Fuzzy Inference System Through Triangular and Hendecagonal Fuzzy Number

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Abstract

A fuzzy inference system works on the basis of fuzzy if-then rules to mimic human intelligence for quantifying the vagueness/uncertainty, which arises in many real-world problems. In this paper, fuzzy inference system is designed using triangular and hendecagonal fuzzy number that represent the value for the linguistic environment. The factors of T2DM mellitus play a critical role in affecting each and every individual health without their knowledge. In this paper, the factor of “Blood Glucose”, medical term known as hyperglycemia, is analyzed through this fuzzy inference system (FIS).

Keywords

Triangular Fuzzy Number Hendecagonal Fuzzy number Linguistic Variables Inference system

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Chapter
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Abstract

Environmental pollution and global warming are major threats to life on Earth. These drastic changes are caused by carbon dioxide emission, which has become a very serious problem worldwide. For the generation of useful sustainable and renewable energy in an efficient manner, the production of electricity using solar energy trapped by algae in combination with microbial fuel cells (MFCs) is a very attractive option. The use of different kinds of algae has become a recent research trend, especially because algae have great capacity to utilize carbon dioxide via photosynthesis, with the potential to convert it into a biomass. Integrating algae into MFCs has given rise to a new MFC model, that of photosynthetic MFCs. Algal MFCs play an extensive role in the treatment of organic contaminants that can be converted to bioelectricity and they also efficiently remove various by-products. This chapter provides- detailed descriptions of the basic experimental setup of MFCs, and the electrode materials used for anodes, cathodes, and membranes. Microbial fuel cells employing different types of algae as substrates under various conditions are described in detail. A brief description of special MFC designs that are integrated with PBR is given. Details of MFC models with algae-assisted anodes and cathodes are also supplied. The multiple bioreactor constructions that are employed to

yield algal biomasses are discussed, along with the technologies that will have to be developed. Future challenges and perspectives are highlighted, and we describe research work that can be applied for the commercialization of algal MFCs.

Keywords

Algal biomass Algal MFC Anode Cathode

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In Vitro Morphogenesis of Woody Plants Using Thidiazuron

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Chapter
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Abstract

Thidiazuron (TDZ) has been in use for in vitro shoot regeneration, in particular, recalcitrant woody perennials. Owing to its superiority over natural cytokinins in plant regeneration, TDZ has been the plant growth regulator (PGR) of choice for mature tissues. In majority of the tree species, TDZ has induced regeneration via axillary shoot proliferation, adventitious shoot organogenesis and somatic embryogenesis. Interestingly, TDZ has evoked different regeneration routes from the same explant at different concentrations. In addition, various other factors like pretreatment, explant type, maturity, orientation, TDZ concentration, combination with other PGRs and organic additives interact synergistically to promote shoot regeneration. Despite being potent PGR, supra-optimal level of TDZ produces shoot abnormalities like vitrification/hyperhydricity (stunted shoots) or fasciation (fused shoots). In shoot organogenesis and somatic embryogenesis, prolonged exposure to TDZ resulted in callus necrosis or reversal of shoot buds or somatic embryos to callus. Therefore, this review paper is intended to bring out the effectiveness of TDZ in woody plant tissue culture. The authors also emphasize on various interacting factors to minimize the negative consequences of TDZ treatment.

Keywords

Thidiazuron Woody plants Shoot regeneration Hyperhydricity Fasciation

Abbreviations

BA

Benzyladenine

GA_3

Gibberellic acid

IAA

Indole-3-acetic acid

IBA

Indole-3-butyric acid

Kin

Kinetin

MS

Murashige and Skoog

NAA

α-naphthalene acetic acid

PGR

Plant growth regulator

SE

Somatic embryo

SSE

Secondary somatic embryo

TDZ

Thidiazuron

Notes

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Author Contributions

AV and RR conceptualized the manuscript. AV prepared the manuscript, while RR edited and provided critical inputs to the manuscript for publication.

Conflict of Interest

The authors declare that the review paper was written in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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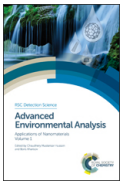

From the book:
Advanced Environmental Analysis: Applications of Nanomaterials, Volume 1

CHAPTER 7

Nanomaterials for Heavy Metal Removal

S. Azzaza, R. Thinesh Kumar, J. Judith Vijaya and M. Bououdina

Wastewater containing heavy metal ions is considered as a serious environmental problem for human society. Advances in nanoscale science and engineering provide new opportunities to develop more cost-effective and environmentally acceptable water treatment technologies. Nanomaterials have a number of physicochemical properties that make them particularly attractive as nanoadsorbents for decontamination of wastewaters from heavy metals. These materials are capable of removing heavy metal ions at low concentrations with high selectivity and adsorption capacity. The use of various nanoadsorbents in treating contaminated water, mainly including carbon-based nanomaterials, iron-based nanomaterials and photocatalytic nanomaterials, was overviewed; their advantages and drawbacks in such applications were evaluated.

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Chapter
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Abstract

Mosquitoes are the most dreadful bloodsucking insects in the world, and though tiny in size, they inflict most human deaths worldwide. They transmit deadly pathogens like *Plasmodium*, chikungunya virus, yellow fever virus, dengue virus, Japanese encephalitis virus and West Nile virus. Worldwide, there are 3500 species of mosquitoes grouped into 41 genera, but only 100 species are reported as vectors of human and other vertebrate diseases. India contributes nearly 34 % of global dengue and 11 % of global malaria cases. During the year 2012, nearly 1.13 million people were infected with dengue, malaria and chikungunya in India, and 766 succumbed to these diseases. In India, three genera, namely, *Aedes*, *Anopheles* and *Culex*, are the most common groups of mosquitoes found almost in all regions. *Aedes* spp. transmit dengue, chikungunya and yellow fever, *Anopheles* spp. transmit malaria, and *Culex* spp. transmit filariasis and Japanese encephalitis. In recent years, a decrease in the malaria and filariasis cases has been reported, but the number of infected cases and mortality due to dengue is steadily increasing. The failure in mosquito control is mainly due to the inefficiency of synthetic pesticides and repellents. Mosquitoes have developed resistance to almost all types of chemical insecticides. The increasing number of mosquito breeding sites and the destruction of mosquitoes' natural enemies are also contributing to the sudden rise in mosquito population and mosquito-borne diseases. Application of synthetic chemicals in water bodies is unsafe to humans and nontarget organisms. Microbial pesticides and

botanical pesticides are eco-friendly and target specific compared to synthetic pesticides. Microbial pesticides obtained from actinomycetes, *Bacillus thuringiensis* (*Bt*), *B. sphaericus* (*Bs*) and many other microorganisms are reported as eco-friendly alternatives for mosquito control. A large number of *Bt* strains have been reported to possess insecticidal properties against different groups of insects. *B. thuringiensis israelensis* (*Bti*) is an important pathogenic bacterium to mosquitoes. The secondary metabolites of some microorganisms are potential toxins against mosquito larvae at very low concentrations. Spinosad, a potent insecticide, has been isolated from the actinomycete bacterium *Saccharopolyspora spinosa*. In this review, potentially effective actinomycetes and other microorganisms against mosquito larvae and their effective bioactive compounds are described. The review also presents up-to-date information on the efficacy of microbial pesticides in mosquito control, their biosafety, field efficacy and commercial applications.

Keywords

West Nile Virus Mosquito Species Mosquito Larva Larvicidal Activity Mosquito Control

These keywords were added by machine and not by the authors. This process is experimental and the keywords may be updated as the learning algorithm improves.

Notes

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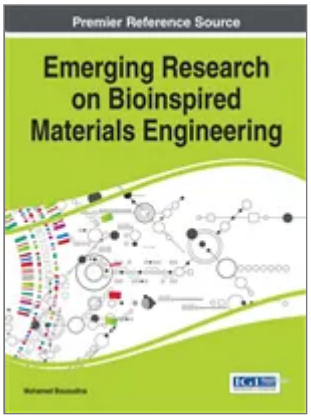

Green Synthesis of Metallic Nanoparticles Using Plant Compounds and Their Applications: Metallic Nanoparticles Synthesis Using Plants ⊗

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Abstract

The advancement in nanoparticulate system has a great impact in many scientific areas. Metallic nanoparticles (NPs) such as silver, gold and copper were found to exhibit antibacterial and other biological activities. The phytochemical constituents (Tannins, flavonoids, terpenoids, saponins and glycosides) present in the plant extracts were used for the green synthesis of NPs of desired size and morphology. Moreover, these active molecules act as reducing and capping agents for the synthe¬sis of NPs, which makes them suitable for biomedical applications. Apart from many approach on synthesis of nanoparticles, green synthesis method becomes more preferable because of its ecofriendly and nontoxic approach. This approach might pave the path for researchers across the globe to explore the potential of different herbs in the synthesis of NPs. This chapter will discuss the synthesis of various metal NPs using plants and their phytochemical constituent's involved during the synthesis. A section devoted to the different applications will be presented.

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ROUTLEDGE

DEMOCRATIZING HIGHER EDUCATION

International Comparative Perspectives

Edited by **Patrick Blessinger** and **John P. Anchan**

DEMOCRATIZING HIGHER EDUCATION

Higher education systems around the world are undergoing fundamental change and reform due to external pressures—including internationalization of higher education, increased international competition for students, less reliance on public funding, and calls to create greater access opportunities for citizens. How are higher education systems evolving structurally as a result of these and other pressures? In light of these changes, how can higher education be a positive force for democratizing societies?

This book examines the emerging trends taking place in higher education systems around the world, focusing on the most salient political and social forces that underlie these trends. Each chapter provides a case study of a country, exploring its cultural and political history, the political and social developments that have affected its higher education system, and the result of these changes on the higher education system. In a fast-changing, knowledge-intensive, democratic society, *Democratizing Higher Education* explores how higher education systems can be developed to provide access, affordability, participation, and quality lifelong learning for all.

Patrick Blessinger is the founder and Executive Director of the International Higher Education Teaching and Learning Association (HETL) and a lecturer, author, and researcher in education.

John P. Anchan is Professor and Associate Dean of the Faculty of Education at the University of Winnipeg, Canada. He is President of the International Higher Education Teaching and Learning Association (HETL).

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Dedication

This book is dedicated to educators all over the world and to the members of the International Higher Education Teaching and Learning Association (HETL) whose passion for teaching, learning, research, and service are helping to transform the academy in many positive ways.

Vision, Mission, and Values Statement

The long-term vision of HETL is to improve educational outcomes in higher education by creating new knowledge and advancing the scholarship and practice of teaching and learning.

To bring that vision to reality, the present mission of HETL is to develop a global community of higher education professionals who come together to share their knowledge and expertise in teaching and learning.

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FOREWORD

The editors of this informative book have provided readers with a stimulating introduction to its contents, so I will not offer a summary here. Instead, I will suggest some questions that should be kept in mind as reading progresses.

Are there conflicts between the two related purposes of education stated here? One is to develop the personal agency of the individuals being educated; the second is to promote the growth and stability of democracy globally by democratizing education. Few of us would argue against either of these aims. But there are worrisome signs. In the United States, for example, the traditional purpose of higher education, to produce better individuals—"better" defined in moral, civic, and intellectual terms—has been overshadowed by economic interests and purposes. Many young people think that the primary reason for obtaining a college degree is to get a well-paying job, and at the national level, we continually emphasize the need for better educated workers in order to maintain our country's economic superiority. If this is a world-wide trend—watch for it as you read—we may be impeding progress toward global democratization. On the one hand, we seek global cooperation through democratization; on the other, we seek economic superiority through successful competition. This is not so much a conflict between the two great aims as it is a neglect of the first; perhaps we are not giving enough attention to the fundamental moral purpose underlying the aim to develop personal agency.

Consider another closely related issue. The democratization of higher education implies greater accessibility, greater participation drawn from the full range of racial, ethnic, and economic classes. Some powerful critics, while harboring no bias against any cultural group, express a fear that the quality of education will suffer—is already suffering—as a result of admitting many students who are not qualified for college. Among other concerns, they point to a proliferation of

courses that they believe are intellectually inferior. Many deplore the increasing decline of interest in the liberal arts as more and more students undertake higher education for economic reasons. Should this be a widespread concern? If so, can it be remedied? What is the role of K-12 education in reducing this worry?

The rapid increase in technology also raises questions for higher education. The chapter writers tell us a lot about innovative modes of instruction and assessment that employ technology. But, if we use technology extensively as a teaching tool, might we lose what many of us consider to be the foundation of education—a strong relationship of care and trust between teachers and students? The aim, for wise educators, should be to find balance.

The use of technology also gives rise to financial concerns. Institutions of higher education all over the world seem to be experiencing financial problems. Greater use of technology might reduce the cost of instruction, but the continual demand for new instrumentation and personnel to supervise and maintain it might increase costs. It is widely agreed that careful analysis and deliberation on the matter are necessary, but we should also be aware that a concentration on financial matters might distract us further from reflective dialogue on educational philosophy—in particular on the moral and civic purposes of higher education.

Although there are many problems to consider as we move to a more inclusive organization of higher education, readers of this book will be heartened by the growing dedication to the democratization of higher education. Better education not only increases the life-opportunities for many more individuals, but it should—when properly defined—also contribute to the quest for global cooperation and intercultural understanding. A well-educated citizenry should be well-informed and better able to exercise the critical thinking required in an increasingly complex world. This book points us in the right direction.

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PREFACE

Patrick Blessinger and John P. Anchan

The Book

Higher education systems around the world are undergoing fundamental change and reform due to common pressures, such as the internationalization of higher education, increased international competition for students, increased pressure to become more self-sustaining financially, and calls for greater access opportunities for all citizens. Within this call for widening participation, movements such as open education, open learning, and open educational resources may be viewed as part of the wider movement to democratize higher education (Kramer, 2014). The global demand for tertiary education is at an all-time high and will continue to expand. It is predicted that by 2025 there will be over 262 million tertiary students worldwide, a dramatic increase from the 97 million level in 2000 (UNESCO, 2009). Within this context, this book examines how higher education systems are changing structurally and how international sociopolitical struggles and governmental policy reforms are helping to shape emerging higher education systems around the world (Altbach, Gumport, & Berdahl, 2011; Burke, 2012; DeMillo, 2011; Kezar, 2014; Kovbasyuk & Blessinger, 2013; Palfreyman & Tapper, 2009; Polyzoi, Fullan, & Anchan, 2003; Trow & Burrage, 2010).

Purpose

The main purpose of this book is to provide higher education professionals with an overview of the emerging changes taking place in higher education systems around the world. The book will focus on the most salient forces that drive these changes. It provides a wide-ranging body of empirical evidence to show how sociopolitical forces have had a democratizing effect on higher education over the

last century. For the purposes of this book, we intentionally use a broad definition of higher education as any formal education received beyond high school from an institution of higher education that is recognized as such, by the state or state sanctioned accreditation organization. Each chapter therefore focuses on a different higher education national or regional system around the world in an attempt to address the following questions: What are the broad forces/pressures impacting higher education? What are the major trends and structural changes occurring as a result of these forces/pressures? How can we best interpret this process of change and the developing trends from a sociopolitical lens?

Structure

The major premise of the book is that the main underlying forces and mechanisms driving change in higher education appear to be fundamentally sociopolitical in nature (e.g. government policy reforms, growing global demand for higher education). Within the last few years, we have also seen an explosion of new technologies (e.g. open educational resources, massive open online courses, online universities) and new economic models (e.g. market-driven proprietary universities) that have helped to open access to higher education to anyone in society who wants to avail her/himself of such services. Many scholars and academics could not have imagined, even a generation ago, how fast these new technologies and new economic models would be developed and how they have helped address the pent-up latent demand for higher education.

In addition to traditional public and private universities, we now have many online universities and community colleges and university distance education programs that allow whole new segments of society to attend higher education. In the US for instance, nearly half of all undergraduate higher education students are now enrolled in the community college system (Community College Research Center, n.d.). Thus, an exclusive focus on the research university would not sufficiently address the increasing diversity of the higher education space and a sole emphasis on technology or economics would not sufficiently explain the increasing expansion of higher education. Each chapter in this collection is presented as a case study of a representative country and includes empirical evidence to support the book's main thesis.

Aims

The book editors have analyzed the findings presented in the chapters to identify the major emerging themes occurring in higher education around the world and they discuss their findings in the introductory and concluding chapters. The authors provide their unique perspectives based on their own interpretations of the research they have conducted and based on their unique disciplinary lens to arrive at particular understandings of the emerging patterns occurring in higher education development in their respective countries. This book is therefore

intentionally multi-disciplinary, interdisciplinary, and international as we try to develop a more integrated understanding of the process of change occurring in higher education around the world. It is one of the responsibilities of the volume editors to provide to the authors a common framework (i.e. the major questions to be addressed) within which to present their findings.

With respect to the common framework for the book, the chapter authors focus on the most salient features (e.g. accessibility, affordability, meaningfulness, quality, lifelong learning) germane to higher education in their countries. This book explores the linkages between higher education diversification, affordability, accessibility, participation, and quality and democracy. The case studies also explore imaginative scenarios and visions of future democratic possibilities (e.g. around lifelong learning and meaningful learning) for higher education. In attempting to address these questions and contexts, the chapters also examine other questions such as: Are different and competing educational models compatible? Can or should competing self-interests and models be reconciled or harmonized? How can new measures of academic achievement such as meaningful learning, creative learning, and authentic assessment be reflected in higher education?

Chapter Overviews

John Anchan reviews the historical development of higher education over the centuries, thus providing the broader context through which to view higher education. Anchan explains how everything we do as educators has international implications and that the world is no more just a collection of separate nations and our decisions impact on people living elsewhere. Anchan reminds us that we need to ask ourselves a fundamental question: What exactly do we expect from education?

Linda Watts raises the notion of education for critical thinking. Education is more than just training toward specific job skills; it is an endeavor to becoming an effective citizen by learning to reason, dialogue, and engage in critical thinking, which involves the development of a learner who can contribute to the building of a stronger democracy. Education is about creating spaces of discomfort that challenge students—goading them into critical thinking and meaningful praxis.

Arshad Ahmad and Lori Goff highlight the fact that education in Canada remains a provincial jurisdiction. The authors raise an important point on the evolution of higher education—from teaching to more research, liberal education to skills-based, and traditional to systems-based on emerging technologies reflecting new demands. However, the meaning of innovation differs between educators in liberal arts and training specialists in corporate or business models. The authors highlight the need for stronger professional development for teaching faculty.

As an introduction to the European context, María Luisa Pérez Cañado provides a good overview of the Bologna initiative. This is quite refreshing and helpful in tracing the trajectory and providing a frame of reference to the

individual case studies throughout the book. Though specific to the European context, many of the concerns, strategies, and reactions are similar to some of the developments in other countries.

Portugal, like most other case studies, exhibits the same historical trajectory of higher education catering to the elite but gradually evolving to become more accessible and affordable. As Luísa Soares and Catarina Faria explicate, these processes are work in progress and will continue to develop in response to the demands placed upon them. Systemic changes are core to structural constraints and remain resilient to dramatic movements. Portugal is not immune to the same financial pressures that plague other countries.

As Craig Mahoney and Helena Lim note, the UK has seen some degree of devolution as centralized responsibilities for higher education are ported on to regions that assume the responsibility for the sustainability of the system. The UK has also evolved from an elitist and exclusivist privileged system to a more egalitarian system and the UK has been a pioneer in the concept of open education. The UK is also experiencing the global phenomenon of more mature students entering the post-secondary institutions. The UK reflects the ongoing discourse surrounding access and equity relative to the democratization of higher education at the global level.

Jørgen Nielsen and Lars Andreasen describe Scandinavian countries reassessing their educational models. Higher education in the Scandinavian countries has common historical trends, in that the development compares with the changes in the rest of the world. They all tend to have similar origins, common restraints, familiar constraints, and comparable evolutionary paths. There appears to be an inherent attempt to move from a socialist perspective to a meritocratic model. Nevertheless, considering the histories of these countries, a combination of these two approaches appears to be developing.

Lorraine Stefani discusses the history of New Zealand's education system. The history of New Zealand paints a very disconcerting, and yet familiar scene from the pages of history of aboriginal peoples in Canada and the US, for instance. The disparity, disconnect, and disillusionment are common strands that have a striking similarity to the concerns of autochthonous peoples in postcolonial narratives. This is especially poignant in analyzing education for democratization. Stability, access, excellence, sustainability, student attrition and retention rates, global economy, and educational attainment for the local residents all appear to be the same concerns plaguing the rest of the world. Stefani presents a number of promising possibilities to address inequalities—a true democratization theme.

Mandla Makhanya and Jeanette Botha present the complexities that emphasize the usual post-secondary challenges around the world but within the context of a post-apartheid country. The disparity and disconnect become more accentuated in a country that has suffered systemic historical grievances plagued by racism, inequality, and injustice. As the authors aptly note, a system "that was deeply divided and fragmented, isolated" had become an historical legacy that had to overcome an

entrenched and diverse culture. Nevertheless, South Africa has moved on to face the challenges and embark on a restructuring of education and beyond.

Natalia Moscvina and Olga Kovbasyuk raise an interesting dilemma and, perhaps, a paradoxical truism as they explore the contradictions between an inherited, national, culturally relevant system versus a more global perspective to adopting an acceptable educational system that works for all. These tensions are ubiquitous to any nation and tend to be more problematic when the legacy of a country indicates disruptive histories. Yet, as they suggest, a contextual and situational approach to contemporary needs might be a reasonable compromise.

As Hei-hang Hayes Tang describes, the Hong Kong situation is quite unique, in that it has had to transition from a postcolonial nation to a modern state under China. With such a unique cultural and political heritage, Hong Kong has adopted various models of higher education institutions. As always and elsewhere, the ongoing tensions are quite familiar with the ideals of a higher calling in education versus the pressing needs of the individual and the State. Amidst this tension lies the notion of a democratic enterprise.

India is another postcolonial country with ancient history tied to entrenched systemic cultural nuances. As is the case with most postcolonial contexts, an enduring strain exists between the evolving society and the historical legacies. Arputharaj Devaraj highlights the need for change toward democratization—in essence, exploring the nature of an educational system tied to histories and cultural diversity, adapting to become a successful global player. With its federal influence over higher education and many variations of higher education models across the country, India has an entrepreneurial approach to the educational enterprise.

Enakshi Sengupta's case study again ties in with the postcolonial legacies of the developing countries. Not unlike the Indian context, Malaysia is another postcolonial country with diverse histories. In many developing countries, the emphasis has been education for employment. The common strand seems to be the triad—nationalization, economic growth, and citizenship. As with most other countries, Malaysia cannot ignore the realities of internationalization in a global economy. Once again, the system has to contend with similar concerns faced by other countries—access, equity, excellence, and sustainability.

In the penultimate chapter, Patrick Blessinger proposes a democratic theory of higher education that maintains that the ultimate purpose of higher education is to promote personal agency through the development of freedom and responsibility. This notion implies that opportunities to learn should be equal. Blessinger emphasizes that this aim can only be achieved by moving from a mindset of exclusivity, which tends to be oriented around power and privilege claims, and toward a mindset of inclusivity, which is oriented around fairness and self-determination claims. Thus, democratizing higher education involves a higher education system based on a vision of higher education that is inclusive, participatory, representative, transformative, meaningful, and rooted in practices of shared ethical values and an ethos of political, social, and economic justice.

Conclusion

This book represents an increasing interest in how higher education is changing, the trends and mechanisms underlying these changes, and what higher education may emerge into in the coming decades (i.e. future possibilities) given its current trajectory. However, there is no assumption that disparate educational systems will eventually converge around a single model—nor should they. The chapters investigate the extent to which democratic ideals such as diversity, inclusiveness, equality, and pluralism are reflected in higher education and how these underlying ideals are helping to shape the higher education landscape.

We hope that this compilation will be useful to faculty and students in schools of education who are interested in the future direction of higher education and to those who are preparing to become teaching faculty or administrators in institutions of higher education. This body of work may also provide other higher education policymakers and leaders (e.g. government, NGOs, accreditation bodies) who do not work directly within higher education institutions but whose decisions impact higher education, with insight into emerging trends in international higher education. As such, this collection is intended to serve as a meaningful resource to anyone who is interested in or cares about the future direction of higher education.

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AN INTRODUCTION TO DEMOCRATIZING HIGHER EDUCATION

John P. Anchan

Preamble

The term *Higher Education* may carry distinct meanings to different readers. This discourse (and the chapters in this book) will imply "education beyond the k-12" system. There are many works on the history of higher education—even writings about early Greek and Roman education such as Clarke's 2012 *Higher Education in the Ancient World*. The intent of this discussion is not to track or create a compendium of the development of higher education around the world. Available contributions provide excellent records describing the meanings, history, evolution, application, and current issues surrounding higher education. This exposition aims to contribute to the ongoing dialectic on contemporary issues relating to higher education in selected sample countries. While comparing systems across countries can create its own limitations and cautionary tales, a global village (*thank you*, Marshall McLuhan) challenges us to think beyond the traditional borders of nation states. We are global and indeed, everything we now do has some international consequence. With international migration, an increase in global travel, interconnected manufacturing and distribution/consumption systems, interrelated political systems, and shared natural resources and calamities, the world is no more a collection of nations. We are truly connected and our decisions will have an impact on people living elsewhere and what happens elsewhere affects us all.

The terms *post-secondary education*, *higher education*, *tertiary education*, and *third-level education* are sometimes used interchangeably but may carry slightly different meanings in different countries. In some countries, tertiary education, post-secondary education, or third-level education normally refers to any formal education beyond high school and may include higher education and further/continuing education. In other countries, higher education is not included in

further/continuing education or, in fact, may indicate any education that does not lead to a degree from an accredited institution. This discourse uses the UNESCO (1998) definition of higher education that includes, "all types of studies, training or training for research at the post-secondary level, provided by universities or other educational establishments that are approved as institutions of higher education by the competent State authorities" (n.p.).

A Quick Backdrop

Education has existed from pre-recorded history throughout ancient civilizations around the world in different forms. For example, the Chinese Confucianism existed in 124 BC and the Qing dynasty from 200 BC; similarly, the Japanese education in the early 6th century was mostly influenced by the Chinese system. The diverse countries on the African continent evolved within their own unique histories with oral histories giving way to written histories and concurrently, various forms of education systems developing across the large continent.[1] Egypt had its own system of education and so did the Middle East with its scribal schools. Ancient Israel had its Torah schools. The more popularly known ancient Greek education in the 5th century BC aimed at democratization. With the familiar Plato and other influential pioneers, education in Greece was more ideological and relatively less religious. By the 4th century BC, Rome had its elitist educational institutions in place. In India, from the 12–13th centuries, the ancient Vedic Temple schools were followed by the residential *Gurukula* system. Chinese Buddhist scholars in India had a great influence on the Indian system, which was then succeeded by the Pre-Mughal rulers with the Islamic *Madrassas*. Many of the early forms of educational initiatives can be closely linked to religious training (e.g. Catholicism, Islam, Buddhism, Hinduism, etc.). In most instances, these were predominantly elitist, private, and exclusive teacher-student learning endeavors. The interaction inherently involved the master transmitting knowledge to the students. The precursor to the current educational institutions as teaching and research bodies can be traced back to the archetypical learning situations. In fact, the research university's roots can be followed back to the founding of the University of Bologna in 1088. By the 19th and 20th centuries, the Humboldtian German model of higher education, with its emphasis on academic freedom, scientific inquiry and research, knowledge creation, and specialization, became the de facto model for most modern universities. The research university model has its historical roots in the German ideal of education for self-cultivation (Bildung). The parallel development of liberal arts colleges with their focus on exposure to multiple disciplines (e.g. the classics, humanities, math, and science) focused on the development of well-rounded students through the enlargement of general intellectual capacity. This model has it historical roots in the English ideal of liberal education. Whereas the research university model has traditionally focused on faculty research and producing students as specialists, the liberal arts college model emphasized faculty teaching and producing students as generalists.

The idea of Bildung was based on the notion of self-cultivation through the harmonization and transformation of the mind, heart, and personality, and the development of personal agency along with self-identity. In short, this idea entailed a process of becoming a more self-regulating and self-determining individual with life-long development and empowerment. The idea of Bildung was greatly influenced by the writings of Hegel, a contemporary of Humboldt (Bruford, 1975; Hegel, 1977). The English idea of liberal education is oriented around the cultivation of the individual but also focuses on education as personal empowerment through the development of broad intellectual capacity and transferable skills (Hoerner, 1970). In addition to this historical perspective, Kovbasyuk and Blessinger (2013) have reviewed the two major epistemological paradigms that dominated educational thought over the centuries.

The Research University

Until recent history, the research university and the liberal arts college have been the two dominant models of higher education. Broadly speaking, and as a result of their historical developments, research universities have been mainly faculty-centered institutions focusing on research and publishing, whereas liberal arts colleges have been mainly student-centered institutions emphasizing undergraduate teaching. However, in today's higher education landscape, a great deal of cross-pollination has occurred and there are elements of many traditions—ancient and modern—in higher education institutions from around the world. These interactions can be viewed as a positive development. The higher education landscape is now dotted with several different types of institutions (e.g. business colleges, community colleges, vocational colleges, non-research proprietary universities). It is interesting to note that in the USA, for instance, more students attend community colleges rather than research universities.

Yet, for much of society, higher education has been shrouded in mystery and governed by a labyrinth of rules and customs that have been handed down from previous generations of educational institutions. Despite many changes within higher education, these institutions around the world still follow arcane rituals, traditions, and rites of passage that reflect their historical legacies. For most of their 800-year history, European universities have been medieval and monastic in character, reflective of their early religious roots. These customs and rites (e.g. as a passage from youth to adulthood and as a passage from novice to expert) are so embedded in the university life that many historical artifacts still remain with us today (e.g. the donning of robes and hoods and the use of other regalia at graduation). For the general public, all this symbolism can mask the true inner workings of a higher education institution. In spite of these historical vestiges, today's higher education institutions are also very bureaucratic organizations and many have grown into massive multimillion and multibillion dollar enterprises that must operate in an increasingly competitive higher education landscape and within

a complex nexus of government regulations and constituent interests. The changing demographics of the student population together with increased calls for reforms to modernize higher education institutions have put additional pressures on educators to institute such changes (DeMillo, 2011).

Higher Education and Globalization

The history of higher education is hardly limited to the growth and development of educational institutions. It is a complex and highly interrelated set of events and movements that connect to the cultural and political histories, social developments, civil rights, and the overall evolution of the nations themselves.[2] Thus, post-colonial legacies, diversity and equality, industrial revolution, the role of the church and state, and the individual trajectories of nation states define the nature of higher education in general. A corollary but important focus of discussion is the role of national and global competition in higher education that has resulted in what Marginson (2006) calls "positional goods" that allow major world players from mostly English-speaking countries to compete for research and teaching stature—which in turn affect student recruitment and the institutional prestige (see Altbach and Knight, 2007, for an excellent explication on this topic). The internationalization of higher education has grown dramatically and for various reasons. Increasingly, a number of sources publish world rankings of educational institutions, e.g. Times Higher Education World University Rankings, the QS World University Rankings, CWCU of Shanghai Ranking, and The Global Higher Education Rankings 2010. This obsession with world rankings of dramatically different institutions with diverse histories, differing challenges, and disparate resources has further raised questions on the metrics of such comparisons.

There is a rich source of academic record of the history of the American higher education—especially focusing on the development of American colleges and universities. These detailed discourses explore the development of higher education in relation to politics, post-colonial institutions, gender, immigration, religion, and Land Acts (Goodchild & Harold, 1997; Lucas, 2006; Thelin, 1976). Similarly, the Canadian context appears familiar and yet unique, with many variations across provinces, with education being a provincial jurisdiction (Dunning, 1997; Harrigan, 1986; Harris, 1976; Sheehan, 1985; Skolnik & Jones, 1991). In the past, there have been sincere attempts to analyze the evolution of higher education in Australia, Canada, Europe, and other parts of the world (Lee & Knight, 1996; de Wit, 1995).

Technology and Higher Education

This overview would be deficient without briefly mentioning by far the most important factor impacting the learning environment and the educational academies at all levels—emerging technologies. Like any technology, academic

technologies are promising, in that they can enhance the learning environment. The latest buzzword has been the MOOC (Massive Open Online Course): a system that can provide the space and access to affordable learning. Despite the inundation of literature holding us hostage to the MOOC-lingo, the debate will eventually subside and one or more forms will become the favored delivery method. Though quite premature, MOOCs will undergo adaptations that can further assist in enhancing the learning process. Currently, blended or hybrid approaches can allow educators to experiment with what works for a given situation. Learning is contextual and hence one cannot suggest that any single system would work for all. These are not universal panacea for pedagogical practices, but rather cautious opportunities for adopting emerging technologies to enrich the learning processes. MOOCs and other such technologies will exist in various formats and provide multifarious learning opportunities. Importantly, these technologies will address the needs of a specific population of learners in defined situations. Nevertheless, in the hands of entrepreneurial advocates, a promising tool could turn into a constraining instrument. One such area is the management of institutions by administrators tasked with the sustainability of the establishment. An unfortunate trend has risen with increasingly more administrators (e.g. Bowen, 2013) beginning to adopt arguments for using MOOCs as a means to an end in cost-cutting measures—tending to present approaches under the guise of pragmatic solutions to fiscal challenges.

The MOOC conundrum is only one of many other such technological concerns worrying well-intentioned educators. With the dramatic development of the internet, along with rapid growth of the social networking service (SNS), the process of education itself has undergone a big shift. From individual SNS clients (Facebook, Skype, LinkedIn, YouTube, Google+, Twitter, etc.) to larger networks and cloud systems (Dropbox, Box, Mega, iCloud, Google Drive, SkyDrive, Tresorit, etc.), the landscape has experienced a radical change. Academic technologies, including eBooks, Learning Management Systems (LMS) (BlackBoard, BB Collaborate, D2L, Angel, Moodle, Sakai, etc.), along with telepresence and various emerging tablet and other mobile technologies (iOS devices—iPad, iPhone, iPods; Android devices; Windows mobile; BlackBerry QNX Neutrino, and Symbian systems), the academic enterprise has dramatically changed on-campus and online learning systems in both the developed and developing world. Along with the newer technologies arise unexpected but important issues such as intellectual property, confidentiality, security, stability, and sustainability.

This is by no means an attempt to list all the available technologies; it is a quick attempt to highlight the amazing changes that have engulfed us—changes we could not have imagined or predicted even a few years ago. Tablets, laptops, smartphones, and communication systems in classrooms have become ubiquitous and in some cases, even mandatory. While some are more positive and optimistic about technology's role in education (Palfrey & Gasser, 2008; Tapscott, 2009, 1998, 1996, 1993; Turkle, 2012, 1995, 1984), a growing cadre of critics (Bauerlein, 2009;

Carr, 2009, 2010; Cuban, 2001; Postman, 1993; Roszak, 1986; Stoll, 1995, etc.) are less enamored by such claims. Despite taking a moment to acknowledge the impact of these major influences on higher education, due to space it is beyond the scope of this discussion. After all, it is irrefutable that these are tools and the teachers using the tools will influence the quality of such experiences. Tools on their own can do nothing. The pedagogical practice influences the process and the outcome. As Eleanor Doan rightly said, "Good tools do not make a good teacher, but a good teacher makes good use of tools."

The Overarching Goals of Higher Education

One cannot talk about the role and changes in higher education without the goals and critiques of such ventures. One of the main themes of any education is *reform*. In fact, many aspiring learners and their families, especially in the developing countries, view higher education as a prerequisite for change. Literacy, in particular, and education, in general, remain the cornerstones of societal change. The education of women tends to confirm that it plays an important role in the overall betterment of a society. Education is considered as a tool for change. Factors such as mortality rates, health, human rights, democracy, employability, and the quality of life are all directly attributed to education. Larry Kramer, the current president of The William and Flora Hewlett Foundation, aptly connects higher education with educational reform:

> Education is the foundation on which everything else rests: our economy, our democracy, our cultural heritage, our future. To accomplish anything as a society, whether that be protecting the environment or addressing inequality, we need an educated, literate citizenry that can reason analytically, grasp scientific principles, and work collaboratively to solve the big problems that confront us.
>
> *Kramer, 2014*

For many educators, higher education implies quality, excellence, access, equity, growth, commitment, sustainability, and overall development. With such altruistic ideals and a heritage of noble intentions, the evolving nature of higher education and the increasing role of for-profit training institutions have raised the ire of many educators. On a more cautious note, critics have questioned the relationship of corporations with post-secondary institutions. Bok (2003) has raised a number of concerns about commercialization of higher education. As a critique of the current trend in universities, he emphasizes preserving the educational values and not succumbing to the corporate agenda. When profits become the "bottom line" and efficiency and measurable outcomes become buzz words, true educational values such as neutrality and "integrity of research" tend to be devalued and ignored.

The overall goal of education becomes the overarching question. David Noble (2011) has remained a strong critic of the current "digital diploma mills," in that the "automation" of higher education has become a hierarchical top-down, administrator-driven agenda with the intent to commoditize research and teaching. According to Noble, the "high tech remedies" are misconstrued and he questions the desperate attempts to solve diverse issues and challenges in contemporary higher education institutions. This is further complicated when we consider the increasing role of information and communication technology (ICT) in education. It is easy to see why many educators become disillusioned with the onerous Sisyphean task of reforming the entrenched education system.

Theoretical Framing

In exploring the sociopolitical struggles, tensions, and competing ideas and values, we have to consider the factors that have influenced the structure of higher education historically and to date. This discourse also explores a vision of education where people freely engage in life-long and life-wide learning, and where higher education works for all. People around the world continue to demand access to meaningful, high-quality education because they see higher education as one of the primary means to improve the quality of their lives. Higher education increases possibilities for greater political and social participation as well as greater self-determination and personal development. Policymakers in many countries also see higher education as a promising means to drive economic development and innovation. In order to achieve these aims a new vision of higher education is required where its purposes are manifold and where higher education is truly representative of the population it serves. This inevitably requires a change in mindset as well as a restructuring (i.e. changes in purposes, assumptions, and means) of education systems based on needed reforms that redress policies of previous decades that have favored and privileged some groups and discriminated against others. In this context, Chomsky (2002) reminds us that "[t]he university will be able to make its contribution to a free society only to the extent that it overcomes the temptation to conform unthinkingly to the prevailing ideology and to the existing patterns of power and privilege" (p. 181).

Although progress has been made in recent decades to open up higher education to more people, barriers to access and participation still exist and these concerns need to be addressed. The ongoing power struggles to achieve equal opportunity will undoubtedly continue as different segments of society continue to strive for fair and equal access to higher educational resources. As Burke (2012) notes, existing cultural values that favor one group over another are often established to serve the interests of historically privileged segments of society, which in turn are often reflected in institutional policies, practices, and attitudes. Therefore, the dialogue around widening participation must, among other issues, concern itself with addressing the under-representation of groups

that have been historically excluded from accessing higher education. Within this context, the key question then becomes: How do we bring about greater inclusivity and a more democratic dialogical space for access and participation for all? In other words, how do we move from a space of exclusivity to a space of inclusivity so that higher education works for all?

The specific phenomenon of widening access and expanding participation has been written about by, among others, Trow and Burrage (2010), focusing mainly on the USA higher education system; Palfreyman and Tapper (2009), analyzing mostly research universities around the world; DeMillo (2011), exploring the historical development of higher education; Burke (2012), examining the underlying assumptions and perspectives shaping modern concepts and theories on widening participation policies and practice; Barnett (2012), investigating a range of possibilities for universities of the future; and Kezar (2014), explicating the mechanisms and models of change in higher education. These and other works add to our understanding of the evolving higher education systems around the world and their potential trajectories.

The work on this topic owes a great debt to the foundational research conducted by Trow, whose work focused mainly on the USA and UK higher education systems. He believed that his notion of elite-to-mass-to-universal higher education could be applied to any modern society. Recent developments in new educational models (e.g. community and technical colleges, online universities, distance education, open universities) have massified and diversified higher education to an astounding degree. In fact, using Trow's benchmark for universal access (50 percent of a nation's population participating in tertiary education in some manner), several nations can be said to now have achieved universal access for their citizens. However, Burke (2012) and Kirby (2009), among others, note that, in spite of remarkable gains in access in many countries, persistent patterns of under-representation continue within higher education—a phenomenon at odds with the basic democratic notion of equal access opportunity and inclusion.[3]

Palfreyman and Tapper (2009) state that the world is experiencing a major transition period in higher education and the nature of the relationships between higher education, government, and society is changing dramatically. Nevertheless, the idea of a common trajectory or the development of a single convergent model of global higher education is still uncertain. They state that:

> There is no assumption that the pressures for change set in motion the trend towards a converging model of higher education, but we do believe that in the present circumstances no understanding of "the idea of the university" remains sacrosanct.
>
> *Palfreyman & Tapper, 2009, p. ix*

In addition to the case studies and empirical data, this book draws upon a substantial body of work from areas of international higher education, changes in

higher education, democracy and education, life-long learning, global learning, meaningful learning, and other relevant topics (e.g. Altbach, Gumport, & Berdahl, 2011; Blessinger & Kovbasyuk, 2012; Burke, 2012; Chomsky & Otero, 2003; Deardorff, de Witt, Heyl, & Adams, 2012; DeMillo, 2011; Kezar, 2014; Knapper & Cropley, 2000; Kovbasyuk & Blessinger, 2013; Palfreyman & Tapper, 2009; Polyzoi, Fullan, & Anchan, 2003; Trow, 1974; Trow & Burrage, 2010).

As illustrated by the case studies in this book, higher education has become massified (even universalized in some countries) just as primary and secondary education have become increasingly universalized over the course of its evolution in the 20th century. With primary and secondary education, the principle of universal education is now seen as a human right, fundamental to producing an educated citizenry—a necessity for the proper functioning of a modern democratic society. Although different than primary and secondary education in several respects, the notion of universalizing access to higher education is now viewed by many as a necessity for acquisition of life-long and life-wide learning opportunities.

One assumption in these writings is that higher education can be a positive force for democratizing societies within which it functions. Conversely, democratic sociopolitical transformations can also lead to changes in the structures of higher education systems. The aim is to discuss these bidirectional forces and impact because change occurs at all levels and in complex ways (see Polyzoi, Fullan, & Anchan, 2003). As previously mentioned, we look at higher education change mainly through a sociopolitical lens (i.e. social and political factors). Each chapter will present a country case study covering the following themes and questions:

Institutional Diversification: To what extent are different institutional types (e.g. private, public, proprietary, sectarian, research universities, liberal arts colleges, community colleges, vocational-technical colleges) represented in the country?

Higher Education Affordability: What are the different, major forms of higher education financing (e.g. higher education as a public investment—public financing versus higher education as a private investment—student financing) in the country? What are the implications of these different policies and economic models?

Accessibility to Higher Education: To what extent can citizens access higher education? Do all citizens have the opportunity to access higher education or is higher education only accessible to certain segments of society and, if so, who decides who has access and who does not?

Participation in Higher Education: To what extent are citizens participating in higher education? Equal opportunity of access does not automatically equate to equitable participation.

Quality of Higher Education: To what extent does the quality of teaching and learning exist in the country? Is quality assurance accomplished via peer-based accreditation agencies or government agencies or other models?

In addition, some segments of society (e.g. women, minorities) who represent well over 50 percent of the population in many countries, and to a large extent

were historically denied access to higher education, are now gaining access in unprecedented numbers. However, much work still needs to be done across the world to break down the barriers of discrimination and lingering monopolistic practices and to ensure that everyone has fair and equal access to all forms of higher education. Ironically, it is against this backdrop that we have also witnessed a widening gap between the developed and developing countries with respect to access and growing stratification in higher education systems.

Given the advent of the globalized world and the transition to knowledge-based societies and economies within the last few decades, the development of a widespread and equitable system of higher education that works for all is becoming increasingly important and necessary as we move further into the 21st century. This means to raise the quality of life for everyone regardless of where they live. Restructuring alone is not the answer and technology alone is not the panacea. It entails real reforms that benefit everyone in society. Universal primary and secondary education, although vitally important, is not sufficient to meet the needs of modern societies. Rather, people must learn to become life-long and life-wide learners, which depends on access to education throughout their lives. This is necessary because, among other reasons, the currency of knowledge continues to decrease as knowledge changes.

In many ways, this diversification has not only fundamentally changed the way higher education functions and is structured, but also how it dramatically changes people's perceptions of and experience with higher education—from chancellors to presidents to provosts to deans to faculty to students as well as all other constituencies (e.g. policymakers, citizens). Since we live in an increasingly globalized, interconnected, and interdependent society, it is important to understand this phenomenon on a global scale and from an international comparative perspective.

Conclusions

In simple terms, one could surmise the grand question in this compilation to be: What is the purpose of education? As a book that explores the essence of democratization in higher education, the authors also hail from various backgrounds with differing emphases on the grand question. Indeed, there are no metanarratives in this discourse. These contributions are from scholars local to their countries and sensitive to their respective histories and cultures. Many of them have lived and experienced the nuances of higher education in relation to their own situation. An earlier work similar to this approach focused on schooling around the world (Mazurek & Winzer, 2006) and education in transition in post-communist Eastern Europe (Polyzoi, Fullan, & Anchan, 2003). The field of Comparative or International Education continues to be enriched by illuminating writers speaking from their own environmental "labs" without being affected by the "othering" aspect that many post-colonial critics have voiced.

It is interesting to see a common thread that connects the various case studies in terms of histories, challenges, resolutions, and development. While all of them agree on the basic fundamental principles of education, they may have individual perspectives on how these can and could be achieved. Amidst the technological changes, changing demographics, international migration, and dwindling resources, not unlike all other public and private enterprises, higher education institutions around the world will continue to be under enormous pressure to respond to societal demands, political pressures, and economic challenges. In the end, we need to ask the question: What exactly do we expect from education? How can we retain the sanctity of a liberal education along with the ancient noble ideals even as we make that experience enriching and rewarding? How can we make the educational enterprise sustainable? How can education provide the assurance of being able to respond to the changing needs of the learners in particular and the society in general? How can we balance between idealism and practicality? How can we make higher education, or any formal education, accessible to those who cannot really afford it? In essence, how can we democratize higher education? What kind of a world will we leave for our children and what does the future hold for higher education?

Notes

1 See Mokhtar (1981) for a compendium of the ancient civilizations and their influence in Africa.
2 For an excellent and exhaustive repository of the most contemporary collection of globalization, internationalization, and higher education, see the Center for International Higher Education at Boston College spearheaded by Philip G. Altbach—a pioneer in this area.
3 One could contend that mere access to educational institutions does not imply democratization. While the argument warrants debate, space precludes extending the discourse to the indagation of this critique.

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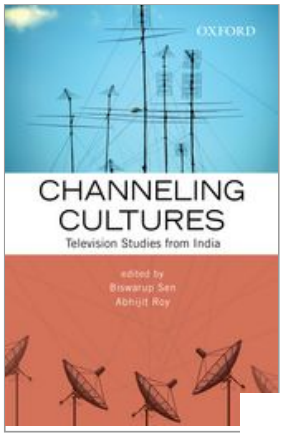

Channeling Cultures: Television Studies from India

Biswarup Sen and Abhijit Roy

ABSTRACT

Channelling Cultures: Television Studies from India is a seminal collection of essays on regional, national and global itineraries of Indian television in the twenty-first century. At a time when the television landscape in India is undergoing a second wave of change with compulsory digitization, new interactivity and convergence, unforeseen forms of televisual publicness and renewed debates on self-censorship, media ethics and the code of content, the essays in the volume seek to provoke a fresh understanding of television as a crucial player in Indian culture and politics. Featu ... **More**

Keywords: postcoloniality, citizenship, democracy, globalization, consumerism, liveness, affect, feminism, public, private, regional television, news, reality TV, soap opera

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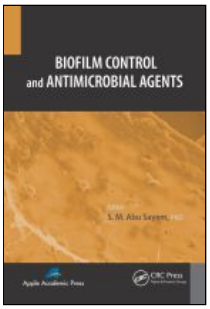

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Dr. S. M. Abu Sayem is an associate professor in the Department of Genetic Engineering and Biotechnology at Shahjalal University of Science and Technology, Sylhet, Bangladesh. He is a researcher and author, having published numerous peer-reviewed articles in the fields of structural biology, biofilms, and biotechnology.

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