

PERSPECTIVE

In Lebanon “It Never Rains But It Pours”—How the American University of Beirut faced dangers and seized opportunities: Transforming medical education through multiple crises

Fadlo R. Khuri 

American University of Beirut, Beirut, Lebanon

Correspondence

Fadlo R. Khuri, President of the American University of Beirut, Beirut, Lebanon.

Email: frkhuri@aub.edu.lb

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Abstract

Higher education and healthcare are in the eye of the health, economic, and political storms induced by the COVID-19 pandemic. Many of the questions that have been raised had been lingering incipiently, but others are legitimately new and specific to the very natures of the healing professions and their educational components. Forced to adapt to the pandemic and the collapse of the Lebanese economy and socio-political structure, the American University of Beirut Faculty of Medicine is evolving in order to survive while enhancing undergraduate and graduate medical education.

Time drives everything before it, and is able to bring with it good as well as evil, and evil as well as good.¹

Niccolo Machiavelli

1 | INTRODUCTION

The American University of Beirut (AUB) is by some margin the oldest and finest American institution of higher education outside the 48 contiguous United States. It has produced leaders in more countries than almost any other university, and currently has alumni in more than 115 countries where they serve their societies in business, academia, politics, agriculture, engineering, architecture, as well as medicine, nursing, and health. This speaks to AUB’s social compact with the peoples of Lebanon, the MENA region, and the world to produce individuals who not only “may have life and have it more abundantly,” in the words of the university motto, but who feel the weight of responsibility to create better and more abundant and equitable societies around them. That is,

a heavy burden on an institution that numbers some 5800 full- and part-time faculty, staff, and instructors, in addition to 8400 students, especially as it enters a protracted period of crisis at home, with the worst economic and financial collapse of any country in the world currently in progress, and the worst man-made disaster of 2020—the Port of Beirut explosion on August 4—happening on our doorstep. Our response has been to commit more than \$100 million from the endowment and from affordable loans to stabilize the basic pay of our faculty and staff while keeping our education and healthcare affordable. We will likely have to raise a similar dollar amount over the next 3 years to achieve more meaningful stability for staff, while substantially increasing our healthcare subsidies and maintaining our educational and housing benefits.

In the late spring of 2019, AUB was moving strategically along a path to improve its inpatient facilities, expand its outpatient reach, and enhance health-related education, research, and service based on our VITAL 2030 strategic plan.² VITAL 2030 was the result of 3 years of intensive engagement with stakeholders across the institution and was

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designed to ensure AUB's future success, relevance, and sustainability over the next decade and beyond. VITAL is a mnemonic for five themes, all of which allow the university to focus energy and resources, strengthen operations strategically, bring all stakeholders together toward common goals, establish agreement around intended outcomes, and course-correct when necessary. VITAL stands for: **V** Valuing our community and sharing our values; **I** Integrating a humanities, technology, and purpose-based education across all disciplines; **T** Transforming the university experience; **A** Advancing a world-class research agenda; **L** Life: Lifting the quality of health and medicine across our region.

The stepping stone to our vision for a sustainable educational and healthcare organization by 2030 was to build on the AUB Medical Center (AUBMC) 2020 Vision,³ launched in 2010, which had resulted in the recruitment of more than 220 physicians, educators, and scientists to the Faculty of Medicine, with the first phase seeing the completion of a brand new state of the art Academic and Clinical Center (ACC) to enhance outpatient care, day surgery, and medical, nursing, and allied healthcare and professional education. The next phase, the design and building of a 150-bed wing and inpatient expansion, was inaugurated by the President of the Lebanese Republic in June 2019, with almost 35% of the funds for a turnkey operation by 2026 already raised. *Pari passu* with the expansion of clinical capacity was a robust growth spurt in the undergraduate and graduate medical education programs and research output, in both quantity and quality, evidenced by a meteoric rise in our QS rankings from the 251–300 range in 2015 to the 151–200 range in

2021.⁴ The university and its medical center appeared to be well positioned to once more regain the pre-eminent role in the Levant and the Arab World with regard to medical and health education, research, and patient care.

What happened over the subsequent 21 months has been scarcely believable (Figure 1). First, Lebanon suffered some of its worst forest fires in almost 50 years. This was followed in October 2019 by the outbreak of a broad-based, public uprising against a failed and inept Lebanese government. This was in the context of a collapsing economy, exacerbated by the coronavirus pandemic, such that over the last 12 months, unemployment has shot up from 11% to 40%, and the value of the local currency has decline to 10% of its value 12 months prior. Close to 60% of the Lebanese population has now fallen below the poverty line, while the minimum legal monthly wage fell from \$400/month to less than \$70/month at the current exchange rate.⁵

On top of these humanitarian calamities, the devastating 4 August 2020 explosion at the Port of Beirut killed more than 200 individuals, wounded more than 6000, and displaced 300,000 from their homes. In just a few seconds, property was destroyed over an area of many square kilometers which included in Ras Beirut, where AUB is located. Three of Beirut's hospitals lost full capacity because of the blast,⁶ and our Medical Center, which itself was badly damaged and its occupants severely shaken, found itself having to treat more than 550 incoming casualties over the next 48 h. On top of the physical scars and loss of life, it is expected that a large proportion of those who witnessed the disaster first-hand will be left chronic stress symptoms, amounting

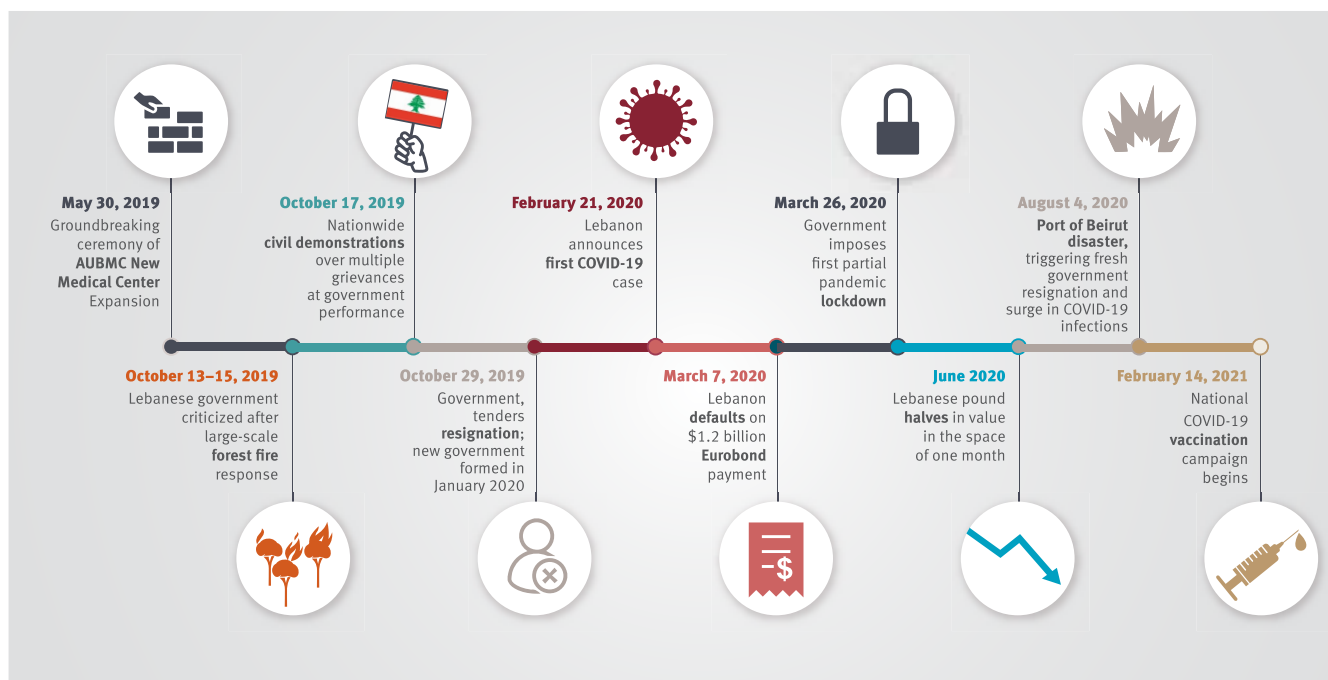


FIGURE 1 Timeline of events

to tens if not hundreds of thousands of individuals across the Lebanese capital.

The simultaneous crises have necessitated a series of momentous decisions that were taken to underpin a secure future for the university. Prior to October 2018, the academic, medical, and administrative leadership had reviewed and updated crisis response procedures, that were last overhauled in the wake of the July 2006 war. This work had put in place an agile multiconstituency consultation process that allowed major decisions to be proposed, debated, and adopted collectively, with the president acting in an executive role accountable to the Board of Trustees and a Crisis Response Team in near daily discussion online of developments and emerging challenges. In addition to the long-established Board of Deans and University Senate, consultative bodies include a President's Cabinet, established in June 2019, consisting of direct reports to the president, and a Council of Associate Deans, established in August 2018, which was enlarged in March 2020 as the Expanded Council of Associate Deans in order to coordinate academic continuity efforts.

Circumstances of such dynamic instability require that institutions prioritize their capability to clearly communicate challenges faced and decisions that they are compelled to take. In the several years preceding the crises, the AUB leadership had identified shortcomings in this regard and set about revitalizing its communications arm with a series of new hires and restructuring of the office responsible. The Office of Communications was charged with regularly updating the community about executive actions, while gaining crisis management experience and expertise in the pre-2019 conditions which produced a series of contextual challenges. This emphasis has stood the university in good stead when the storm clouds appeared in 2019 and as they have lingered over Lebanon. The Communications team has continued to work closely and strategically with the leadership to socialize and gain acceptance for major changes, manage expectations, and announce alterations to the calendar, course delivery, and other matters, supported by regular presidential town halls held remotely on Zoom, with faculty, staff, and students adapting well to the format and engaging in Q&As using the chat function.

In July 2020, AUB took the painful but unavoidable step of laying off 600 staff members, from a then-total of 5500 nonacademic employees, with an additional 244 individuals accepting early retirement or not having their contracts renewed.⁷ The collapse of the Lebanese lira compelled us to adjust the US dollar exchange rate at which students paid their tuition, resulting in a 160% jump in the cost of education in the local currency, although the adjustment enabled us to deliver financial assistance to those without access to hard currency or funds outside Lebanon. With the continued deterioration of the economy, more than 20% of our medical, research, and educational faculty have departed Lebanon,

either through resignations or taking leave without pay, and the total staff resignations across the university have resulted in a loss of over 1700 personnel since the beginning of the crisis, a substantial number comprising 22% of our full-time staff. Student transfers away from Lebanon, meanwhile, peaked following the August 4 explosion, and our measures to bridge the tuition fee gap have prevented further large-scale departures, including at the medical school.

COVID-19 presented a major challenge for our educational, research, and health enterprises. When the pandemic surged initially, there were widespread fears among medical students, staff, and faculty urging the university, school, and medical center leadership to protect the non-pandemic workers by allowing them to work, and learn, from their homes.

The decisions we have had to take in these trying times will long define our legacy and the trajectory of the university, and we keep reviewing the acute and long-term challenges, the decisions taken, lessons learned, and other major insights and directions that have resulted from these defining 21 months.

2 | CONFRONTATION AND ADAPTATION

Prior to the Lebanese Civil War (1975–1990), and well into it, AUB had Lebanon's only international medical school that was fully accredited by the Association of American Medical Colleges (AAMC), such that its medical graduates competed for and matriculated at the premier medical residency programs in the United States, and physicians who completed their residency at the AUBMC entered accredited US fellowship programs and sat for their respective specialty and subspecialty board examinations upon completion. As the war dragged on for 15-and-a-half years, AUB lost many of its medical faculty and its accreditation status, due principally to the fact that AAMC was averse to sending site visitors to Lebanon.

As the war came to an end in October 1990, the university and its medical school started to reverse the brain drain that had devastated the educational and health sectors. Over the last two-and-a-half decades in particular, recruitment of US-trained, board-certified physicians accelerated and AUB took on the task of reaccreditation. This entailed substantial reform of the MD curriculum as well as, by 2019, MAGNET and JCI serial re-accreditation and ACGME-I accreditation of all 18 graduate medical residency programs. More than 20 fellowship programs have also been fully prepared for accreditation by ACGME-I.⁸

From the perspective of the undergraduate medical education program, the MD program was accredited fully, effective January 2019, by the World Federation for Medical Education with adoption of multiple mini-interviews for

admissions decisions.⁹ Special concentration tracks have been created in the last 2–3 years, such as the Scholarly Concentration Track targeting research-focused medical students and the Van Dyck Medical Educator Group (named after the first dean of the Faculty of Medicine, founded in 1867, Cornelius Van Dyck), which gathers together outstanding clinical skills educators. Student support was enhanced through the establishment of a student wellness curriculum, and the AUB Faculty of Medicine was named as a new chapter in the Gold Humanism Honor Society with the first cohort of students inducted in 2020.

Several adaptations became necessary as the months of Lebanese crises and pandemic became years. As the economy deteriorated, the purchasing power of Lebanese citizens declined substantially. Medical students were faced with a situation where, for those whose parents or tuition payers resided and worked in Lebanon, more than 80% of their purchasing power was lost. Individuals who were previously donors at AUB now required financial aid assistance for their own children attending AUB's medical school, and the university's ability to adjust tuition in order to pay its faculty and staff were affected equally. The collapse in real terms of the Lebanese pound against the US dollar meant that a medical education which had cost the equivalent of \$160 000 for 4 years without room and board, fell to the equivalent of \$48 000, generating revenue that would simply prove inadequate to support the outstanding AUB and AUBMC faculty and staff. Over the last 18 months, the Board of Trustees and administration have been forced to adopt a forward-thinking approach; more than \$100 million in endowment revenue, loans, and scholarships will be invested in our faculty, staff, and students to ensure that the employees' quality of life remains acceptable, while the students' indebtedness and ability to afford tuition remain within acceptable parameters.¹⁰ Further challenges were presented when MCAT examinations in Lebanon were canceled due to political and pandemic-related issues,¹¹ forcing the medical school to enhance the role of the interview process and the scrutiny of grades and extracurricular achievements in order to secure an adequate number of first-rate medical students capable of adding to the long and distinguished AUB tradition of excellence in the service of the greater good.

A medical e-learning task force was appointed during the academic year 2019–2020 to address obstacles to in-person learning that resulted initially from the Lebanese uprising of October 2019 and then the COVID-19 pandemic.^{12–15} Resources, including specific educational software, were both purchased and developed in order to enhance student learning. As the challenges with convening classes continued, it became increasingly difficult to implement competency-based medical education.^{16,17} Launched in June 2019, and interrupted from October 2019 onward, this has become an increasing focus of the planned reform of the MD program.

Consolidating the pre-clerkship years, expanding the 3rd year for the core clerkships, and reconfiguring the 4th year for advanced study, electives, and integrated clinical/basic science clerkship have become priorities. This has become especially relevant as the AUB Faculty of Medicine made the decision to deploy and educate the 3rd- and 4th-year medical students alongside the attending physicians and house officers from the early days of the pandemic. The decision to involve clinical rotation students in-person was not taken lightly, and involved significant modifications to the number of students in each rotation, and the staggering of attendance so that the former could be achieved. It must be emphasized that the principle underlying our decision to keep clinical students on the wards was based on our firm belief that the Hippocratic commitment to serve in the face of danger and epidemics needs be applied to all who have chosen this profession, even before they actually hold the degree of doctor in medicine.

The preemptive revamp and development of a separate 50-bed USAID-funded Pandemic Evaluation Center and Clinic (PECC),¹⁸ intensive training efforts, and careful stewardship of personal protective equipment led to an increasingly engaged, competent, and confident student, resident, and fellow workforce working and learning alongside attending physicians as the pandemic dragged on. With lectures and large groups continued online via synchronous and asynchronous methods, written exams were performed remotely using the online testing application Respondus and the course management system Moodle, and final exams were given on-site with adequate social distancing, cognitive outcomes showed comparable performance, and the evaluations of the graduating classes of 2022 (where education had been delivered in-person) versus 2023 (largely online) were quite similar by all assessed criteria.¹⁹ Figures 2 and 3 summarize these outcomes in two courses, “The Blood” (Medicine I students) and “Human Development and Psychopathology” (Medicine II students), respectively. The two cohorts performed equally well in regard to entry MCAT scores and in the “Cellular and Molecular Basis of Medicine” (CMM) course, which was delivered prior to the lockdown, as they did in the “The Blood” course, delivered online after the lockdown (Figure 2). Medicine II students (Figure 3) performed similarly in regard to MCAT scores and two pre-lockdown courses (CMM and “The Kidney”), but the performance on the “Human Development and Psychopathology” course, delivered online, was actually superior in the 2022 cohort versus 2021, after scores were adjusted for the difference in the passing grade for the course between the 2 years (83.7 ± 7.4 vs. 86.7 ± 6.8 , $p = 0.002$). Students' evaluation of the course itself was also not different, confirming that learners did not perceive drawbacks or disadvantages to online delivery.

With the focus on enhancing safety through social distancing, online resources were expanded and mental health services enhanced. A task force convened to focus on student

Medicine class of	2022	2023	P-value
Academic Year 1	2018-2019	2019-2020	
Number of students	115	118	
<i>Baseline Performance</i>			
MCAT scores	509±6	510±6	0.119
Class average on the final exam of the CMM course	82.6±6.1	84.3±7.4	0.011*
Passing grade for the final exam of the CMM course	64.1	64.7	
Adjusted grade for the final exam of the CMM course ^a	83.2±6.1	84.3±7.4	0.065
<i>Performance in The Blood course</i>			
Course delivery	Face to Face	Online	
Number of questions on the final exam	50	77	
Class average on the final exam	83±9	81±9	0.043*
Passing grade for the final exam	65	61	
Adjusted grade for the final exam ^a	83±9	85±9	0.091
<i>Student Evaluation of The Blood Course</i>			
Rating of teaching methods	4.0±0.8	4.0±1.0	0.920
Overall course rating	4.0±0.7	4.1±0.8	0.754

Data are presented as Mean ± Standard Deviation

P-values were generated by Student's unpaired t-test; * P < 0.05 considered statistically significant

MCAT: Medical College Admissions Test; CMM: Cellular and Molecular Basis of Medicine

^aadjusted after equalizing the passing grades on the examinations in the 2 different years

FIGURE 2 Comparison of performance of Year 1 students in various courses and examinations and their evaluation of the Blood course

support worked on expanding online resources for students into adopting available technologies and software and hardware to facilitate teaching and learning. This included greater emphasis on training in telemedicine as part of the revised MD curriculum.

The conversion to online instruction necessitated a rapid training of faculty in the new delivery methods. For this purpose, a dedicated group of IT specialists at the medical school was charged with assisting individual faculty members on a one-to-one basis in the mechanics of live and pre-recorded presentations. For complex activities, such as team-based learning sessions, which required live sessions with switching of students from small group to large group formats, IT specialists actually sat with the faculty member throughout the exercises, at least for the first few times.

The adoption of remote learning methodologies has spurred newer innovative approaches to medical education, which we are still analyzing and assimilating. Faculty instructors recognized an opportunity to improve their deliveries, especially with didactic lectures, which became necessarily more dynamic and interactive, and they also learned novel ways of presenting information, such as animations, videos, and live polls, which they had not ventured into before, due largely to comfort with the tried approaches they had been using for years. In addition, the freedom afforded to students

by attending lectures asynchronously freed up valuable hours which were used to administer obligatory in-person teaching activities (such as anatomy dissection and clinical skills sessions) in small socially distanced groups staggered over the now available time slots previously dedicated to lectures.

With regard to graduate medical education, with 18 residency programs fully accredited by ACGME-I, programs were advised to incorporate sessions which encouraged residents to keep up with the latest findings and treatment modalities regarding COVID-19. While most GME programs held educational didactic sessions through Moodle or video conferencing, some sessions had to be rescheduled or replaced with different, more relevant educational activities. Additional residents' on-call rooms were relocated to the ACC and hotel space was rented to ensure sanitary and safe accommodations for house staff.

The residents' response during the pandemic was extraordinary. The family medicine residents were the first to cover the PECC, which screened and diagnosed COVID-19 patients. The emergency medicine residents covered COVID-19 patients in the ED and internal medicine modified the residents/critical care fellows' rotations to ensure adequate coverage of all COVID-19 units. AUBMC graduates not currently enrolled at AUBMC volunteered as visiting residents in the internal medicine COVID-19 units and general surgery

Medicine class of	2021	2022	P-value
Academic Year 2	2018-2019	2019-2020	
Number of students	114	115	
<i>Baseline Performance</i>			
MCAT scores	509±5	509±6	0.842
Class average on the final exam of the CMM course	83.8±6.4	82.6±6.1	0.156
Passing grade for the final exam of the CMM course	65.3	64.1	
Adjusted grade for the final exam of the CMM course ^a	82.6±6.4	82.6±6.1	0.455
Performance on the final exam of The Kidney course	78.1±7.9	78.7±7.2	0.558
Passing grade for the final exam of The Kidney course	62.2	62.3	
<i>Performance in the Human Development and Psychopathology Course</i>			
Course delivery	Face to Face	Online	
Number of questions on the final exam	45	75	
Class average on the final exam	83.7±7.4	83.5±6.8	0.892
Passing grade for the final exam	68.0	64.8	
Adjusted grade for the final exam ^a	83.7±7.4	86.7±6.8	0.002*
<i>Student Evaluation of the Human Development and Psychopathology Course</i>			
Rating of teaching methods	4.2±0.9	4.1±0.9	0.426
Overall course rating	4.3±0.7	4.1±0.8	0.251

Data are presented as Mean ± Standard Deviation

P-values were generated by Student's unpaired t-test; * P < 0.05 considered statistically significant

MCAT: Medical College Admissions Test; CMM: Cellular and Molecular Basis of Medicine

^aadjusted after equalizing the passing grades on the examinations in the 2 different years

FIGURE 3 Comparison of performance of Year 2 students in various courses and examinations and their evaluation of the Human Development and Psychopathology course

and pediatric residents trained via a non-internal medicine training module were mobilized in support of front-liners as of 26 October 2020.

The training gaps in specialties and sub-specialties with case logs and mostly outpatient, non-urgent, and non-emergent areas resulted in training gaps in the following areas: ambulatory clinic visits, elective operations, and related specialties. These were acute challenges in the setting of significant personnel departures due to Lebanon's deteriorating situation. Selected programs will need to lower the number of residents moving forward to ensure an appropriate number of case logs and to meet ACGME-I faculty-to-resident ratios.

As the crisis continues, there is a glimmer of light up ahead. On Sunday, February 14, 2021, Lebanon launched its national vaccination strategy at three pilot sites, one of which was the AUBMC. More than 500 patients were vaccinated at AUBMC out of the first 1000 recipients²⁰ and over the course of the first 4 weeks, the medical center administered 15% of all vaccines nationally, by far the leading center among the 28 vaccination sites. As befits their prominent role in battling

the pandemic, all medical residents, fellows, and 3rd- and 4th-year medical students obtained their vaccines along with their nursing and physician colleagues during these first 4 weeks.

The pandemic has reinforced the sense of mission at the AUBMC and Faculty of Medicine, which have cared for the most severely injured and the least fortunate for more than 150 years. The COVID-19 pandemic has provided an ideal opportunity to reflect on the competency of residents and fellows in dealing with extraordinary clinical circumstances involving the necessity of communication, teamwork, and professionalism, while expanding medical knowledge and emphasizing patient care. As programs have relied more on telemedicine with increasing amounts of online teaching, training for the treatment of patients with COVID-19 will also have to integrate critical educational objectives, including ethics, patient-centered care, and collaborative approaches to patients. Dealing with complex patients and stress-related disorders will become more important in these challenging circumstances.

3 | CONCLUSION

A concatenation of substantial crises has defined Lebanon's last 2 years and forced AUB, its Faculty of Medicine, and the AUB Medical Center to adapt in order to survive, while maintaining the quality of its medical educational programs. The decision to engage medical students and residents at the front lines of patient care was a difficult one, but it was taken prudently and after much reflection on the importance of trainee engagement in mission-focused patient care. The subsequent adaptation of the AUB Faculty of Medicine to the myriad crises that have afflicted Lebanon over the last 21 months, with the pandemic and loss of key personnel will stand us in good stead as we are forced to adapt to the prolonged economic deterioration of Lebanon, resulting in the expected departure of 20% of our physicians and nurses. With the national vaccination program gaining momentum, adapting our medical curricula and resources to continue to educate and empower the best and brightest students in the region will only become ever more challenging, but in spite of that, more necessary than it has been for a long time. The dangers alluded to by Machiavelli are most clearly present, but so are the opportunities for us to do good. It is now time, as the university's first president and founding father Daniel Bliss said, once more "to lay foundations on which greatness could be built."²¹

ORCID

Fadlo R. Khuri  <https://orcid.org/0000-0002-8638-7618>

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