

Practice of Academic Surgical Pathology During the COVID-19 Pandemic

Perspective on the Situation During the Lockdown From a Leading Center in Pakistan and Reflections on the Future—Fears, Hopes, and Aspirations

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ABSTRACT

Objectives: To determine the impact of the coronavirus disease 2019 (COVID-19) pandemic on our service, pre-, and postgraduate education and discuss the measures taken to ensure continued provision of quality service as well as education during the mandatory lockdown.

Methods: Measures taken to protect staff from infection and minimize virus transmission within the department as well as measures taken to allow smooth provision of quality service and uninterrupted pre- and postgraduate education were analyzed. Data were collected regarding case volumes (histology, cytology, and frozen sections) and case complexity during the lockdown and analyzed.

Results: Staggered rota was introduced for all staff. Strict social distancing measures were implemented. Staff was extensively counseled regarding the importance of protective measures. Pre- and postgraduate education, which was temporarily suspended, was quickly resumed using online teaching ensuring continuation of academic activities. The volume of cases decreased during the lockdown but complexity increased even more.

Conclusions: Immediate and effective measures were taken to protect staff from infection and ensure smooth provision of quality services. Measures were quickly taken to ensure resumption of pre- and postgraduate academic activities. The volume of cases decreased but complexity increased. There is fear among faculty and staff regarding the future.

Key Points

- Pakistan is moderately affected by the coronavirus disease 2019 (COVID-19) pandemic; the numbers of cases and deaths are low compared with Europe and the United States. A countrywide lockdown was imposed in March and eased in May.
- We adopted strict precautionary measures and a clear strategy to minimize transmission of the infection. A marked drop in new cases was noted during the lockdown period.
- We adapted to the new situation, and online sessions for undergraduate students and residents started quickly. Every effort was made to ensure that impact on training of residents was minimal.

Pakistan is a densely populated, lower middle-income country in South Asia, with a population of approximately 220 million. Poverty and unemployment are widespread. Quality health care is not accessible to large swathes of the population.

The first case of coronavirus disease 2019 (COVID-19) was diagnosed in February 2020. At the time of writing (around May 30), the number of confirmed cases had surged to more than 63,000, with more than 1,300 deaths, according to official figures released by the Government of Pakistan's National Command and Operation Center (NCOC) (NCOC data was obtained from the NCOC website [ncoc.gov.pk] and from the Ministry of National Health Services, Govt. of Pakistan [covid.gov.pk]), a single operation and nerve center to ensure a unified national effort against COVID-19. Fortunately, death and infection rates are low compared with Europe and the United States. However, the infection rate is likely much higher than documented because testing capacity

is limited, and the number of tests being performed daily across the country is very low, as NCOC data show.

A nationwide lockdown was imposed from March 20 through May 10. The lockdown was most effective for the first 2 weeks—only 2,000 new cases were reported between March 20 and April 2. Lockdown was gradually eased starting the first week of April. The general population was still not taking the pandemic seriously and continued to participate in social activities. Around May 11, markets were opened and congregational prayers were allowed. NCOC figures suggest that these openings resulted in a steep rise in the number of cases.

Challenges in Clinical Practice

The Aga Khan University (AKU) Hospital Karachi is Pakistan's most reputable tertiary care and academic center, and the histopathology section at AKU is Pakistan's largest and premier center for histopathology. The section receives surgical pathology and cytology specimens not just from AKU but from the entire country. The AKU Clinical Laboratory is a College of American Pathologists–accredited pathology laboratory that has 294 collection centers and satellite laboratories located in all corners of Pakistan (all 4 provinces and semiautonomous regions such as Kashmir and Gilgit-Baltistan) **Figure 1**. These collection centers are a rich source of specimens and account for nearly 80% of our entire case volume. In fact, the entire country serves as a catchment area for us. The specimens are packed in special temperature-regulated (thermohyrometer-fitted) wide-topped containers (temperature levels 18°C–25°C) and are brought to Karachi by air from distant areas or by laboratory vans from nearby cities and towns. All specimens collected until 7:00 PM on any particular day are dispatched to Karachi so that all are received in the histopathology laboratory the following day. In 2019, the histopathology section processed and reported more than 90,000 surgical and more than 20,000 cytology specimens. Almost 10,000 prognostic and predictive markers were also performed. The department employs 17 full-time and 8 part-time histopathologists with various subspecialty interests and strengths. Before the pandemic, the section received between 250 and 300 biopsies and surgical specimens daily, averaging around 270 per day.

With the imposition of strict lockdown around March 20, the number of cases declined substantially. As the number of COVID-19 cases in the country had begun to rise and lockdown was implemented throughout the country, surgical outpatient clinics began to close, and elective surgeries all over the country were canceled

or postponed. During the lockdown, all elective and semielective surgeries across the country were canceled, and only urgent and emergent cases were allowed to be operated. In our hospital, operating rooms were completely shut down for all elective and semielective cases, as were endoscopy suites and other clinics (the sources of histopathology and cytology specimens) throughout the country.

As surgeries, endoscopies, and other procedures declined (or halted) throughout the country, and as domestic flights and trains and interprovincial road travel were banned, the transport of the few specimens received at our collection centers became increasingly difficult. We faced the most severe impact of the lockdown between March 20 and April 10, when the number of surgical pathology specimens decreased to about 50 to 80 a day.

Laboratory and Pathologist Modifications to Reduce Virus Transmission

In mid-March, when the pandemic erupted in Pakistan, there were no detailed established international guidelines regarding prevention of COVID-19 transmission in surgical pathology laboratories.¹

As the number of specimens received in histopathology declined, drastic changes were made in duty rosters for consultants, residents, technologists, cytology screeners, transcribers, technicians, administration, and secretarial staff. Because there is no provision of digital pathology in our section, the physical presence of pathologists (including residents) and technologists was essential. To prevent overcrowding and to maintain social distancing, the staff (pathologist, residents, technologists, etc) were temporarily assigned staggered duties on alternating weeks, and pathologists received cases for reporting based on this roster. Although histopathology staff are not directly on the front line, chances of exposure are still high because of working in close environments. Awareness was created through active counseling by the departmental quality officer on the need for measures such as frequent hand washing with soap and disinfectant, use of face masks and hand sanitizers, and adequate social distancing. Strict compliance to standard laboratory procedures with gloves, masks (N95 masks were specified for receiving area, grossing area, and especially during frozen section), goggles, aprons, and so forth was ensured and practiced strictly during processing of specimens. Specimens of body fluids, fresh frozen tissue, for example, can be active sources of rapid infection. During this time, we received a number of biopsies from patients known to be infected with

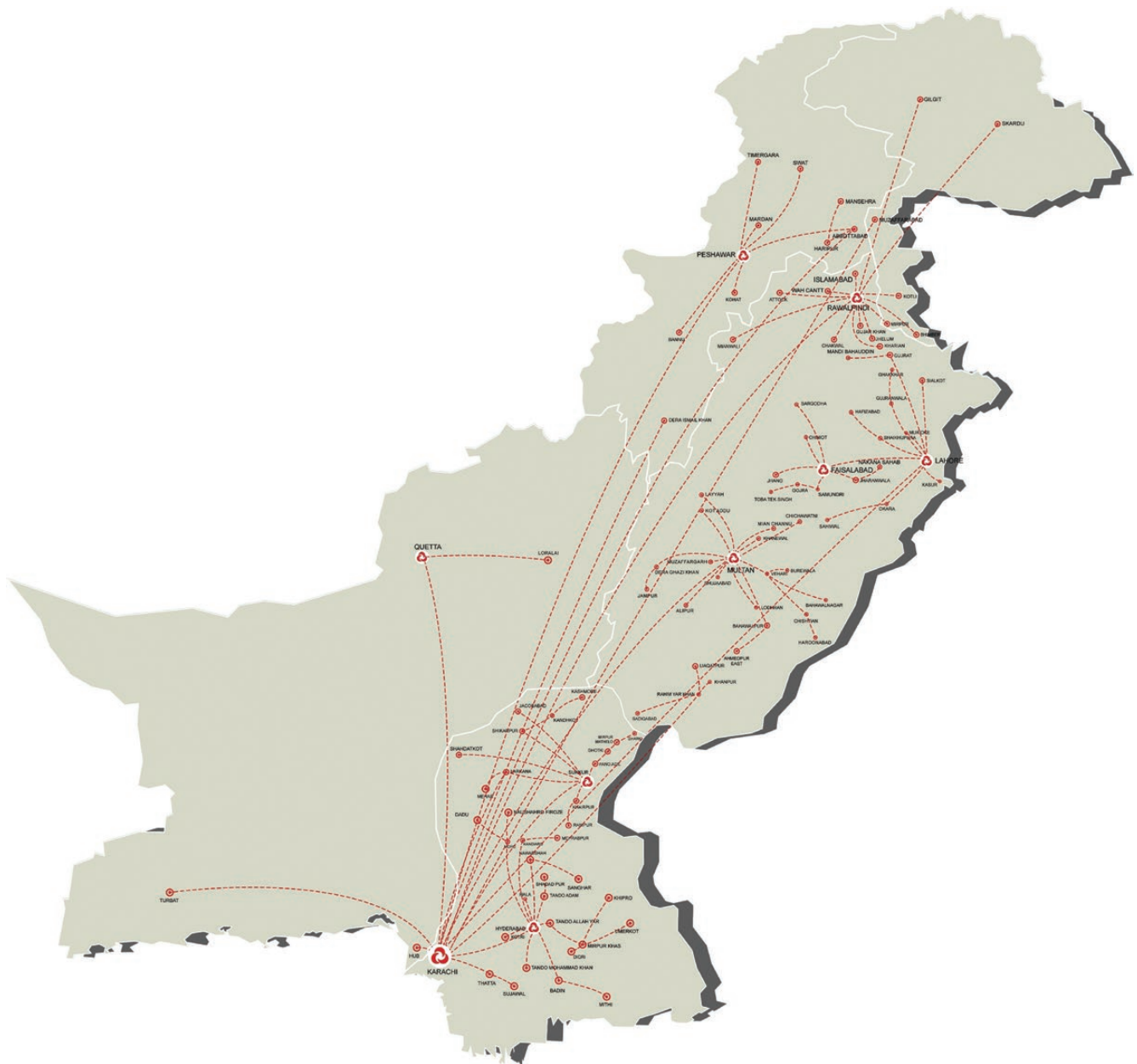


Figure 1 Distribution of Aga Khan University collection centers throughout the country.

coronavirus. All referring laboratories and services were asked to clearly mark such samples as “COVID-19 positive.” These specimens were fixed in 10% buffered formalin and were processed by residents and staff wearing protective gear including N95 face masks. Fixed and embedded tissue is not likely to be infectious. The requisition slips accompanying the specimens from infected patients were placed in a plastic folder at the receiving bench. All specimens arriving in the section and accompanying paperwork were considered contaminated. At the time this article was written, one of our technologists

working the night shift developed symptoms and tested positive. He and the other technologists on the night shift were quarantined at home. However, other night shift technologists tested negative. All did well and recovered fully. Since then, all staff have been tested and about 6 tested positive. All had mild symptoms and quarantined at home until they tested negative. The strategy adopted by the section during lockdown kept our workflow viable and streamlined and, at the same time, ensured that all safety measures were maintained to safeguard against coronavirus infection.

Resumption of Semielective Surgeries and Virtual Outpatient Clinics and Related Pathology Modifications

After 2 to 3 weeks of strict lockdown, large medical centers throughout Pakistan realized that some diseases, especially cancers, might not be immediately life-threatening but could have serious consequences (eg, cancer stage and patient survival) owing to delays in diagnosis and treatment. Based on this observation, some restrictions were removed to allow semielective procedures under stringent criteria and newly established protocols.² A number of outpatient clinics were reopened as virtual or telemedicine clinics mainly to treat cancer patients. Residents, interns, and medical officers were exempted from these clinics.

From the second week of April, the number of histopathology specimens gradually began to rise as the government allowed intercity cargo flights and road travel for transport vehicles. Our laboratory made arrangements with the airlines to use these flights for transport of laboratory specimens from collection points across Pakistan. Based on this increase in the number of specimens, the section reverted to the original daily roster, and pathologists were assigned cases daily. However, the staggered roster remained in place for residents, medical officers, technologists, and other support staff.

Investments to Ensure Visibility of Pathologists in the Post-COVID-19 World

We will need to invest urgently in new technologies and equipment to allow pathologists to maintain social interaction and visibility and to collaborate closely and interact with clinicians in the diagnosis, prognosis, and management of patients while following the rules of social distancing. Surgical pathologists traditionally have not been very visible, and their role often does not involve a high level of social interaction. The COVID-19 pandemic poses a serious threat to the visibility of pathologists, and with global reductions in clinical activity, there is a real risk of being marginalized. Some necessary technology and equipment are already available to us and are being used mainly for undergraduate and postgraduate education. Such technology and equipment include microscopes with digital cameras, computers with web cameras, TV monitors, and internet connections.³ This pandemic gives us an opportunity to transform our practice and make it faster, smarter and more modern, accessible, and efficient. Telepathology will probably play a permanent role in future surgical pathology practice globally, and we need to invest in it extensively and train our faculty and residents to become skilled

in this case model. We need to invest heavily in digital slide scanners and artificial intelligence software (deep learning algorithms) to equip our surgical pathology service for the post-COVID-19 world. We will need to convince the university hospital administration to provide capital for these endeavors; however, in these difficult economic times, this is easier said than done. Laboratory leadership will need to play a proactive role to make this happen. This technology can also be used for communications with pathologists and clinicians at our own institution and at other institutions in Pakistan and abroad.

Educational Measures

Postgraduate Training

Residency training across all specialties has been adversely affected globally by the pandemic. One recent study assessing the impact on urology residency training in Italy reported a severe reduction (>40%) or complete suppression (>80%) of training exposure for residents and even more for senior residents in their last year of training.⁴

Daily One-on-One Sign-out for Residents

The daily one-on-one sign-out has been the cornerstone and strength of our residency program for decades, but it has suffered, resulting in a temporary setback in training of histopathology residents. The necessity of distancing and avoiding close proximity adversely affected one-on-one teaching on the microscope between consultants and residents during sign-out of cases assigned daily to the residents, although this is such an integral component of our residency training. If COVID-19 is going to stay with us for the foreseeable future, we will need to invest urgently in procuring technology and equipment that will enable us to continue our signature exclusive one-on-one interactive training and teaching of surgical pathology residents. Basically, the same set-up used in daily intradepartmental consultation in our section could be expanded and used for one-on-one teaching of residents, who can sit at a distance from the microscope, and for communicating and collaborating remotely with clinicians in real time.³

Resident Didactic Education

In academic settings all over the world, strategies aiming to increase the use of telemedicine (and telepathology), smart teaching programs, and even telemonitoring of surgical procedures are already being contemplated. There is real hope that in the near future,

teaching of residents will be altered for the better, with teleteaching playing a permanent role in medical practice across all disciplines.⁵ In the first 2 weeks of complete lockdown, postgraduate academic sessions in histopathology remained suspended. Within the first 2 weeks all academic sessions, including slide seminars and journal clubs, were restarted online via Microsoft Teams. Residents on duty in the section and those at home attended these sessions. The sessions have been held regularly since then, ensuring that academic activities for residents do not suffer. In addition, the development of examination questions for residents by the faculty continued uninterrupted. Monthly tests for residents were also held online using Google Docs. On short notice, we were able to improvise, adopt a proactive approach, and establish telepathology as a portal for learning and interaction between pathologists and residents.

There is now emerging global consensus that, given the success of remote sessions for residents during this pandemic, lectures and microscopic sessions may be continued in this format in the post-COVID-19 world. In the United States, strategies are being devised and programs are already being developed to design core education for various medical disciplines, with focused subspecialty talks given by faculty from different academic institutions and programs. In the New York area—one of the worst affected by the pandemic—it is hoped that such a uniform core curriculum will serve as a foundation for all residency programs. The pandemic is being viewed as an opportunity to closely examine current clinical practice and residency program structures, discard methods that have been used based solely on tradition, and embrace new paths for residency education in all specialties in the 21st century.⁵

Undergraduate Education

Our surgical pathology faculty at AKU is extensively involved in undergraduate education. A number

of our faculty lead or are members of important institutional educational committees and deliver didactic and interactive lectures, small group sessions, and mandatory problem-based learning sessions. All undergraduate academic activities were suspended at the university when lockdown started in mid-March, and students were sent to the safety of their homes. However, within 2 weeks, the academic leadership of the university, in consultation with the information technology team, devised a detailed strategy for online teaching. The Microsoft Teams application was used as an online portal for conducting classes. Since then, our faculty has contributed extensively to regular online undergraduate teaching, preparation of examination questions, and conduct and assessment of online exams. In this way, the histopathology faculty is playing an important role in undergraduate education in these difficult times. Risk of students losing an academic year has been minimized.

Impact of Strict Lockdown on Case Volumes, Types, and Complexity (March 20-May 10)

The number of surgical pathology specimens had dropped precipitately to fewer than 50 a day during strict lockdown. With the easing of lockdown starting in mid-April, that number climbed slowly to around 125 a day. During the strict lockdown, we noticed that although the volume of cases was considerably reduced, the complexity of cases increased. We routinely receive complex and challenging cases from all over the country that require extensive specialized workup and intradepartmental consultation to reach an accurate diagnosis.

The total number of cases during lockdown is shown in **Table 1** and **Table 2**, and the number of cases for which immunohistochemistry (IHC) was performed during this period is shown in **Table 3**. As shown in **Table 1** and **Table 2**, the average daily volume of small

Table 1
Number of Cases During Lockdown

Specimen	Type of Case	March (21-31)	April	May (1-10)
1	Small biopsy	431 ^a	2,058 ^b	995 ^c
2	Large resection specimen	151 ^a	466 ^b	258 ^c
3	Cytology (nongynecologic)	92 ^d	375 ^e	186 ^f
4	Cytology (gynecologic)	7 ^d	64 ^e	59 ^f
5	Frozen section	7	34	18

^aTotal surgical specimens: 581.

^bTotal surgical specimens: 2,524.

^cTotal surgical specimens: 1,253.

^dTotal cytology specimens: 99.

^eTotal cytology specimens: 439.

^fTotal cytology specimens: 245.

biopsies plus large resection specimens fell to an average of 56 per day in the last 11 days of March, and then rose to an average of 84 per day in April and 125 per day in the first 10 days of May. Cytology volumes fell to an average of just 9 per day in the last 11 days of March, and then rose to an average of 15 per day in April and 25 per day in the first 10 days of May. These figures show the catastrophic fall in case volume. Average daily surgical volume for our section in 2019 was about 270 specimens per day, whereas average daily cytology volume in 2020 was approximately 60 specimens per day.

If we take the volume of immunohistochemical tests ordered daily as an indicator for difficult cases, we can roughly determine the average proportion of difficult cases in our daily mix. As shown in Table 3, 59% of all cases (surgical and cytology cell blocks) required IHC in the last 11 days of March. This percentage rose to more than 76% in April and 67% in the first 10 days of May. Our data for January and February show that 4,096 and 1,169 cases of a total of 9,460 and 2,800 surgical and cytology cases, respectively, required IHC. These cases comprised slightly more than 43% each of the total case volume. In the period from January to May

2019, 13,515 of 30,767 surgical cases required IHC, comprising 43.9% of the total case volume. Number of cancer biopsies and resection specimens can also be taken as an indicator of complex and difficult cases. During this 50-day period, although the volume of cases fell precipitously, the number of cancer-related specimens greatly increased by proportion. Normally, cancer-related cases comprise about 22% of our total caseload.⁶ However, during the lockdown, the proportion of cancer cases rose to approximately 35% of our total case volume. These figures demonstrate that our caseload, which is extremely complex and emotionally stressful in normal times, became even more so during the lockdown. These factors have contributed to even more professional stress in an atmosphere already fraught with fear, anxiety, and strain due to the pandemic.

Although the number of frozen sections also declined, they remain a cause of concern during the pandemic. It has been recommended that as few frozen section specimens should be sent as possible and only when essential because COVID-19 persists on cryostats for a long time. The technical and medical personnel handling these specimens follow the full precautionary measures and protocols reserved for COVID-19 specimens. Thus, it is extremely important that frozen sections during these times be reduced to a strict necessity basis. We are continuously counseling the surgeons on this issue. Formalin greatly decreases the infectivity of the virus on the first day, and thus routine formalin-fixed, paraffin-embedded tissue sections are unlikely to be infectious.⁷

Table 2

Number of Daily Cases (March 20-May 10)

	Average No. of Daily Specimens
Surgical, last 11 days of March	56
Surgical, April	84
Surgical, first 10 days of May	125
Cytology, last 11 days of March	9
Cytology April	15
Cytology, first 10 days of May	25
Frozen sections, last 11 days of March	0.6
Frozen sections, April	1.1
Frozen sections, first 10 days of May	1.8

Table 3

Number of Cases (Surgical and Cytology Cell Blocks) During Lockdown on Which IHC Was Performed^a

Sample	Time Period	Total No. of Surgical and Cytology Specimens	No. (%) of Cases on Which IHC Was Performed
1	March 21-31	Surgical Cytology Total	401 (59%)
		581 99 680	
2	April	Surgical Cytology Total	2,263 (76.4%)
		2,524 439 2,963	
3	May 1-10	Surgical Cytology Total	1,010 (67.4%)
		1,253 245 1,498	

^aNumber and percentage of cases on which IHC was performed in January and February 2020: surgical specimens: 4,096/9,460, 43.3%; cytology specimens: 1,169/2,800, 41.8%. Number and percentage of cases on which IHC was performed in January-April 2019: surgical specimens: 13,515/30,767, 43.9%

complex referral cases from all over the country, and the commitment of the faculty to undergraduate and post-graduate teaching, research, and administrative activities including membership and chairing of various hospital and university committees. In these times and in the future, stress levels will remain high and likely increase. The increased case complexity combined with decreased volumes will affect salaries, job safety, and retention. Particularly problematic and disturbing will be the career prospects for young and midlevel faculty who are apprehensive about their futures. More acutely, the risk of exposure to the virus in close spaces is a valid cause for worry. Temporal and physical segregation of staff will be necessary with minimal interactions. Segregation by physical barriers may need to be introduced, and adequate microscopes (with monitors) and adequate work sections in physically separate locations may be required. Nonphysical forms of communication may need to be used. Essential face-to-face meetings may be held only in small groups in large rooms with widely spaced seating and adoption of other precautions such as wearing of face masks. With spatial segregation in place, staff will not need to meet at work or socially. Even rest areas, eating lounges, and toilet facilities will need to be modified and segregated.⁸

The fear is acute and palpable—a fear of the present and of the future. In the near term, the lack of visibility and the fear of being marginalized and sidelined as surgical operations worldwide decline will be significant. A new study predicted that the virus pandemic could result in the cancelation of 28 million surgical operations worldwide during the 12-week peak of COVID-19 disruption.⁹ The number of surgeries may not reach the prepandemic levels for a year or more and maybe even longer. No one can predict how the story of COVID-19 will evolve, what shape it will take, and how and to what extent it will affect our role as surgical pathologists and our lives. However, we need to take all measures to protect ourselves and to contain and minimize the spread of infection within our workplaces and our homes. The pandemic may completely transform the way we work, live,

and relate to the world. The virtual world, which had been encroaching on the real world even before the pandemic, will become the center of most activities. Physical presence may not be required for most work. The location of most work in the future will be virtual—accessible by anyone anywhere. The existing structures may be broken down. At this point, we can only wait and hope for the best.

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