depth-look-at-innovative-prisoner-rehab-progr>
5. EPEA (2019). MOBi – Mobilizing Society Towards (ex) Offenders Reintegration. Retrieved from: URL: <https://www.epea.org/mobi-mobilizing-society-towards-ex-offenders-reintegration>
6. European Union (2015). Unleashing young people's creativity and innovation.
7. Retrieved from: URL: https://ec.europa.eu/assets/eac/youth/library/publications/creativity-innovation_en.pdf
8. John Howard Society of Ontario (2016). Reintegration in ontario: practices, priorities, and effective models. Retrieved from: URL: <https://johnhoward.on.ca/wp-content/uploads/2016/11/Reintegration-in-Ontario-Final.pdf>
9. Ministry of the Solicitor General. Offender Programs and Services. 2021.
10. Retrieved from: https://www.mcscs.jus.gov.on.ca/english/corr_serv/OffenderProgramsServices/offender_programs.html
11. National Youth Achievement Award. Retrieved from: URL: <http://www.nyaa.org/outdoor.html>
12. Retrieved from: URL: <http://prisonsystems.eu/reenter-project>
13. Singapore Prison Service.
14. Retrieved from: URL: <https://www.sps.gov.sg/news-about-us/in-the-news/largest-number-of-inmates-clinching-goldin-national-youth-achievement-awards-20th-anniversary-in-prisons>
15. Step Together (n.d.). About us. Retrieved from: URL: <https://www.step-together.org.uk/pages/5-about-us>
16. Tang S. (n.d). Effective rehabilitation and reintegration of offenders. Resource material series No. 82. Retrieved from: URL: https://www.unafei.or.jp/publications/pdf/RS_No82/No82_07VE_Tang.pdf
17. The Tavistock Institute (n.d). HERO: Health & Education Support for the Rehabilitation of Offenders 2001–2003. Retrieved from: URL: <https://www.tavinstitute.org/projects/hero-health-education-support-for-the-rehabilitation-of-offenders-2001-2003>

<https://doi.org/10.29013/YSJ-21-8.9-22-25>

Yumeng Ye,
RDF International School, Shenzhen, China
E-mail: xxjnicole@hotmail.com

DIFFICULTY CAUSED BY DEPRESSION

Abstract

Objective: This study aims to: 1) examine the association of Difficulty caused by depression and Income; 2) build a predictive model for Difficulty caused by depression using logistic regression model.

Data and Methods: National Health and Nutrition Examination Survey (NHANES) 2017–2020 data was used in this study. NHANES is a program of studies designed to assess the health and nutritional status of adults and children in the United States.

All the participants who were eligible were randomly assigned into 2 groups: training sample and testing sample. logistic regression was built using training sample.

Results:

About 26.4% ($n = 1216$) of 4598 participants experienced difficulty caused by depression. It was 24.1% among the male and 28.3% among the female. According to the logistic regression, Non-Hispanic Black has lower risk for Difficulty caused by depression compared to another race ($p < 0.001$), so was Non-Hispanic Asian ($p = 0.003$). Older people were more likely to have Difficulty caused by depression ($p = 0.008$). The risk of Difficulty caused by depression trended down when the family income increased ($p < 0.001$). The ROC was 0.6178 for the Logistic regression. The optional cutoff time is 0.40. The mis-classification error was 0.27. sensitivity is 13% and specificity was 95%.

Conclusions: In this study, we identified significant factors for being a victim of difficulty caused by depression, for example, age, race, and family income.

Keywords: Depression, difficulty, significant factors, victim, depression.

1. Instruction

Depression is one of the most common mental health illnesses in the United States, affecting about 26 percent of adults (American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition).

The exact cause of depression is unknown. It may be caused by a combination of genetic, biological, environmental, and psychological factors [2]. Some people who are depressed may think about hurting themselves or committing suicide (taking their own life). If you or someone you know is having thoughts about hurting themselves

or committing suicide, please seek immediate help [3].

This study aims to: 1) examine the association of Difficulty caused by depression and Income; 2) build a predictive model for Difficulty caused by depression using logistic regression model.

2. Data and Methods:

Data:

National Health and Nutrition Examination Survey (NHANES) 2017–2020 data was used in this study. NHANES is a program of studies designed to assess the health and nutritional status of adults and children in the United States. The data is avia-

lalbe at URL: https://www.cdc.gov/nchs/nhanes/about_nhanes.htm.

Models:

We also used logistic regression models to calculate the predicted risk. Logistic regression is a part of a category of statistical models called generalized linear models, and it allows one to predict a discrete outcome from a set of variables that may be continuous, discrete, dichotomous, or a combination of these. Typically, the dependent variable

is dichotomous and the independent variables are either categorical or continuous.

The logistic regression model can be expressed with the formula:

$$\ln(P/(1-P)) = \beta_0 + \beta_1 * X_1 + \beta_2 * X_2 + \dots + \beta_n * X_n$$

3. Results

About 26.4% ($n = 1216$) of 4598 participants experienced Difficulty caused by depression. It was 24.1% among the male and 28.3% among the female.

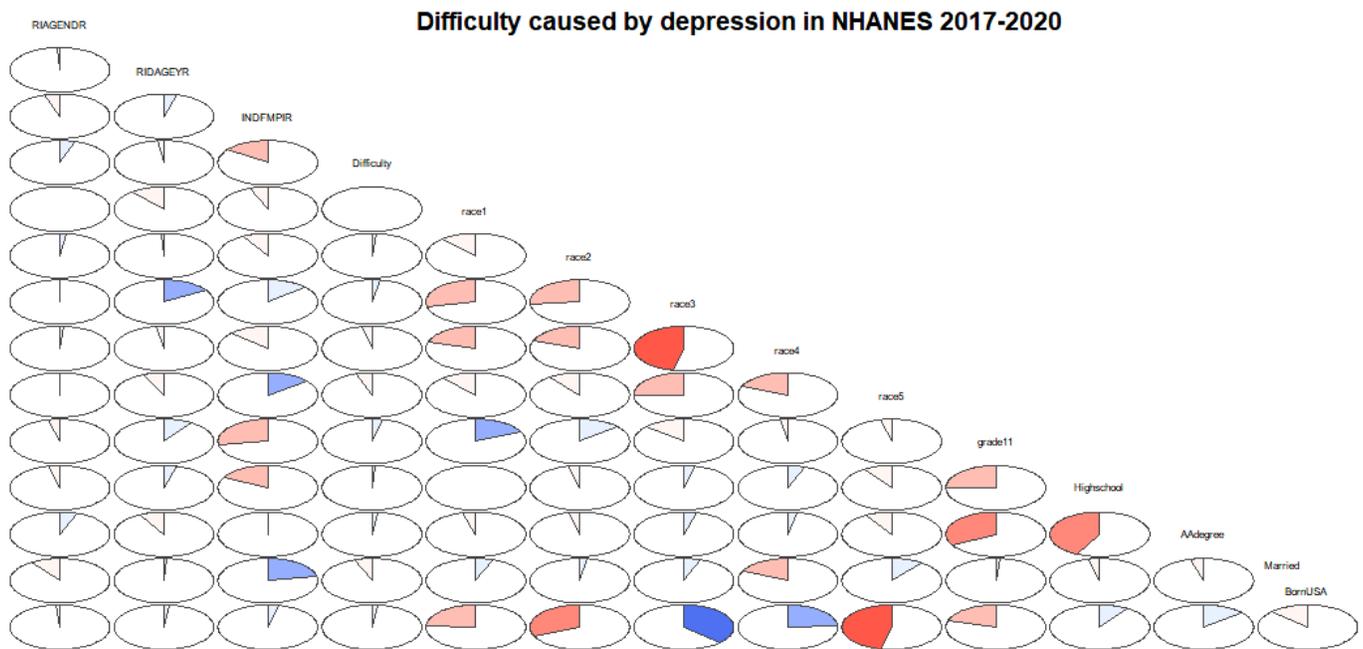


Figure 1. Matrix of correlations between variables

According to the logistic regression, Non-Hispanic Black has lower risk for Difficulty caused by depression compared to another race ($p < 0.001$), so was Non-Hispanic Asian ($p = 0.003$). Older people

were more likely to have Difficulty caused by depression ($p = 0.008$). The risk of Difficulty caused by depression trended down when the family income increased ($p < 0.001$).

Table 1. – Logistic Regression for Difficulty caused by depression and Income

	Estimate	Std. Error	z value	Pr(> z)	
1	2	3	4	5	6
(Intercept)	-0.243	0.246	-0.989	0.322	
RIAGENDR	0.185	0.070	2.652	0.008	**
RIDAGEYR	-0.002	0.002	-1.259	0.208	
INDFMPIR	-0.227	0.026	-8.793	< 0.001	***
race 1	-0.408	0.176	-2.317	0.020	*
race 2	-0.327	0.180	-1.814	0.070	.
race 3	-0.232	0.143	-1.623	0.105	

1	2	3	4	5	6
race 4	-0.615	0.149	-4.120	0.000	***
race 5	-0.605	0.202	-2.990	0.003	**
grade 11	-0.011	0.126	-0.088	0.930	
Highschool	-0.070	0.111	-0.625	0.532	
AAdegree	0.017	0.100	0.168	0.866	
Married	-0.113	0.071	-1.593	0.111	
BornUSA	0.051	0.114	0.444	0.657	

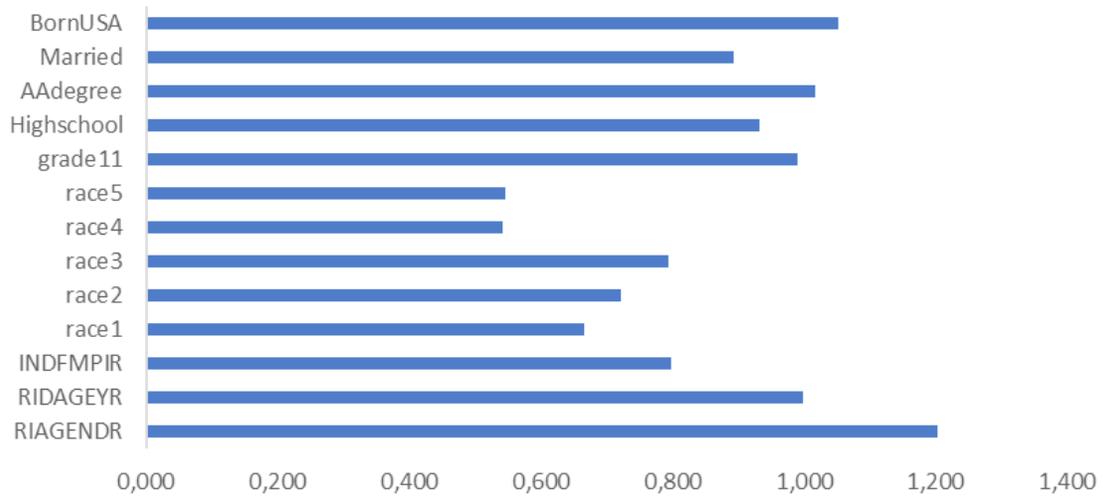


Figure 2. Odds Ratios based on logistic regression

The ROC was 0.6178 for the Logistic regression. The optional cutoff time is 0.40. The mis-classification error was 0.27. sensitivity is 13% and specificity was 95%.

ROC Curve

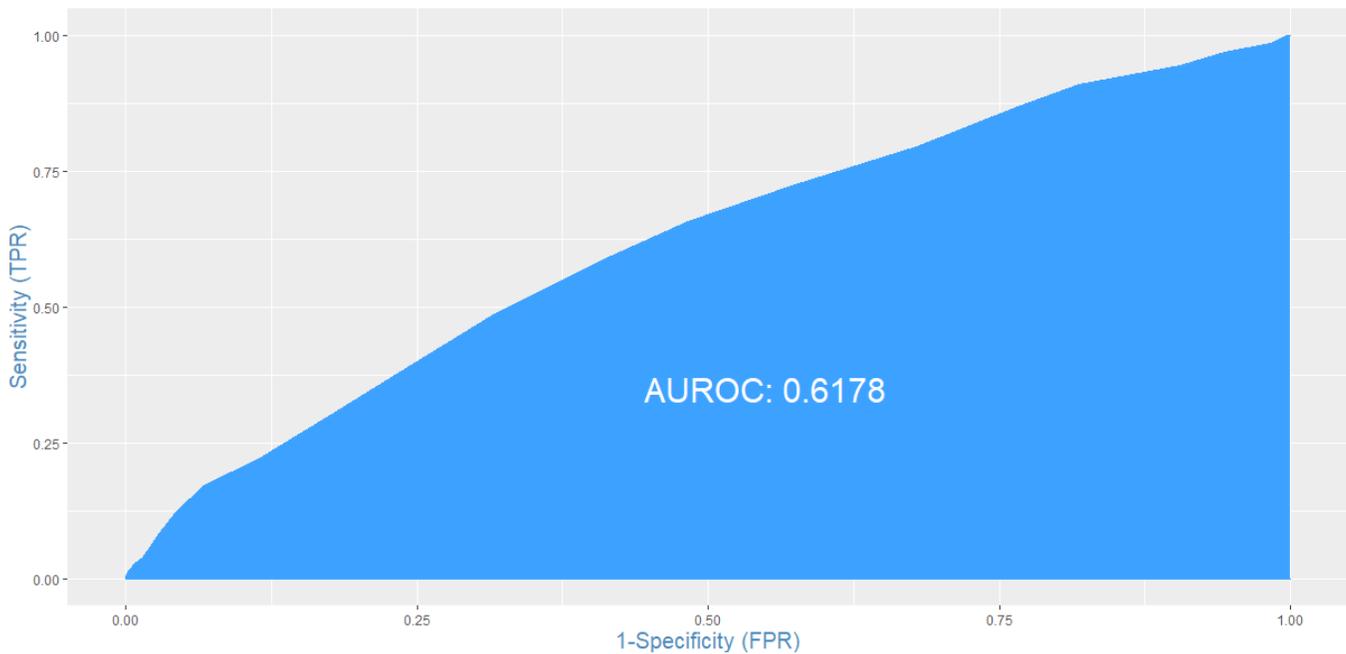


Figure 3. ROC for Logistic Regression

4. Discussions

About 26.4% ($n = 1216$) of 4598 participants experienced difficulty caused by depression. It was 24.1% among the male and 28.3% among the female. According to the logistic regression, Non-Hispanic Black has lower risk for Difficulty caused by depression compared to another race ($p < 0.001$), so was Non-Hispanic Asian ($p = 0.003$). Older people were more likely to have Difficulty caused by depression

($p = 0.008$). The risk of Difficulty caused by depression trended down when the family income increased ($p < 0.001$). The ROC was 0.6178 for the Logistic regression. The optional cutoff time is 0.40. The mis-classification error was 0.27. sensitivity is 13% and specificity was 95%.

In this study, we identified significant factors for being a victim of difficulty caused by depression, for example, age, race, and family income.

References:

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition.
2. Belmaker R. H., Agam G. Major Depressive Disorder external icon. *New England Journal of Medicine*, 358. 2008.– P. 355–68. (Accessed 2018 Mar 22).
3. Refer to: URL: <https://suicidpreventionlifeline.org>
4. Peng C. J., Lee K. L., Ingersoll G. M. An Introduction to Logistic Regression Analysis and Reporting. *The Journal of Educational Research*,– 96(1).– P. 3–14.
5. Tabachnick B. and Fidell L. *Using Multivariate Statistics* (4th Ed.). Needham Heights, MA: Allyn & Bacon, 2001.
6. Stat Soft, *Electronic Statistics Textbook*. URL: <http://www.statsoft.com/textbook/stathome.html>
7. Stokes M., Davis C. S. *Categorical Data Analysis Using the SAS System*, SAS Institute Inc., 1995.

Section 4. Sociology

<https://doi.org/10.29013/YSJ-21-8.9-26-37>

Annie Wu,
Shanghai World Foreign Language Academy
Shanghai, China
E-mail: annie13162808176@163.com

GENDER AND MEDICINE IN ANCIENT AND MODERN CHINA

Abstract. In recent years, the relationship between gender and medicine has become a widely discussed topic. In both ancient and modern China, it was always difficult for women to engage in medical careers. This paper explores the problems that hinder female physicians in their careers from ancient to modern times, the influence these problems exert on female doctors and the government's plans for improvement. Firstly, the paper focuses on women's limited access to education from the fifth century to the nineteenth century. Women were generally excluded from the practice of medicine. The few forms of medical training that were available to women were regarded as low-status and unorthodox. However, the situation changed with the introduction of modern medicine. The famous Chinese practitioner and feminist Zhang Zhujun collaborated with western missionaries to establish modern medical treatment options in China and introduce women into the medical field. Furthermore, the paper illustrates three problems female doctors face in the twenty-first century: threats of violence, lack of child care, and the burden of additional domestic duties, offering the story of my grandmother for confirmation and the government's plans for improvement.

Keywords: Gender; Medicine; Female doctors in China.

Introduction

The TV series, *The Imperial Doctress* features a female doctor who practices medicine in the Ming Dynasty (1368 CE–1644 CE). Although the show is largely fictitious, it raises an intriguing question. To what degree are women in China involved in the medical field and how far back does that involvement date? How have recent cultural events like the cultural revolution or the introduction of modern Western medicine impacted the standing of women in the medical profession? These questions have a special meaning to me because my maternal grandmother graduated medical school in

1968 to work in a small rural hospital in Yichang, Hubei Province. Growing up, my grandmother often shared stories about the challenges she faced as a professional woman and mother who was forced to juggle responsibilities both at home and at work. Inspired by my grandmother's life story, I decided to research gender and medicine in China. I discovered that my grandmother is not alone in her struggle. This paper will trace the often rocky history of female doctors in China from the Han Dynasty to modern times. I will show how changes in social values have made it easier for women to pursue a career in medicine.

Nevertheless, women still face discrimination when working in the medical field. These discriminations include threats of violence by abusive patients, childbirth, and the burden of additional domestic duties. Thus, despite recent progress, we still have some work to do. Yet, there is hope as the Chinese government plans to address many of the challenges female doctors typically face.

Women and Medicine in Ancient Times

The Problem of Education

I will begin by examining the standing of female doctors in ancient times. The most obvious problem faced by women pursuing a medical career in ancient society was their limited access to education. From the sources available to us, it seems that medical knowledge in ancient China was transmitted through two main channels. For one, the art of medicine was taught at the Imperial Medical Academy. In the fifth century CE, the influential Emperor Wen established the first academy. Initially, the focus was not necessarily on medicine, but rather on art and philosophy [35, 20]. Later, another academy was founded and medicine was added to the curriculum. The large institution consisted of two departments: medicine and pharmacy [35, 20]. Both departments were renowned for their graduates who served the emperor, his family, and the aristocracy [35, 20]. It was considered one of the most influential institutions when it came to education and medical research. The second, less prestigious opportunity, was to attain a rudimentary training in folk medicine [21, 19]. This training was not formally organized and for the most part folk-medicine was based on knowledge that passed down from generation to generation.

Unfortunately, it appears that neither of these two channels were available to women. First of all, the majority of women did not receive any type of formal education, which means they were illiterate and as such unable to study any subject. Secondly, women were not allowed to attend the Imperial Medical Academy to attain a formal theoretical

medical education. Even if, under certain circumstances, a woman would be literate and would be admitted to the institute, she would still lack the legitimate social status to practice medicine even if she graduated [19, 19]. During this time period, most families expected their daughters to be housewives rather than career women. Consequently, women were taught according to certain feudal doctrines. These doctrines emphasized the importance of women to remain uneducated and family-oriented. For example, *Nüjie, Admonitions to Women* claimed that, ‘As far as knowledge goes, a woman need not be extraordinarily intelligent. As for her talents, they need only be average’ [1, 18]. Also *Wen’s Book of Mother Indoctrination*, written in the Ming Dynasty (1368 CE–1644 CE), states that ‘It is sufficient for women to know a glossary of a few hundred words such as fuel, rice, fish and meat for their daily use’ [25, 19]. Another example, the book *Li ji*, claims that ‘Men never talk inside; women never talk outside’ [7, 18]. What women were encouraged to learn was mostly cookery, sewing, knitting, cotton-spinning and housekeeping [20, 19]. Morally, they had to adhere to the ‘Three Obediences and Four Virtues’, a succession of values and etiquette [20, 19]. ‘Three obediences’ indicated that women ought to be compliant with their father, husband and sons all the time. “Moral discipline, proper speech manner, modest appearance and diligence” constituted the ‘four virtues’ [31, 20]. If anything these sources are quite upfront in their claim that women should completely dedicate themselves to their families instead of involving themselves with public affairs and interfering with their husband’s sphere of responsibility. Because of these restrictions, the education of women was mainly used to regulate their manners and morals rather than spreading knowledge and encouraging intellectual curiosity. And yet, we still know of a few exceptions to these rules as some areas of medical knowledge were accessible to women although they were generally not of high standing.

Women and Medicine in Ancient China

As we have seen, women were not encouraged or prepared to study or work outside of the house. And still, we know that a few women succeeded in the field of medicine even in ancient times. As may be expected, these exceptional women were mostly involved in gynecology, food production or worked as shamans, the latter of which were generally mistrusted. In the Tang Dynasty (618 CE–907 CE), midwives and women engaged in childbirth-related care and mastered their skills by hands-on experience [19, 16]. For example, through years of treating women of childbearing age, they knew that plantago seeds can effectively enhance conception [34, 41]. Meanwhile, some women were recruited to the main imperial palace where they worked as maids under the supervision of Matrons of the Food Service. There they were tasked with preparing and serving imperial food to the emperors and their royal families. These maids often took charge of handling herbal medicine and making herbal recipes for court ladies. They learnt how to help in childbirth, heal wounds. Through practical training and were also well versed in skills such as acupuncture and moxibustion.

In the context of Shamanism, women did have the opportunity to study and practice medicine, albeit not as an academic, but rather as a practical endeavor. For instance, shamans were able to communicate with the dead, ‘demons’, and ‘nature spirits’ without becoming possessed by them [10, 18]. They believed the intrusion of a magical object or an evil spirit into the patient’s body caused diseases. So they would use their supernatural capabilities to extract or expel the harmful demons through trance or ecstasy [10, 18]. The cure was like a séance involving divination and various sacrifices [10, 18]. Unfortunately, shamans encountered increasing restrictions. In the Six Dynasties (222 CE–589 CE), officials began to regard shamanism as an unorthodox practice although shamans still existed and were sometimes consulted by medieval Daoist physicians [22, 19]. Eventually, shamans were degraded to disrepute and

even executed when the emperor enacted a regulation to prohibit them from providing medical treatment. Secondly, women in the Tang Dynasty were only limited to practicing midwifery and had little to no access to the fields beyond gynecology. Even if some of the midwives were experienced, they generally had little technical competence and childbirth itself was a high-risk event [47, 21]. Thus, the medical knowledge available to women was narrow, limited and mostly restricted if not off-limits.

An Exceptional Woman: Tan Yunxian

Despite the barriers women faced when it came to acquiring medical knowledge in the ancient world, some women successfully overcame the education problem and were able to practice medicine. Among them, Tan Yunxian (1461 CE–1556 CE) was undoubtedly one of the most prominent female doctors who learned medicine from her family, making a great contribution to the fields of obstetrics, gynecology, pediatrics and performing minor surgery.

Tan Yunxian was born into a family of army officers. Her grandfather, Tan Fu, had become a doctor after quitting his military position and married a woman who came from a family of physicians [37, 20]. Since their two sons chose to be government officials instead of pursuing medical careers, attention fell on their granddaughter Tan Yunxian who was highly intelligent. Tan Fu decided to let her study medicine instead of needlework in order to compensate for the inheritance of family knowledge [47, 21]. From the time that she was a teenager, Tan Yunxian immersed herself in the study of medical literature. It was her grandmother who played a leading role. Having undergone medical training herself, her grandmother explained the principles of medical books and helped her to learn the typical methods of traditional Chinese medicine. She also gave all the prescriptions, pathologies and instruments to Tan Yunxian [37, 20]. After her marriage at age 15, Tan Yunxian used her medical knowledge to treat herself and her most immediate family members under her grandmother’s supervision. It was not until the pass-

ing of her grandmother, that she started to practice medicine outside her home. Limited by the feudal society's restraint on women at that time, Tan Yunxian was only able to work out of a small local clinic. Because she was a woman, Tan Yunxian had the opportunity to treat other women who were not always able to receive proper medical care. Women were often unwilling to be treated by male doctors. If they were treated, they often received suboptimal care because women evaded physical examinations out of fears for their chastity. For example, women wrapped their wrists with cloth so that male doctors wouldn't touch their skin when taking their pulse [18, 19]. They also needed to sit behind the curtain or bamboo screen, stretch out her hand and point at an ivory doll to describe her pain according to her body parts [16, 19]. Of course these concerns about chastity were not a problem for Tan Yunxian who herself was a woman. It was said that "she always [got] wonderful therapeutic effects in treating those women who refuse to see a male physician" [49, 21]. When she was fifty years old, Tan Yunxian wrote a book called *Miscellaneous Records of a Female Doctor* (Nu yi za yan). The book was based on her grandmother's medical manual, to which she had added her own contributions. *Miscellaneous Records of a Female Doctor* is not only the earliest known medical works of a woman doctor, but also one of the earliest preserved medical case documents. The book provides us with rare materials to study the ancient medical practice and the life of a female physician [49, 21]. Although the whole book only included 31 case reports, each one was brief and comprehensive, all based on Tan Yunxian's medical experience. The subjects of treatment in the book were all women - ranging from maids, merchant women to daughters from wealthy families or nobility. The age of the patients ranged from 6 to 69 years and women of childbearing age accounted for more than half [33, 20]. The author first presented her patients and then outlined symptoms, treatments and outcomes. The introduction of the book showed the profound closeness between

Tan Yunxian and her patients, showing her careful observation of patients' emotions and life situations [33, 20]. When diagnosing the condition, she took notes on timings and bibliographic references. If she decided on a treatment, she took care to record her recommendation. When prescribing drugs, she consulted the medical texts in order to avoid errors and ensure the validity of the chosen treatments. Undoubtedly, she had extensive experience in treating gynecological diseases such that the book contained exclusive references to female diseases and medical cases, such as habitual abortion, postpartum diseases, and abdominal lumps [47, 21]. Even though Tan Yunxian lived during the Ming Dynasty when the feudal ethics were extremely strict, she was well versed in medical classics and fully dedicated herself in curing illness. The theoretical knowledge in her book was sophisticated and more advanced than other ordinary woman doctors at that time and thus she was honored as the representative of ancient Chinese woman doctors [33, 20].

Female Doctors in Modern China Solving the Problem of Education

So far we have seen that women in ancient China had to fight to gain access to medical knowledge and only a few succeeded. Change would not come, until a Chinese woman called Zhang Zhujun, as both a female doctor and a feminist, began collaborating with Western missionaries. She eventually succeeded in establishing modern medical treatment options in China and opening the field of medicine to women. In the mid-sixteenth century, medical missionaries first introduced Western medicine into China [42, 21]. Later, in the nineteenth century, the institution of American Board of Commissioners for Foreign Missions (ABCFM) dispatched a group of missionaries to Canton, including Dr. Peter Parker [42, 21]. Dr. Parker was a student at Amherst college, then graduated from Yale College where he attended Yale Medical School and obtained a degree in theology as well. He embarked for Canton in June, 1834. In 1835, he established the first Western hospital

in China called Canton Hospital. From the beginning, it served as an ophthalmic hospital, but soon it became a general hospital. In the first year, 2,000 Chinese were already being treated at the hospital. Soon the hospital boasted a high success rate and thus it quickly gained an outstanding reputation that attracted a myriad of patients.

More importantly, some female patients were willing to receive treatment at Canton Hospital accompanied by their male relatives. In the process of communicating with these Chinese female patients, Western missionaries first realized that a lot could be gained if Chinese women could be trained in the medical profession. This sentiment was expressed for example by Dr. R. H. Graves, who came to Canton to practice medicine in 1856 [30, 20]. In his book on his time in China, he insisted that “with Chinese women well qualified as physicians under the instructions of their sisters from the West, [...], there is a hope for a great improvement in the well-being of the sick in China” [12, 18]. In order to train women to work as medical doctors, they first had to receive a general education. This education was offered by newly established boarding schools. In 1852, after being approved by the Presbyterian Board of Foreign Missions, Mrs. Lillie B. Happer established a boarding school for girls to study literature [29, 20]. It was expanded in 1872 and named Zheng Guang (True Light) School. After receiving a general education, many of the graduates of this school started to study medicine.

A brief glance at the statistics at that time shows a mounting number of female students who received medical education at Canton Hospital. In 1879, Canton Hospital first allowed two Chinese women to study in their medical classes, which was the first Chinese medical institution to do this openly [42, 21]. In 1882, three out of the twelve students at Canton Hospital were women. By 1890, there were nine women in the class [42, 21]. Later, in 1897, the Presbyterian Board sent an American female doctor, Dr. Mary H. Fulton, to Canton Hospital to practice medicine and take charge of women’s treat-

ment [42, 21]. Dr. Fulton received her M.D. degree in 1884 from Women’s Medical School of Pennsylvania. She started to work in a dispensary at Guiping in Guangxi Province and soon founded the first female medical school in China in 1900. This med school for women was later renamed Hackett Medical College for Women in honor of the donor, Mr. E. A. Hackett [42, 21]. The college sought to mitigate suffering, disseminate modern medicine and elevate Chinese women’s social status [42, 143]. These graduates had done outstanding technical work and saved countless lives in one year, bringing not only the knowledge of public hygiene into homes, but also teaching the fundamentals of modern medical treatments [28, 20]. In this capacity, Hackett College had a profound influence on Chinese women, as a driving force of social reform. American doctors taught their students core values, laying emphasis on the ideas of women’s rights and providing them with practical skills to help them gain independence [42, 161]. Dr. Harriet M. Allyn, who worked as the dean of Hackett College in the 1920 s, deemed that not only did Hackett College cultivate the first Chinese female physicians, but also China’s new women in that era [42, 161]. The training they received at the university and their professional practice itself helped the students develop various abilities and qualities beyond their specialized medical knowledge, such as leadership, courage and initiatives, making them become more reflective, resourceful and determined [15, 19]. These women founded new businesses and organizations. After the success of Hackett College, several additional programs for studying medicine were established in China and admitted women.

One of the greatest graduates of these schools was Zhang Zhujun. She studied in Nan Hua Medical School affiliated with Canton Hospital and then transferred to Hackett College. After graduating from Hackett College with honor, Zhang Zhujun opened a philanthropic clinic in Canton and frequently delivered public speeches to advocate gender equality and women’s independence [42, 162]. She claimed that

the first step to achieve this goal was to encourage women to study, so that they could acquire knowledge and skills and thus obtain jobs and financial independence [13, 18]. As a result, in 1902, she resolutely changed her clinic into Yuxian Girls' School. Zhang Zhujun served as both president and teacher, teaching medicine together with topics such as astronomy and geography [14, 19]. Influenced deeply by Zhang, the Cantonese established more private girls' schools in the early 20th century, which promoted the feminist movement. She also contributed a lot to the improvement of women's education and health in other places in China. Thanks to the combined efforts of Chinese individuals and Western missionaries, the education problem for Chinese women was mainly solved and they were able to study and practice medicine.

Female Doctors in the Twenty First Century

In the past century tremendous efforts have been made in promoting women to pursue the subject of medicine and to excel in their respective specializations. Nevertheless, in the contemporary era, new problems have emerged. These difficulties include issues such as threats of violence by abusive patients, the lack of child care, and the burden of additional domestic duties. In the following paragraphs, I will discuss how these problems have affected women in the medical field.

Threat of Violence

The first problem that contemporary Chinese woman physicians encounter is the threat of physical violence and verbal abuse by patients and their family members. This so-called hospital violence has a negative impact specifically on the career of women. According to the World Health Organization, hospital violence is defined as any form of abuse, threat and assault against medical staff in hospitals, resulting in a clear or potential threat to their safety, health and well-being [2, 18]. In China, hospital violence is a common issue that all medical staff are facing. In 2012, the China Hospital Association carried out an investigation with 8,000 patients and 8,000 medi-

cal personnel in 316 hospitals in 30 provinces, municipalities, autonomous regions and cities [17, 19]. The results of this survey suggests that the proportion of hospitals with incidence of verbal abuse and violence is rising considerably. The average number of attacks on doctors per hospital grew from 20.6 in 2008 to 27.3 in 2012. Another research in 2010 in 70 different Chinese medical institutions, focused on the work, study and life of female doctors in China, indicated that 65.55% of the surveyed female doctors felt they had a doctor-patient trust crisis, leading to hospital violence [44, 21].

There are many reasons that result in violence against doctors. The survey from China Hospital Association pointed out that the causes of most assaults were unsatisfactory treatment outcomes, poor communication and distorted media reports [38, 20]. Unsatisfactory therapeutic effects can be the most obvious reason. With the rapid advancement of medical standards, the expenses that patients have to pay for treatment have also increased dramatically, surpassing the patient's affordability. Once the outcome of the treatment does not meet the patient's expectations, they and their family members are liable to perceive that as medical malpractice and become anxious or even angry [9, 18]. The dissatisfaction of the patient's family makes them resort to violence.

Both verbal abuse and physical assaults exert a negative effect on the mental and physical health of medical workers in general, but female doctors in particular. Verbal abuse from patients and relatives increases doctors' mental stress in that doctors are already experiencing a high level of occupational pressure and a risk of job burnout [5, 18]. According to a study conducted in 2019 in Fuzhou, Jiangxi Province, 85% of healthcare workers who suffered violence in hospitals felt angry, wronged and depressed. 70% of the medical staff felt a lack of security and a decline of professional identity. 40% of the medical staff had severe insomnia, fear, and were even unable to work [43, 21]. Not only can hospital violence cause doctors to suffer psychological trauma, but it also results in physical injuries, ranging from

bruises, fractures to disability and death [3, 18; 6, 18]. With that said, female doctors are especially impacted by hospital violence because they report more negative emotions and higher job pressure, which complicates their success in practicing medicine. In 2002 and 2003, a study of primary care physicians reported the job burnout for women was almost twice as high as that for men [32, 20]. This is because women physicians tend to show more empathy and give patients especially more empathic care [11, 18]. Therefore, female doctors' were more likely to suffer from negative emotions and job burnout compared to their male counterparts [40, 21].

Family Responsibility

Another problem that hinders Chinese female doctors from practicing medicine is that they need to shoulder a heavy family responsibility which is incompatible with their profession. Women are the ones to conceive, bring a pregnancy to term and give birth. This process is typically accompanied by both physical and bureaucratic complications. Just as their male colleagues, female doctors are expected to instruct interns and orderlies, conduct research, and teach seminars. At the same time, they are obligated to keep up with the latest medical news. These obligations collide with women's roles as parents and caregivers. A 2010 study carried out in 70 different Chinese medical institutions showed that 76.83% of female doctors felt work pressure due to excessive workload both in the professional and the domestic spheres [44, 21]. The pressure begins with the birth of a child. Maternity leave usually amounts to less than 98 days [23, 19]. Work that is missed has to be made up upon return [39, 20]. Should a woman request a longer maternity leave, she is expected to make up for more hours. Therefore, female doctors tend to go on maternity leave only a few days before the birth, and dare not to ask for more. Once the woman returns to the hospital, she continues working, catching up on the progress of research, reports, and medical training. These tasks, coupled with their routines, make them overloaded [40, 21].

Secondly, female doctors are burdened with a disproportionate amount of domestic duties. Women in contemporary China face gender stereotypes and are still impacted by traditional notions when it comes to the division of labor between couples. According to a survey, conducted by Yu, Jia and Yu Xie (2012), most of the household chores fall on the shoulders of the wife rather than the husband [45, 21]. After work, women need to take care of the children, cook and clean which diverts huge chunks of time and energy. It seems that sending their children to daycare is the only possible solution. However, there are too many people with this need. In 2016, China implemented a new childbearing policy, allowing married couples to have two children [36, 20]. So, the number of newborns has risen and more families have the demand for child care services, leading to serious shortages in this sector [46, 21]. The trend of burdening women with domestic duties also affects women working in the medical field. The above mentioned 2010 study, showed that 61.74% of all female doctors were responsible for raising their children [44, 21]. Because of the additional demands of household and child care, female doctors are less invested in research, publication and teaching. A Chinese study dating to 2019 demonstrated that only 34% of all projects are led by women [39, 20]. In short, domestic demands prevent female doctors from reaching their full potential as they are tasked with countless additional duties.

My Grandmother's Story

The observation that women in the medical field are held back by demands in the domestic sphere is confirmed by the experience of my grandmother who graduated med school in 1968. After a short stint at a small hospital in the countryside, she took up work at a more urban and better equipped hospital. The work was divided into a day shift from 8 am to 4 pm and a night shift from 4pm to 8am the next morning. When she was pregnant, she only applied for a short period of maternity leave. Because there weren't many doctors in the hospital, she quickly returned after giving birth. The training she missed had to be made up in

her free time. Due to the lack of child care facilities, my grandmother ended up taking her child to work with her for the next five years. When she was on duty, she entrusted the care of her child to other female doctors on break. The ensuing exhaustion and the organisational challenge was a common phenomenon as she often heard the same complaints from other female doctors. Once my mom had grown up, things got better as my mom was able to take care of herself and later even took over some household chores. If anything these stories confirm the struggles a lot of women still face in the workplace. Namely, the need to balance their careers and their families.

Plans for Improvement

After having analyzed current trends that were confirmed by the personal story of my grandmother, I will now turn to explore steps that have been taken by the government, to improve the situation of working women including women in the medical field. First, the government has taken some measures to provide more safety for all hospital staff. On June 5, 2020, the 22nd meeting of the Standing Committee of the 15th Beijing Municipal People's Congress voted to pass the Provisions on The Management of Hospital Safety and Order. It took effect on July 1, 2020 [26, 19]. This provision is necessary because it achieves the goal to protect the safety of medical staff, maintain the order of hospitals, prevent and eliminate the potential dangers, and punish the illegal and criminal behaviors related to hospital violence. According to the provision, some new changes have come into effect. The hospital has improved the complaint system of medical disputes by offering consultation, mediation, litigation to solve disagreements and address claims of malpractice. Additionally, hospitals in China have been equipped with a one-button alarm system in public areas. Hospitals have been instructed to establish a security protocol by checking visitors at the entrance, regularly patrolling the hospital grounds and ensuring that safety protection equipment and monitoring equipment are fully functional.

Secondly, the issue of child care and unfair distribution of domestic duties has been tackled by the government by advocating for an increased availability of child care services, extending maternity leave, and introducing paternity leave. China's 31 provinces successively revised their regulations on population and family planning which had afforded women a maternity leave of 98 days. The provinces were given the freedom to extend the legally mandated maternity leave of 98 days [23, 19]. The majority of provinces increased the duration by 60 days affording women a total of 158 days of maternity leave. Moreover, the provinces are now invested in supporting gender equality by introducing paternity leave. All 31 provinces have mandated 7 to 30 days of paternity leave, most of whom offer 15 to 20 days [23, 19]. The hopes are that these rules will enhance maternal and infant health which will help female doctors in starting and maintaining healthy families.

The government has also addressed the lack of child care services by planning to expand daycare centers. In 2021, at a press conference, a member from the research office of the State Council indicated that with the country's fourteenth Five-Year Plan (2021-2025), the accessibility of daycare centers will grow by 150 percent [24, 19]. As a result, there will be 4.5 daycare places for every 1,000 people, and 6.3 million spots nationwide [24, 19]. Shanghai has announced that over the next three years, they will achieve the goal of building at least 50 new child care centers annually so that the coverage rate of inclusive child care centers in urban areas will be no less than 85 percent by the end of 2022 [27, 20]. Thus, it appears that the Chinese government is in the process of addressing issues that have been plaguing working women in general and women in the medical field in particular.

Conclusion

Inspired by my grandmother's story, this study traced the history of female doctors in China. As was shown, female doctors have faced difficulties that impede their career development in the field of medicine in both ancient and modern China. For ancient times,

it was illustrated how social constrictions, general distrust and the lack of formal education made it difficult for women to pursue medical careers. Women in ancient times were generally encouraged to stay at home where they would take care of the household and children. Only a few options existed for women who wanted to pursue medical careers. One of the options consisted of being recruited to the imperial palace. The other option consisted of working as a shaman, the latter of which did not have a good reputation. Although a few exceptions to this rule existed as, for example, Tan Yunxian, women were mostly confined to the private sphere.

It was only with the introduction of modern Western medicine and the help of one Chinese woman, Zhang Zhujun, that women were accepted into medical school. In 1835, Dr. Peter Parker, first opened a Western medicine hospital in China, Canton Hospital. Soon missionaries realized the importance of training Chinese women in the art of medicine which led to the first steps towards allowing women to gain a basic education. In 1852, Mrs. Lillie B. Happer founded Zheng

Guang (True Light) School which provided a chance for girls to study literature. In 1897, Dr. Mary H. Fulton established the first female medical school called Hackett Medical College. Zhang Zhujun, graduated from this school, opened a private girl's school called Yuxian Girls' School in 1902 and frequently made speeches in the public to appeal for Chinese women's education rights and independence. On account of all their effort, Chinese women could start to study and practice medicine.

Nonetheless, up to this day, women deal with difficulties. Threats of violence by abusive patients and the burden of child care as well as domestic duties exert great pressure on them and hinder their career success. As could be shown, measures are underway that are meant to alleviate these issues providing female doctors with a more reassuring work environment and more support at home. Only time will tell whether these measures will be successful, but my hopes are that female doctors of the future will not have to face the same hardship as my grandmother and the women that came before her.

References:

1. Ban Zhao, Fuxing, in Fan Ye, Hao Hanshu. This text was written by Ban Zhao (49 CE–120 CE), a knowledgeable woman historian from an influential family in the Eastern Han Dynasty (25 CE–220 CE). *Nüjie, Admonitions to Women*, regulated women's words and deeds in detail in the form of exhortations. – 2789 p.
2. Beech B. & Leather P. Workplace violence in the health care sector: A review of staff training and integration of training evaluation models. *Aggression and Violent Behavior*: – 11(1). 2006. – P. 27–43. Science Direct. <https://www.sciencedirect.com/science/article/abs/pii/S1359178905000340?via%3Dihub>
3. Caldwell M.F. Incidence of PTSD among staff victims of patient violence. 1992. *Pub Med*. URL: <https://pubmed.ncbi.nlm.nih.gov/1427689>
4. Cho E. & Jeon S. The role of empathy and psychological need satisfaction in pharmacy students' burnout and well-being. *BMC Medical Education*. February, 4. 2019. URL: <https://bmcomeduc.biomedcentral.com/articles/10.1186/s12909-019-1477-2>
5. Chou L., Li C.-Y. & Hu S. C. Job stress and burnout in hospital employees: comparisons of different medical professions in a regional hospital in Taiwan. *BMJ Open*: February 25. – 4(2). 2014. – P. 1–7. *PubMed*. URL: <https://pubmed.ncbi.nlm.nih.gov/24568961>
6. Cooper C. L. & Swanson N. Workplace Violence in the Health Sector: State of the Art. *Global Resource Center*. 2002. URL: <https://www.hrresourcecenter.org/node/1120.html>

7. Dai Sheng, Li ji (The Books of Rites). The Book of Rites, compiled in the Han Dynasty (206 BCE–220 CE) by Dai Sheng, who was a prestigious scholar of etiquette, was an anthology of regulations that reflected thoughts in philosophy, education, politics and aesthetics.
8. Daming Palace. ChinaCulture. Ministry of Culture of the People's Republic of China. 2015. URL: https://web.archive.org/web/20151201160624/http://www.chinaculture.org/gb/en_travel/2003-09/24/content_34024.htm
9. Du Y., Wang W., David J.W., Lee S., Samuel D.T.J., Zhang H. & E.M. Jay. March, 26. 2020. Violence against healthcare workers and other serious responses to medical disputes in China: surveys of patients at 12 public hospitals. BMC Health Services Research. URL: <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-020-05104-w>
10. Eliade M., Trask W.R. & Doniger W. Shamanism: Archaic Techniques of Ecstasy (Bollingen Series, 24) (Later Reprint ed.). Princeton University Press. 2004. – 216 p.
11. Gleichgerrcht E. & Decety J. Empathy in clinical practice: how individual dispositions, gender, and experience moderate empathic concern, burnout, and emotional distress in physicians. PLoS One 8: e61526: April 19. 2013. Pub Med. URL: <https://pubmed.ncbi.nlm.nih.gov/23620760>
12. Graves R. H. Forty Years in China or China in Transition. R.H. Woodward Co. Baltimore: Woodward, 1895. Reprint, Scholarly Resource at Wilmington, Delaware, 1972. – 249 p.
13. Yang Guo. Analysis of Zhang Zhujun's Feminist Thought. Journal of Lanzhou University of Education: 2019. CNKI. <https://t.cnki.net/kcms/detail?v=3uoqIhG8C46NmWw7YpEsKMypI3qVj28LA5R-0JFVUppCX7Wt8LrCX9M32gLgiWYPtkT0KODjyM8XPhv7NM0Ox9kOJ5nHyR3pE>
14. Ye-min Guo. Zhang Zhujun: "China's Nightingale." Tong Zhou Gong Jin: 2020. CNKI. <https://t.cnki.net/kcms/detail?v=3uoqIhG8C46NmWw7YpEsKMypI3qVj28LGACqMpRVR0Cx7F0z4nrArI0fCcPtrXNZqnWYHS5-4j4IVCjvPSHceLZ8YOG5zbej>
15. Harriet M. A. "Is a Woman's Medical College Worth While in China?" Post Jubilee News. 1921.
16. Imbler Sabrin. Chinese Women Once Had to Point Out Their Medical Troubles on Ivory Dolls. Atlas Obscura. March 27. 2019. URL: <https://www.atlasobscura.com/articles/chinese-medical-doll>
17. Xiaoli Jia, Hongzhu Zhou, Yue Zhao, Lili Zheng, Qi Wei, Xueqian Zheng. Investigation on the situation of violent injuries in hospitals in China from 2003 to 2012 [J]. (Chinese hospital: – 18(03). 2014. – P. 1-3. [Chinese]. CNKI. https://t.cnki.net/kcms/detail?v=3uoqIhG8C46NmWw7YpEsKL-WhGHP2RH_CcuaMktoPCjEyEotI3_AZzpQvsLCy7lkbD45zSmEyaxJRLnwAQXLjCnCY_PWJHOs
18. Kou Zongshi. Ben cao yan yi. Kong Zongshi. 1116.
19. Jen-der Li. Gender and Medicine in Tang Dynasty (Asia Major: 2003). – 20 p. URL: <https://www.jstor.org/stable/41649876>
20. Lee W. Y. Women's education in traditional and modern China. Taylor & Francis. December 19. 2006. URL: <https://www.tandfonline.com/doi/abs/10.1080/09612029500200092>
21. Li D. A Study on the System of Chinese Ancient Medicine Education. CNKI. May 1. 2006. URL: https://t.cnki.net/kcms/detail?v=3uoqIhG8C475K0m_zrgu4h_jQYuCnj_co8vp4jCXSivDpWu-recxftJhAk_PK-NO5t2PsVER8gnqSLGySM4vOGYybI70Y-po5
22. Lin Fushi. Shamans and Healing in China during the Six Dynasties Period (3rd–6th Century A.D.). (Institute of History and Philology: Academia Sinica, 1998). – P. 1–48. Sinica. URL: <http://www.ihp.sinica.edu.tw/~bihp/70/70.1/fuji.html>

23. Liu H., Yu D. & Wang H. A review of the development of maternity leave policy in China over the past 70 years. *China popul. dev. stud.* 3, 2020. – P. 172–187. URL: <https://doi.org/10.1007/s42379-019-00038-1>
24. Liu Y. The State Council Information Office's briefing on the revision of the Government Work Report _ Press release. Information Office. March 13. 2021. URL: http://www.gov.cn/xinwen/2021-03/13/content_5592798.htm
25. Ms Lu (Mother of Wen Huang). *Wenshi Muxun (Mother's Instructions of the Wen Family)*, as quoted in Chen Dong-yuan, *Zhongguo Funu Shenghuoshi*. – 192 p.
26. Maintaining hospital Safety and Order and protecting medical staff safety - Beijing Hospital Safety and Order Management Regulations deliberated and approved [J]. *Beijing People's Congress*, – 06. 2020. – P. 42–46. URL: https://t.cnki.net/kcms/detail?v=3uoqIhG8C46NmWw7YpEsKMyp3qVj28LGACqMpRVR0Cx7F0z4nrArL3TsqAFXzEhvZuGIFpOp3Iz_m_vt6LmWSMLQ5uFN_Py&uniplatform=NZKPT
27. Ma D. Good news: Half of kindergartens in Shanghai will have day-care classes by 2022. *Xinmin Evening News*. September, 16. 2020. URL: <https://wap.xinmin.cn/content/31807718.html>
28. Fulton Mary H. "Hackett Medical College for Women, Canton." *China Medical Missionary Journal XXIII*, – 5. 1909. – P. 324–29.
29. Noyes H. N. *History of the South China Mission of the American Presbyterian Church, 1845–1920* (1st ed.). Shanghai: the Presbyterian Mission Press. 1927. – P. 10–12.
30. Powers Jac. The missionary activities of R. H. Graves, 1853–1912. UR Scholarship Repository. 1931. URL: <https://scholarship.richmond.edu/honors-theses/684>
31. Qiming Press. Zhou Li: *The Rites of the Zhou Dynasty* Taipei Qiming Press: Shisanjing Zhushu edition, 1959. – 687 p. Taipei: Qiming Press.
32. Rabatin J., Williams E., Baier Manwell L., Brown R. L. & Linzer M. Predictors and Outcomes of Burn-out in Primary Care Physicians. 2016. – P. 41–43. *Pub Med*. URL: <https://pub.med.ncbi.nlm.nih.gov/26416697>
33. Lei Sha, Fangfang Gong, Li Yong. *Tan Yunxian and the Miscellaneous Records of a Female Doctor*. 2016. CNKI. https://t.cnki.net/kcms/detail?v=3uoqIhG8C46NmWw7YpEsKMyp3qVj28L63FDqW9F0hnqUVtDu_jKqwoDRwD8B4XC2ONrKfVYSuG1TG1UFaHB04qcB80hj8f
34. Shijing. Taipei: *Yiwen yinshuguan*. 1955. – 125 p.
35. *The Sui and Tang Dynasties*. (June, 2003). Shen-Nong. URL: <http://www.shen-nong.com/eng/history/suitang.html>
36. "Take Maternity Leave and You'll Be Replaced." (July 14. 2021). *Human Rights Watch*. URL: <https://www.hrw.org/report/2021/06/01/take-maternity-leave-and-youll-be-replaced/chinas-two-child-policy-and-workplace#>
37. Yunxian Tan. *Miscellaneous Records of a Female Doctor*. Nu yi za yan. Tan Yunxian. 1511.
38. Violence against doctors on the rise: survey - China - *Chinadaily.com.cn*. (2013). *China Daily*. URL: http://www.chinadaily.com.cn/china/2013-08/16/content_16897958.htm
39. Wang J. & Xing H. Discussion on the relationship between gender and Career Development of female Doctors. – 07. 2019. – P. 258+260. CNKI. https://t.cnki.net/kcms/detail?v=3uoqIhG8C46NmWw7YpEsKMyp3qVj28LAsR0JFVUppCX7Wt8LrCX9NTie_6txXj-uutvUNICDt5BD7vh1a4GNUobJUzyT1LI

40. Wang L., Wang H., Shao S., Jia G. & Xiang J. Job Burnout on Subjective Well-Being Among Chinese Female Doctors: The Moderating Role of Perceived Social Support. *Front. Psychol.* – 11(435). 2020. Pub Med Central (PMC). URL: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7138424/>
41. Xiong V. Sui-Tang Chang'an: A Study in the Urban History of Late Medieval China (Vol. 85. 2000). (Michigan Monographs In Chinese Studies). U of m center for chinese studies.
42. Guangqiu Xu. *American Doctors in Canton: Modernization in China, 1835–1935* by Guangqiu Xu (2011. – P. 07-19). Piscataway, NJ: Transaction Publishers (2011. – P. 07–19). – P. 137–42. p.
43. Ye M. & Zhang L. The psychological impact of violence on doctors. 2019. CNKI. https://t.cnki.net/kcms/detail?v=3uoqIhG8C46NmWw7YpEsKMyp3qVj28LA5R0JFVUppCX7Wt8LrCX9CGMKuPgnWF_yCHAreY1XOQKEaWHIie1sDmiRJoFfUj
44. Dong Yu, Ling Tian, Pei-bang Qu, Bing Zheng Research on the status quo of work, study and life of Chinese female doctors. *China hospital*, – 14(05). 2010. – P. 20–22. CNKI. https://t.cnki.net/kcms/detail?v=3uoqIhG8C46NmWw7YpEsKlWhGHP2RH_WMv_DQNmseGfyoJmuWcwDbTaAAc4_U3wRO9xZgieQ2974QNpCudkcXnDvoTq6oGl
45. Yu J. & Xie Y. The Varying Display of 'Gender Display'. *Taylor & Francis. Chinese Sociological Review* – 44 (2). 2012. – P. 5-30. URL: <https://www.tandfonline.com/doi/abs/10.2753/CSA2162-0555440201>
46. Zhang S. China Hopes More Day Care Will Reduce Cost of Having Kids. *Sixth Tone*. 2021. *Economist*, URL: <https://www.sixthtone.com/news/1006955/china-hopes-more-day-care-will-reduce-cost-of-having-kids>
47. Jin-sheng Zheng. (n.d.). *Female Medical Workers in Ancient China*. Abz-Nord. The China Institute for the History of Medicine and Medical Literature: China Academy of Traditional Chinese Medicine, Beiji. Retrieved August 24, 2021. From: URL: <http://abz-nord.de/Literatur/Fachartikel/female-medical-worker.htm>
48. Zheng J. Tan Yunxian, a woman physician of Ming dynasty, and her *Nu yi za yan* (Random talks of a woman physician). 1999. *Pub Med*. URL: <https://pubmed.ncbi.nlm.nih.gov/11624101>
49. Zheng J. Tan Yunxian, a woman physician of Ming dynasty, and her *Nu yi za yan*, Random talks of a woman physician. *Zhonghua Yi Shi Za Zhi*: 1999. – 1 p.

Section 5. Philology

<https://doi.org/10.29013/YSJ-21-8.9-38-47>

Yunji Li,
St. Francis Preparatory School
Queens, New York
E-mail: yunjiology@gmail.com

THE HISTORY OF LANGUAGE: THE TRANSFORMATION FROM OLD ENGLISH TO MIDDLE ENGLISH

Abstract. In the mid-5th century, the Anglos, Saxons, and Jutes lived, fought, and intermarried in Britannia. After the Anglo-Saxons dominated Britannia, the Anglo-Saxon language became the earliest form of the English language, known as the Old English. The Old English could mainly be identified as four different dialects (Northumbrian, Mercian, West Saxons and, Kentish); one of the most famous Old English literary works – *Beowulf* – was written in the West Saxons dialect. Later, the interactions and communications between the Anglo-Saxons and the Normans gave rise to Middle English, the combination of Anglo-Saxon language and French language. During the Age of Middle English, with the advancement of the printing press, *The Canterbury Tales*, a remarkable Middle English literary work, was successfully spread and handed down to this day.

Keywords: Old English, Middle English, Anglo-Saxon, printing press.

“Language is the expression of ideas by means of speech-sounds combined into words. Words are combined into sentences, this combination answering to that of ideas into thoughts.”

Henry Sweet

Introduction

Throughout the Middle Ages, the first English language, known as Old English, emerged. Influenced by the Norman Conquest, the intermarriages between the Normans and the Anglo-Saxons, Edwardian War, Chaucer’s book, and the introduction of the printing press, Old English succeeded in transforming into Middle English, alternating the languages and ways of communication among people. Such a transformation was remarkably significant in history because language is the necessary communication vehicle, and literature is a pivotal component to record communications, understandings, thoughts, and ideas.

The Middle Ages was a marvelous period of time for not only tremendous social, political, economic developments but also linguistic transformations that have far-reaching influences on the English language, literature, communication, culture, and human history.

Historical Background

In the mid-5th century, Germanic tribes overtook Europe as the Roman Empire fell. The Anglos, Saxons, and Jutes then migrated to and settled throughout Central and Eastern Britannia (today’s Britain), where they intermarried, waged wars against each other, and drove the indigenous tribes ever west-

ward in the next five centuries [7]. (Specifically, the Anglos settled in Middle and Northern England – Mercia and Northumbria; the Saxons settled in the South of the Thames – West Saxon area; and the Jutes settled in the Southeast of England – Kent [20]).

In the 7th century, the Anglos and Saxons absorbed the Jutes; the Anglisc culture of the Anglo-Saxons dominated Britannia for the next four centuries. Their Anglo Saxon language became the earliest form of the English language, Germanic in origin, known as Old English, thus starting the history of English language. Anglo-Saxon gradually became a cultural identity that associated divergent groups of Germanic tribes people together, and such an integration of society enabled the flowering of the Old English language, culture, and literature [4]. The Anglo-Saxons left their mark on the English language in its grammar and vocabulary; many simple and common words we are using today come from this Anglo-Saxon language, or Old English [15].

The Old English Period

Four Dialects

Old English was not only one language. “The Old English was divided into four distinct dialectal varieties of three related tribes: its presence in different regions was like this: 1) **Northumbrian**, 2) **Mercian** (of the Anglos), 3) **West Saxons** (of the Saxons) and, 4) **Kentish** (of the Jutes)” [14]. Unfortunately, there is not enough evidence or traces of the Northumbrian, Mercian, and Kentish dialects that have been found today; only the West Saxon dialect is still in existence in some written form [14].

West Saxon Dialect

The only Old English dialect that left a written record and is known today is the Wessex one – West Saxon Dialect, which was the dialect mainly used by the Kingdom of Wessex. The continuing existence of Old English (West Saxon Dialect) could not be without the efforts made by Alfred the Great (the King of the West Saxons from 871 to c. 886 and King of the Anglo-Saxons from c. 886 to 899) [2]. Before the rule of Alfred the Great, most people could not read

or write, and the few who could only did in Latin [15]. Alfred the Great brought teachers and learned men from all parts of his country and other lands in Europe together to write books and teach his people how to read and write Old English (West Saxon Dialect), instead of Latin [15]. As a wise Christian king, he also encouraged the translation of substantial great Christian books from Latin into Old English [15]. Under the influence of Alfred the Great, not only were the understandable Christian values and knowledge were spread to society, but also valuable Old English language and history were successfully recorded [15]. For instance, the *Anglo-Saxon Chronicle*, the most influential and important work for Anglo-Saxon history was compiled during his reign [15].

West Saxon Dialect was the foundation for subsequent and widely used literary forms of Old English. During the reign of Alfred the Great and also his successors, the West Saxon Dialect was used in the court. In other words, West Saxon Dialect became the official dialect while the Anglo-Saxon kings predominated. Thus, as the Saxons established a dominant political force in the Old English period, the West Saxon dialect turned into one of the most prevalent and essential dialects in the manuscript writing of Old English [26].

Beowulf

Beowulf, a heroic epic poem composed between approximately 700 and 750 [5], is considered as one of the earliest literature works written in Old English. It is a story of a dramatic Germanic warrior Beowulf, who valiantly fought monsters and dragons to pursue glory for himself, his people, his ancestors, and his king. The background of this story is set in 5th century Scandinavia, where the Anglo Saxons’ ancestors once lived before they moved to Britannia.

Actually, *Beowulf* was originally an oral poem that was told from memory and passed along from person to person, from tribe to tribe, and from generation to generation. During the Anglo-Saxon period, oral poems prevailed; as a form of vernacular art, it was made by, and made for, ordinary people and was a

part of their everyday life. The vernacular poetry regularly used simple, everyday language, even when telling an extraordinary story like *Beowulf*. Following the oral tradition, people were told by practiced storytellers and the tribe's entertainer and historian, at social gatherings, dinner, weddings, parties, and other celebrations. There was even an occupation for storytellers – Scop. Scops travelled to Mead Halls

around the Anglo-Saxon countryside, reciting their stories from their memories of their encounters with the warriors who had returned home from battlefields, often accompanied with a lyre or harp; they told stories that could provide positive and negative models of warrior behaviors, consolidate the tribe, immortalize the gallant deeds, and shape men's reputation in Anglo-Saxon culture [24].



Figure 1. Alfred the Great and Edington: How the King of Wessex became great

Even though the practice of oral storytelling was widespread in Anglo-Saxon society and Germanic cultures were oral, the Germanic tribes people did have their own alphabets, which are generically known as Runes. Runes are the letters in Runic Alphabets, a set of related alphabets used by many Germanic tribes before the adoption of Latin Alphabets [27]. In particular, the Anglo-Saxons had their own Runic Alphabet, known as Futhorc [3], which was not commonly used and later on supplanted by the Old English Latin alphabet introduced by Christian missionaries [19].

In 313 CE, as the Roman Emperor Constantine issued the Edict of Milan, which decriminalized Christianity and granted religious toleration, Christianity began to spread throughout the Roman Empire. Following the example of Augustine Canterbury, a Roman monk who went to Britannia for preaching, many other missionaries spontaneously went to Britannia for the purpose of converting the «pagan» Anglo-Saxons to Christianity. As time went on, increasingly more Anglo-Saxon people were converted to Christianity, and increasingly more religious elements were gradually added into *Beowulf* through

oral transmission. As the Anglo-Saxons became increasingly Christianized, they adopted the Latin alphabet of the church, to displace the Futhorc. Then,

after three centuries of continuation of oral transmission, the *Beowulf* poem was eventually written down by a few Christian monks in the 11th century [8].



Figure 2. The Hero Beowulf Fighting with Monster Grendel

Christian values and Old English culture kept shaping the Anglo-Saxon society for centuries. However, after William the Conqueror (Duke of Normandy and, later, William I of England) invaded the island of Britain from his home base in northern France, (known as the Norman Conquest), and settled in his new acquisition along with his nobles and court in 1066 CE, the arrivals of the Norman tribes started to change Anglo-Saxon society, culture, lifestyle and languages.

The Norman Conquest

In 1066, Edward the Confessor, the last Anglo-Saxon king and the last king of the House of Wessex [11], died with no child. The nearest heir to the throne was Prince Edgar, but he was too young to rule. Thus, the Witenagemot, an assembly of the ruling class [28], decided to crown Harold Godwinson. Nevertheless, at this time, the Duke of Normandy spoke out and self-proclaimed that Edward the Con-

fessor had promised the crown to him, and that Harold had sworn to support him. Therefore, the Duke of Normandy came over with a powerful army and claimed the throne. After several terrible battles were fought, Harold Godwinson was defeated and killed at the Battle of Hastings [16]; the Duke of Normandy achieved victory, becoming known as William the Conqueror [20].

The Middle English Period

The Middle English Language

Under the reign of the Normans, most Anglo-Saxon people became serfs. Even though the Anglo-Saxon people mostly retained their own language and culture, they and their languages were no longer dominant. Since the Normans gained the throne in 1066, the kings, royal court members, and all the upper-class people spoke French, so French became the British aristocracy's language. As French was spoken at court and became the British state's

official language, French language and culture be-

gan to dominate the island of Britannia for the next 300 years.

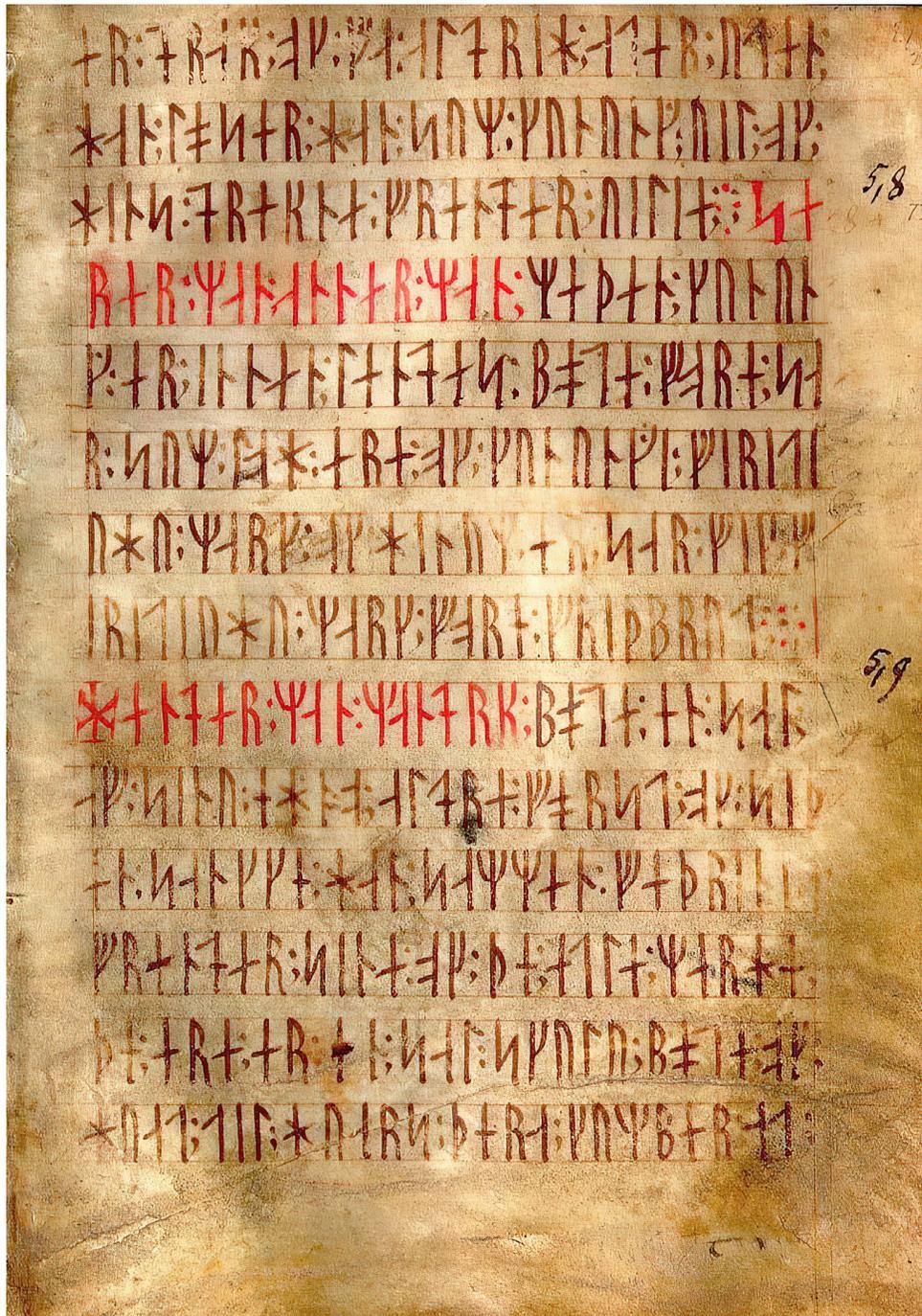


Figure 3. Runes, the alphabets of Germanic tribes

Surprisingly, with the decrease of the cultural and lifestyle difference between the Norman and Anglo-Saxon people, their language gradually blended contemporaneously, becoming the Middle English language.

Communication in Family and Society

The Middle English, the compound of French and Old English languages, was majorly influenced by the intermarriages between the Anglo-Saxons and the Normans. Many Anglo-Saxon women (especial-

ly widows) married Norman French male peasants. At that time, neither Anglo-Saxon peasants nor Norman peasants could read and write, and there were no schools or teachers to teach children how to read or write [10]. Thus, in such households, when the

husband spoke French, and the wife spoke Old English, their children naturally spoke a combination of their two parents' languages [10]. There was scarcely anything to keep the language from changing or evolving [10].



Figure 4. Music and Verse

In 1337, Edward III, the King of England, commenced the first phase of the Hundred Years War between England and France, known as the Edwardian War. After the wars began, English nationalism

was stoked; many English people perceived French as the enemy's language. The King decreed that only English was allowed to be spoken in the courts and schools, and other public places, and the nobles be-

gan to use it among themselves [15]. Thus, the status of the English language rose [29].

By the late 14th century, the Norman people and the Anglo-Saxon people essentially became well-integrated. Old English had absorbed ten thousands of French vocabularies and expressions, which enabled the amalgamation of French and English to become the principal national language, known as Middle English.

The Canterbury Tales

As Old English evolved into Middle English, the language procured more ways to describe more things than ever before. Geoffrey Chaucer, the father of English literature, composed a collection of 24 stories narrated by 30 pilgrims, known as *The Canterbury Tales*. In this book, Chaucer wrote in the Middle English language that had exploded in size during the previous three centuries. Chaucer introduced iambic pentameter into English poetry, a line of verse with five metrical feet, each consisting of one stressed

syllable and one unstressed syllable. (For example, da-DUM da-DUM da-DUM da-DUM da-DUM); he used rhyming couplets in his tales, too (aa, bb, cc, dd, ee...) [9].

By employing iambic pentameter and rhyming couplets, Chaucer proved that the English language was beautiful and can be efficiently wielded to display different ideas and sentiments too, which significantly enhanced the prestige of English as a literary language [15].

The Introduction of the Printing Press

Books used to be prohibitively expensive, precious, and rare in Europe until 1440, as most books were hand-written by scribes in universities and monasteries; only nobles and clergy could afford books. In 1440, Johannes Gutenberg invented the printing press in Germany, enabling the production of vast numbers of books with legible letters for a relatively little cost for the first time [18].



Figure 5. Chaucer, *The Canterbury Tales* c.1387–1400



Figure 6. The Original Canterbury Tales

In the 1470s, William Caxton, a wealthy merchant, introduced the printing press to England after learning about it in Germany. Therewith, William Caxton printed the first book in English and set up the first English press in England. Caxton printed approximately one hundred books, including *The Canterbury Tales* of Chaucer [25], which helped the Middle English language be rooted profoundly and spread widely. Caxton's printing press was applied and subsequently prevailed, empowering books to become available to a broad general

audience, significantly contributing to the spread of literacy and education in England [17]. And, this is how Middle English remained in its continuation.

All in all, the transformation of Old English to Middle English is a long-term and gradual process. It was initially caused by the wars, enabled by the printing press, and promoted by society's progress, leaving profound influences on civilizations and languages, which is the key to communication and the key to understanding.

References:

1. "Alfred the Great and Edington: how the King of Wessex became great". HistoryExtra. URL: <https://www.historyextra.com/period/anglo-saxon/king-alfred-why-great-battle-edington-somerset-marshes-burn-cakes>
2. "Alfred the Great." On Wikipedia. 2021 ed. URL: https://en.wikipedia.org/wiki/Alfred_the_Great
3. "Anglo-Saxon runes." On Wikipedia. 2021 ed. URL: https://en.wikipedia.org/wiki/Anglo-Saxon_runes
4. Author unknown. "Chapter 8 The Middle Ages in Europe". OER services. Last modified date unknown. Accessed February 23, 2021. <https://courses.lumenlearning.com/suny-hccc-worldhistory/chapter/the-anglo-saxons>
5. "Beowulf." On Britannica. 2021 ed. URL: <https://www.britannica.com/topic/Beowulf>
6. "Chaucer, The Canterbury Tales c.1387–1400". The British Library Board-Learning English Timeline. URL: <https://www.bl.uk/learning/timeline/item126565.html>
7. Dr. Masullo. "Beowulf, Lesson 1: Introducing the Anglo Saxon." Video file, 16:35. Youtube. MassuloEnglishUSN August 18, 2016. URL: <https://www.youtube.com/watch?v=Yby0ZylJAKk>
8. Dr. Masullo. "Beowulf, Lesson 2: The History of Beowulf poem." Video file, 19:51. Youtube. MassuloEnglishUSN. August 18, 2016. URL: <https://www.youtube.com/watch?v=IXm1bZrEU-A>
9. Dr. Masullo "Chaucer, Lesson 2: Introducing The Canterbury Tales" video file, 16:38. Youtube. MassuloEnglishUSN. September 18, 2016. URL: <https://www.youtube.com/watch?v=stHO1qISXhU&t=6s>
10. Dr. Masullo "Chaucer, Lesson 3: The Language of The Canterbury Tale." Video file, 15:54. Youtube. MassuloEnglishUSN, September 18, 2016. URL: <https://www.youtube.com/watch?v=8zNESD2VmVg&t=816s>
11. "Edward the Confessor." On Wikipedia. 2021 ed. URL: https://en.wikipedia.org/wiki/Edward_the_Confessor
12. Ellen Gutoskey. "New App Lets You Hear Chaucer's The Canterbury Tales in Original 14th-Century English". February 4, 2020. URL: <https://www.mentalfloss.com/article/616293/geoffrey-chaucer-canterbury-tales-app>
13. "Geoffrey Chaucer". URL: https://literature.fandom.com/wiki/Geoffrey_Chaucer
14. Ghosal Rjib. "How did Old English become Middle English." Quora. Accessed January 17, 2021. URL: <https://www.quora.com/How-did-Old-English-become-Middle-English>
15. Hao Peng. Major Events and Famous People in History of the United Kingdom. Nanhi: Nanhai Publishing Company, 2007.

16. "Harold Godwinson." On Wikipedia. 2021ed. URL: https://en.wikipedia.org/wiki/Harold_Godwinson
17. HISTORY.COM.EDITORS. "Printing Press". History. Last modified 2018. Accessed February 23, 2021. URL: <https://www.history.com/topics/inventions/printing-press#:~:text=Goldsmith%20and%20inventor%20Johannes%20Gutenberg,use%20commercially%3A%20The%20Gutenberg%20press>
18. "Johannes Gutenberg." On Britannica. URL: <https://www.britannica.com/biography/Johannes-Gutenberg>.
19. "Latin influence in English." On Wikipedia. 2021 ed. URL: https://en.wikipedia.org/wiki/Latin_influence_in_English
20. Nelson, Thomas. The Royal History Readers. Tianjin: Tianjin Publishing Company, 2014. "Old English". University of Delaware. Accessed February 23, 2021. URL: https://www.uni-due.de/SHE/SHE_Old_English.htm
21. Roland Williamson. "Music and Verse", 1999. Last modified December 10, 2002. URL: <https://regia.org/research/misc/music.htm>
22. "Runes." On Wikipedia. 2021ed. URL: <https://en.wikipedia.org/wiki/Runes>
23. Scotter Kate. "Beowulf: The enduring appeal of an Anglo-Saxon's 'superhero story'." BBC News. Published May 3, 2018. URL: <https://www.bbc.com/news/uk-england-suffolk-43045874>
24. "'The Voice That Brought Beowulf', Beowulf to Lear: Text, Image and Hypertext". Pace University. Accessed February 23, 2021. URL: <http://csis.pace.edu/grendel/projf20004d/Scop.html>
25. Vinay S. Pendse "Caxton's Printing Press". Video file, 3:32. Youtube. Literature Guide. May 19, 2020. URL: <https://www.youtube.com/watch?v=m5VL6h7-pvI>
26. "West Saxon Dialect." On Wikipedia. 2020ed. URL: https://en.wikipedia.org/wiki/West_Saxon_dialect
27. Wikipedia s.v. "Runes" 2021ed. URL: <https://en.wikipedia.org/wiki/Runes>
28. "Witenagemot." On Wikipedia. 2021ed. URL: <https://en.wikipedia.org/wiki/Witenagemot>
29. Zappia Susie. "The Effects of the Hundred Years' War on English Literature". The Classroom. Accessed February 23, 2021. URL: <https://www.theclassroom.com/effects-years-war-english-literature-8343840.html>

Contents

Section 1. Astronomy	3
<i>Mucheng Ma, William H. Waller</i> SURFING THE AURORAL CASCADE – QUANTITATIVE CONSTRAINTS ON OXYGEN FORBIDDEN-LINE EMISSIONS AND EXCITING ELECTRON VELOCITIES	3
Section 2. Pedagogy	12
<i>Li Qing</i> PEDAGOGICAL CONDITIONS FOR THE FORMATION OF READINESS FOR PROFESSIONAL AND CREATIVE SELF-REALIZATION OF FUTURE TEACHERS FINE ARTS	12
Section 3. Psychology	17
<i>Khalilova Khalida</i> SOCIAL AWARENESS MEASURES FOR RELEASED YOUNG PRISONERS.....	17
<i>Yumeng Ye</i> DIFFICULTY CAUSED BY DEPRESSION.....	22
Section 4. Sociology	26
<i>Annie Wu</i> GENDER AND MEDICINE IN ANCIENT AND MODERN CHINA	26
Section 5. Philology	38
<i>Yunji Li</i> THE HISTORY OF LANGUAGE: THE TRANSFORMATION FROM OLD ENGLISH TO MIDDLE ENGLISH	38