2013 Number 6

ISIAQ NEWSLETTER

October 2013

Indoor Air 2014 Call for Abstracts

Indoor Air 2014 will be held July 7-12, 2014, in Hong Kong. The theme of Indoor Air 2014 is "Healthy indoor air for an energy efficient and sustainable built environment".

Indoor Air 2014 is the 15th International Conference on Indoor Air Quality and Climate, long the premier conference on the science of indoor environmental science. The Indoor Air "xx conference series is the flagship scientific conference of ISIAQ. Attendance has typically been around 1000 at the recent meetings, and the proceedings are a major resource for the latest and emerging trends and findings in indoor air science.

You are invited to submit one page abstracts. Each abstract should be submitted separately and should contain the following information:
1. Topic code
2. Title of the paper
3. Full name of the author(s)
4. Affiliation of the author(s)
5. Mailing address and e-mail address of the corresponding author

Important Dates

Submission deadline:	November 15, 2013
Acceptance notification:	November 30, 2013
Paper submission deadline:	January 31, 2014
Final paper submission:	April 1, 2014
Registration open:	January 1, 2014

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Indoor Air journal to Switch to On-line Only in 2014

Beginning in January 2014, the *Indoor Air* journal will be switching ISIAQ Individual and Corporate Members' subscriptions to on-line only. At that time, the publisher will no longer include the print version under our agreement and ISIAQ will have to purchase the print version for members who wish to receive it. Note that the number of pages (and articles) in the journal will increase starting in 2014.

Qualifying members will receive the print edition, Volume 23, until the end of the current publishing year. For members whose current membership term expires before the end of the 2013, starting with the first issue in 2014, subscriptions will automatically default to online-only access of the journal. However, you will be given the option to receive the print version for $40/year (6 issues.)
(continued on page 3)

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Call for Proposals to Host Indoor Air 2016

The ISIAQ Board of Directors and the Members of the International Academy of Indoor Air Sciences (Fellows of ISIAQ) are soliciting proposals to host Indoor Air 2016, the 14th International Conference on Indoor Air Quality and Climate. The meeting series, which began in 1978, is the premier international conference on indoor air quality and climate, attracting between 700 and 1100 participants during the last six offerings.
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In This Issue

Call for Abstracts (continued from Page 1)
All abstracts must be submitted via conference website www.indoorair2014.org . The abstract template is available on the conference website.

A. Fundamentals of indoor air sciences
(A1) Indoor air chemistry
(A2) Indoor air physics
(A3) Indoor air microbiology
(A4) Indoor aerodynamics
(A5) Indoor transport phenomena
(A6) Health and Indoor air epidemiology
(A7) Thermal comfort
(A8) IAQ & perceived air quality
(A9) Indoor air acoustics and lighting
(A10) Public health and exposure studies

B. Application of indoor air sciences
(B1) Source of Indoor air pollutants
(B2) Particles
(B3) Control of indoor environment
(B4) Ventilation
(B5) Filtration and air cleaning
(B6) Prediction & measurement
(B7) Impact of outdoor environment IAQ and energy efficiency
(B8) IAQ in developing countries
(B9) IAQ in rapidly urbanizing cities
(B10) Indoor air for animals and plants
(B11) Education and issues
(B12) Productivity and economics
(B13) Community engagement
(B14) Policy, standards & regulations

C. Emerging issues in indoor air sciences and engineering

(C1) Respiratory infection in indoor environment
(C2) New chemical substances in buildings
(C3) Nanoparticles in indoor environment
(C4) Climate change and indoor environment
(C5) Environmental impact of buildings
(C6) Low energy buildings
(C7) Transport cabin environments

D. New technologies for indoor climate and air quality
(D1) Smart and mobile technologies
(D2) Wireless sensors and smartphone monitoring of indoor environment
(D3) Gene-sequencing and bio-informatics for indoor microbiology studies
(D4) New bio-monitoring technologies for indoor applications
(D5) Biomarkers of indoor exposure
(D6) Wearable and wireless physiological sensors for thermal comfort and health studies

E. Others

Forum/Workshop Submissions
We uphold the tradition of great forum/workshop organization at Indoor Air 2008 and 2011. These workshops are expected to discuss broadly the future science of indoor air, new and emerging directions.

- Forums will be 60 minutes long and usually consist of a panel or sequence of invited speakers on a specific subject or that address prepared questions on a subject.
- Workshops will be 120 minutes long, and usually consist of invited presentations and round -table discussions with audience participation.

Each proposal should contain the following information:
1. Title of the forum/workshop
2. Full name, affiliation and email address of the facilitators, the panel/presenters
3. The goal and a bulleted list of key issues to be discussed or presented (200 words or less)
4. The importance of the workshop/forum to Indoor Air 2014 (100 words or less)

Please send proposals to the Vice-President, Christopher Chao at mmeyhchao@ust.hk

Industry and Government Forum Submissions
We recognize the importance of practical implementation of the findings of indoor air sciences and also the Government policy. We invite major industry and Government to hold Indoor Air Health Industry Forums to discuss the major scientific questions in the indoor air health industry (e.g. air cleaners, ventilation, paints, etc), and Healthy Indoor Air Regulation/Guideline Forums to discuss the barriers and share success stories.
(continued on page 3)

Call for Abstracts (continued from Page 2)

These forums will be 60 minutes long and usually consist of a panel or sequence of invited speakers on a specific subject or that address prepared questions on a subject.

Each proposal should contain the following information:

1. Title of the forum
2. Full name, affiliation and email address of the facilitators, the panel/presenters
3. The goal and a bulleted list of key issues to be discussed or presented (200 words or less)
4. The importance of the forum to Indoor Air 2014 (100 words or less)

Please send proposals to the General Secretary, Alvin Lai at malvinlai@cityu.edu.hk

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Journal Switch (continued from Page 1)

For those of you with membership expiration dates past 2013 who wish to continue to receive the print version for the remainder of your paid current membership term, ISIAQ will cover the increased cost of your print copies until your current membership expires. If you choose not to receive the print copy, we will extend your current membership one month for each print issue you would have received.

We will send an email to qualifying members notifying you of your expiration date and issues remaining. At that time you will be able to indicate which of the above options you would prefer. If we do not hear from you, we will assume you do not wish to continue receiving a print copy.

While other scientific and professional societies have raised their membership fees, we are pleased that ISIAQ membership fees have been the same since its inception in the early 1990s. There was an increase when the Secretariat was located in Finland due to the Dollar to Euro currency exchange rates during that time. However when the Secretariat moved to California, we recommended and the Board agreed to switch back to fees in USD. That was at the beginning of 2009, effectively lowering the cost dramatically

We are not raising the membership fees at this time, but our arrangement with Wiley, the publisher of the *Indoor Air* journal, is about to change.

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Call for Proposals (continued from Page 1)

The Call for Proposals is available for download on the website.Please review it if you are interested in hosting the conference in your country. All Proposals will be reviewed by The Board of Directors and host organizations notified of acceptance.

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Member News

Chandra Sekhar Professorship

Chandra Sekhar is now a Professor in the Department of Building at the National University of Singapore. He received his PhD in Mechanical Engineering from the University of Adelaide, Australia and has since 1992, been teaching and conducting research in the areas of thermal comfort, ventilation and indoor air quality, air-conditioning and ventilation systems, building energy analysis and has published widely in these areas in peer-reviewed journals and international conferences. Prof Sekhar is an Associate Editor of ASHRAE HVAC&R Research and an editorial board member of Energy and Buildings, International Journal of Ventilation, Indoor and Built Environment & International Journal of Sustainable Built Environment. He is a co-inventor and holds 3 US and other patents in the area of energy efficient air-conditioning system with zonal ventilation control for enhanced indoor air quality and thermal comfort. Prof Sekhar is a Fellow of ASHRAE and ISIAQ. He is the current Chair of STC 21 (Ventilation) in ISIAQ. He is actively involved in the development of local IAQ, ventilation and energy standards in Singapore

***Indoor Air*, Volume 23, Number 5 October 2013**
Abstracts

William W Nazaroff - Four principles for achieving good indoor air quality

Great scientific achievements are often expressed in simple terms. Consider Newton's second law: force equals mass times acceleration. Or the first law of thermodynamics: energy is conserved. Or Einstein's equation describing the interdependence of energy and matter: $E = mc^2$. These truths bring light to darkness and allow us to see order in what otherwise appears chaotic. Among my favorite examples is the ideal gas law: $PV = nRT$. Consider an ordinary room, with a volume of 50 m^3, an air temperature of 293 K, and a pressure of 1 atmosphere. From the ideal gas law, we know that the room contains 2080 moles of air. Furthermore, because the molecular weight of air is 29 g/mol, we also know that the room contains 60 kg of air. From Avogadro's number, we understand that the room's air comprises 1.25×10^{27} molecules, a stunningly large number. From the kinetic theory of gases, we know that the molecules are traveling at a mean speed of 460 m/s and that they travel an average distance of 0.065 μm before colliding with another molecule. From these last two points, we infer that the average travel time between collisions is a mere 0.14 ns. Overall, each of the 10^{27} molecules in the room experiences an average of 70 billion collisions per second with other molecules. And yet, $PV = nRT$. Order out of chaos!

W. J. Fisk - Health benefits of particle filtration

Abstract The evidence of health benefits of particle filtration in homes and commercial buildings is reviewed. Prior reviews of papers published before 2000 are summarized. The results of 16 more recent intervention studies are compiled and analyzed. Also, reviewed are four studies that modeled health benefits of using filtration to reduce indoor exposures to particles from outdoors. Prior reviews generally concluded that particle filtration is, at best, a source of small improvements in allergy and asthma health effects; however, many early studies had weak designs. A majority of recent intervention studies employed strong designs and more of these studies report statistically significant improvements in health symptoms or objective health outcomes, particularly for subjects with allergies or asthma. The percentage improvement in health outcomes is typically modest, for example, 7% to 25%. Delivery of filtered air to the breathing zone of sleeping allergic or asthmatic persons may be more consistently effective in improving health than room air filtration. Notable are two studies that report statistically significant improvements, with filtration, in markers that predict future adverse coronary events. From modeling, the largest potential benefits of indoor particle filtration may be reductions in morbidity and mortality from reducing indoor exposures to particles from outdoor air.

Practical Implication People with allergy and asthma symptoms who reside in homes with strong sources of allergens may reduce their symptoms moderately through use of particle filtration systems in their home. Particle filtration may also help to reduce the substantial morbidity and mortality associated with indoor exposures to outdoor air particles.

H.-J. Kim, B. Han, Y.-J. Kim, T. Oda and H. Won - Submicrometer particle removal indoors by a novel electrostatic precipitator with high clean air delivery rate, low ozone emissions, and carbon fiber ionizer

Abstract A novel positive-polarity electrostatic precipitator (ESP) was developed using an ionization stage ($0.4 \times 0.4 \times 0.14$ m^3) with 16 carbon fiber ionizers in each channel and a collection stage ($0.4 \times 0.4 \times 0.21$ m^3) with parallel metallic plates. The single-pass collection efficiency and clean air delivery rate (CADR) were measured by standard tests using KCl particles in 0.25–0.35 μm. Performance was determined using the Deutsch equation and established diffusion and field charging theories and also compared with the commercialized HEPA filter-type air cleaner. Experimental results showed that the single-pass collection efficiency of the ESP ranged from 50 to 95% and decreased with the flow rate (10–20 m^3/min), but increased with the voltage applied to the ionizers (6 to 8 kV) and collection plates (−5 to −7 kV). The ESP with 18 m^3/min achieved a CADR of 12.1 m3/min with a voltage of 8 kV applied to the ionization stage and with a voltage of −6 kV applied to the collection stage. The concentration of ozone in the test chamber (30.4 m^3), a maximum value of 5.4 ppb over 12 h of continuous operation, was much lower than the current indoor regulation (50 ppb).

Kim et al (continued from previous page)

Practical Implications A novel air cleaner was developed that has a simple design and uses electrostatic precipitation with carbon fiber ionizers and parallel collection plates. When fitted with thin carbon fiber ionizers, the air cleaner achieved a high clean air delivery rate (>12 m^3/min) with significantly lower ozone concentration than the current indoor ozone standard (50 ppb). Here, the single-pass collection efficiency and flow rate obtained experimentally or from the theoretical considerations are reported.

E. S. Gurley, N. Homaira, H. Salje, P. K. Ram, R. Haque, W. Petri, J. Bresee, W. J. Moss, P. Breysse, S. P. Luby and E. Azziz-Baumgartner - Indoor exposure to particulate matter and the incidence of acute lower respiratory infections among children: A birth cohort study in urban Bangladesh

Abstract Approximately half of all children under two years of age in Bangladesh suffer from an acute lower respiratory infection (ALRI) each year. Exposure to indoor biomass smoke has been consistently associated with an increased risk of ALRI in young children. Our aim was to estimate the effect of indoor exposure to particulate matter ($PM_{2.5}$) on the incidence of ALRI among children in a low-income, urban community in Bangladesh. We followed 257 children through two years of age to determine their frequency of ALRI and measured the $PM_{2.5}$concentrations in their sleeping space. Poisson regression was used to estimate the association between ALRI and the number of hours per day that $PM_{2.5}$ concentrations exceeded 100 μg/m^3, adjusting for known confounders. Each hour that $PM_{2.5}$concentrations exceeded 100 μg/m^3 was associated with a 7% increase in incidence of ALRI among children aged 0–11 months (adjusted incidence rate ratio (IRR) 1.07, 95% CI 1.01–1.14), but not in children 12–23 months old (adjusted IRR 1.00, 95% CI 0.92–1.09). Results from this study suggest that reducing indoor $PM_{2.5}$exposure could decrease the frequency of ALRI among infants, the children at highest risk of death from these infections.

Practical Implications Exposure to indoor biomass smoke has been consistently associated with an increased risk of acute lower respiratory infections (ALRI) in young children, but the nature of this relationship is not well-characterized. In our study, every hour that average indoor particulate matter concentrations were above 100 μg/m^3 was associated with a 7% increase in risk of acute respiratory infection among infants, although no increased risk was observed for older children. Reducing indoor exposure to particulate matter could reduce incidence of ALRI among infants, who are at highest risk of death from these infections.

E. Kettleson, S. Kumar, T. Reponen, S. Vesper, D. Méheust, S. A. Grinshpun and A. Adhikari - *Stenotrophomonas*, *Mycobacterium*, and *Streptomyces* in home dust and air: associations with moldiness and other home/family characteristics

Abstract Respiratory illnesses have been linked to children's exposures to water-damaged homes. Therefore, understanding the microbiome in water-damaged homes is critical to preventing these illnesses. Few studies have quantified bacterial contamination, especially specific species, in water-damaged homes. We collected air and dust samples in twenty-one low-mold homes and twenty-one high-mold homes. The concentrations of three bacteria/genera, *Stenotrophomonas maltophilia*, *Streptomyces* sp., and *Mycobacterium* sp., were measured in air and dust samples using quantitative PCR (QPCR). The concentrations of the bacteria measured in the air samples were not associated with any specific home characteristic based on multiple regression models. However, higher concentrations of *S. maltophilia* in the dust samples were associated with water damage, that is, with higher floor surface moisture and higher concentrations of moisture-related mold species. The concentrations of Streptomyces and *Mycobacterium* sp. had similar patterns and may be partially determined by human and animal occupants and outdoor sources of these bacteria.

Practical Implications Because *S. maltophilia* is a known respiratory pathogen, its concentrations in homes should be monitored to better understand its health implications, especially as a co-contaminant with mold.

M. Richter, O. Jann, J. Kemski, U. Schneider, C. Krocker and B. Hoffmann - Determination of radon exhalation from construction materials using VOC emission test

Abstract The inhalation of ^{222}Rn (radon) decay products is one of the most important reasons for lung cancer after smoking. Stony building materials are an important source of indoor radon. This article describes the determination of the exhalation rate of stony construction materials by the use of commercially available measuring devices in combination with VOC emission test chambers. Five materials – two types of clay brick, clinker brick, light-weight concrete brick, and honeycomb brick – generally used for wall constructions were used for the experiments. Their contribution to real room concentrations was estimated by applying room model parameters given in ISO 16000-9, RP 112, and AgBB. This knowledge can be relevant, if for instance indoor radon concentration is limited by law. The test set-up used here is well suited for application in test laboratories dealing with VOC emission testing.

Practical Implications European regulation plans to set reference levels for indoor radon concentrations between 200 and 300 Bq/m^3 in residential and public buildings, and up to 1000 Bq/m^3 at workplaces and public buildings with low occupancy time. These values contribute to occupant's protection from negative health issues caused by inhalation of radon decay products. Building materials can be an important source for indoor radon, especially in low-energy buildings where air change rates between 0.1 and 0.3/h can be found. Currently, no test method exists for measuring their exhalation rate under practical realistic conditions, especially methods and protocols comparable to well-established methods for emission of indoor air pollutants. This article reports on the implementation of an appropriate test set-up, enabling the determination of the radon exhalation rate using VOC emission test chambers and its relation to model room conditions for evaluation purposes.

D. D. Hauri, A. Huss, F. Zimmermann, C. E. Kuehni and M. Röösli, for the Swiss National Cohort - Prediction of residential radon exposure of the whole Swiss population: comparison of model-based predictions with measurement-based predictions

Abstract Radon plays an important role for human exposure to natural sources of ionizing radiation. The aim of this article is to compare two approaches to estimate mean radon exposure in the Swiss population: model-based predictions at individual level and measurement-based predictions based on measurements aggregated at municipality level. A nationwide model was used to predict radon levels in each household and for each individual based on the corresponding tectonic unit, building age, building type, soil texture, degree of urbanization, and floor. Measurement-based predictions were carried out within a health impact assessment on residential radon and lung cancer. Mean measured radon levels were corrected for the average floor distribution and weighted with population size of each municipality. Model-based predictions yielded a mean radon exposure of the Swiss population of 84.1 Bq/m^3. Measurement-based predictions yielded an average exposure of 78 Bq/m^3. This study demonstrates that the model- and the measurement-based predictions provided similar results. The advantage of the measurement-based approach is its simplicity, which is sufficient for assessing exposure distribution in a population. The model-based approach allows predicting radon levels at specific sites, which is needed in an epidemiological study, and the results do not depend on how the measurement sites have been selected.

Practical Implications Accurate assessment of radon exposure at population level is important for health impact assessments. Radon measurements are the gold standard to determine radon levels in a specific building. However, population radon exposure assessment may be biased, if measurement sites are not selected in a representative way. This study demonstrates that a nationwide prediction model is suitable for assessing radon exposure at population level. The model-based approach is unlikely to be affected by the way the measurement sites are selected. Uncertainties of the model-based approach depend on the underlying regression model and not on the number of available measurements per community. Further, the model-based approach allows estimating radon levels in specific subgroups (e.g., age-groups, regions, or building age) and is useful for identifying buildings with a high radon risk in a systematic way.

Z. T. Ai, C. M. Mak and J. L. Niu - Numerical investigation of wind-induced airflow and interunit dispersion characteristics in multistory residential buildings

Abstract Compared with the buoyancy-dominated upward spread, the interunit dispersion of pollutants in wind-dominated conditions is expected to be more complex and multiple. The aim of this study is to investigate the wind-induced airflow and interunit pollutant dispersion in typical multistory residential buildings using computational fluid dynamics. The mathematical model used is the nonstandard k–ε model incorporated with a two-layer near-wall modification, which is validated against experiments of previous investigators. Using tracer gas technique, the reentry of exhaust air from each distinct unit to other units on the same building, under different practical conditions, is quantified, and then, the possible dispersion routes are revealed. The units on the floor immediately below the source on the windward side, and vertically above it on the leeward side, where the reentry ratios are up to 4.8% and 14.9%, respectively, should be included on the high-infection list. It is also found that the presence of balconies results in a more turbulent near-wall flow field, which in turn significantly changes the reentry characteristics. Comparison of the dispersion characteristics of the slab-like building and the more complicated building in cross (#) floorplan concludes that distinctive infectious control measures should be implemented in these two types of buildings.

Practical Implications The realization of the interunit dispersion routes and quantification of the reentry ratios in a typical multistory building with a source located in different units, under different practical conditions, can be useful from both academic and practical points of view. Academically, this study enhances the understanding of the pollutant dispersion mechanism around built environment under such a coupled indoor and outdoor airflow condition. Practically, it helps the building officials and designers to implement more effective and immediate infectious intervention strategies.

N. Hashiguchi, A. Takeda, Y. Yasuyama, A. Chishaki and Y. Tochihara - Effects of 6-h exposure to low relative humidity and low air pressure on body fluid loss and blood viscosity

Abstract The purpose of this study was to investigate the effects of 6-h exposure to low relative humidity (RH) and low air pressure in a simulated air cabin environment on body fluid loss (BFL) and blood viscosity. Fourteen young healthy male subjects were exposed to four conditions, which combined RH (10% RH or 60% RH) and air pressure (NP: sea level or LP: equivalent to an altitude of 2000 m). Subjects remained seated on a chair in the chamber for 6 h. Their diet and water intake were restricted before and during the experiment. Insensible water loss (IWL) in LP10% condition was significantly greater than in NP60% condition; thus, combined 10%RH and LP conditions promoted a greater amount of IWL. The BFL under the LP condition was significantly greater than that under the NP condition. Blood viscosity significantly increased under LP conditions. Increases in red blood cell counts (RBCs) and BFL likely contributed to the increased blood viscosity. These findings suggest that hypobaric-induced hypoxia, similar to the conditions in the air cabin environment, may cause increased blood viscosity and that the combined low humidity and hypobaric hypoxia conditions increase IWL.

Practical Implications An increased incidence of venous thromboembolic events (VTE) following long-haul flights is now well documented. However, it is not clear whether cabin environmental factors contribute to air travel–related VTE. To address this question, we evaluated body fluid changes and blood viscosity associated with exposure to low air humidity and air pressure in a climatic chamber where each condition can be controlled independently. This study demonstrated a relationship between these cabin environment factors and the risk of VTE.

THIS SPACE IS AVAILABLE FOR **YOUR** NEWS IN THE NEXT ISSUE OF THE NEWSLETTER – TELL YOUR COLLEAGUES ABOUT ARTICLES YOU HAVE HAD PUBLISHED, GRANTS YOU HAVE RECEIVED, NATIONAL OR INTERNATIONAL NEWS OF INTEREST TO THE ISIAQ COMMUNITY. PLEASE SEND US YOUR NEWS ITEM, LESS THAN 300 WORDS IN LENGTH.

THANK YOU IN ADVANCE

About ISIAQ

With more than 800 members from more than 45 countries, ISIAQ is an international, independent, multidisciplinary, scientific, non-profit organization whose purpose is to support the creation of healthy, comfortable and productive indoor environments. We strongly believe this is achievable by advancing the science and technology of indoor air quality and climate as it relates to indoor environmental design, construction, operation and maintenance, air quality measurement and health sciences.

As a Society, our major role is to facilitate international and interdisciplinary communication and information exchange by publishing and fostering publication on indoor air quality and climate. We organize, sponsor and support initiatives such as meetings, conferences, and seminars on indoor air quality and climate; and we develop, adapt and maintain guidelines for the improvement of indoor air quality and climate.

ISIAQ's journal, *Indoor Air*, published six times per year, is the most respected and widely-cited source of scientific information relevant to building scientists and professionals. Our two major international conferences -- the Indoor Air 'xx and the Healthy Buildings 'xx conference series -- set the standard for high quality scientific information and its application to making healthy buildings. We also cooperate with government and other agencies and societies with interests in the indoor environment and climate.

To find out more about us, visit our website: http://isiaq.org

International Society of Indoor Air Quality and Climate—ISIAQ

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Corporate Memberships are available

If your organization is involved in indoor air science, policy, or practice, a corporate membership in ISIAQ will place you in the limelight with the international indoor air community.

- ISIAQ reaches more than 45 countries around the world.
- ISIAQ's conferences, considered the most important in the field, have been attended by more than 4,000 individuals.
- The official Society journal, *Indoor Air*, is respected by scientists and policy-makers as the most reliable way to keep up with the latest scientific findings in the field.

To learn more about the benefits of corporate membership in ISIAQ, visit the membership page on our web site and click on the corporate membership link.

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