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SCIplanet

EYE ON SCIENCE

SCIENCE EVERYWHERE

SCIENCE AT WORK

THE LABOR OF SCIENCE

By: Maissa Azab

Unless you work in a purely scientific field, you probably do not expect to see any science looking around your workplace: correct? Wrong! Science is everywhere; we already discussed how it is all over our homes, and now it is time we look around workplaces for the science at work.

It might be easier to imagine science at workplaces and industries that obviously require scientific research and innovation; for example, oil extraction. In reality, however, it is in all industries; from buildings, through machinery, to methods of production, science is evident in every single aspect. Not just that, but it even manifests in how humans construct the buildings, run the machinery, and handle the production, all the while maintaining their own safety and staying out of harm's way; not just physically, but also psychologically.

Science is not just in industrial workplaces; it is also in the classroom, in business deals, and even at the office. Looking around the office, one can immediately see the fascinating results of long decades, if not centuries, of innovation. Not just that, but science is also in the psychology behind office layouts and how even that affects work dynamics, and, yes, productivity.

Let us not forget the fear of losing our work altogether because of science! Well, as science communicators, we do not believe that science leads to any harm. That is, as long as we humans stick to using it for good rather than evil, the latter of which can simply be the result of excessive or overzealous endeavors. At the end of the day, it is all simply a matter of reasoning and humanity; let us hope that they eventually win over greed and short-sightedness.

In this issue, we just scratch the surface of a very broad perspective of science; we will continue to dig into it through our online magazine at www.bibalex.org/SCIplanet, so be sure to keep an eye on it. Moreover, if you do not already receive our monthly e-newsletter and wish to, please write to us at PSCeditors@bibalex.org.

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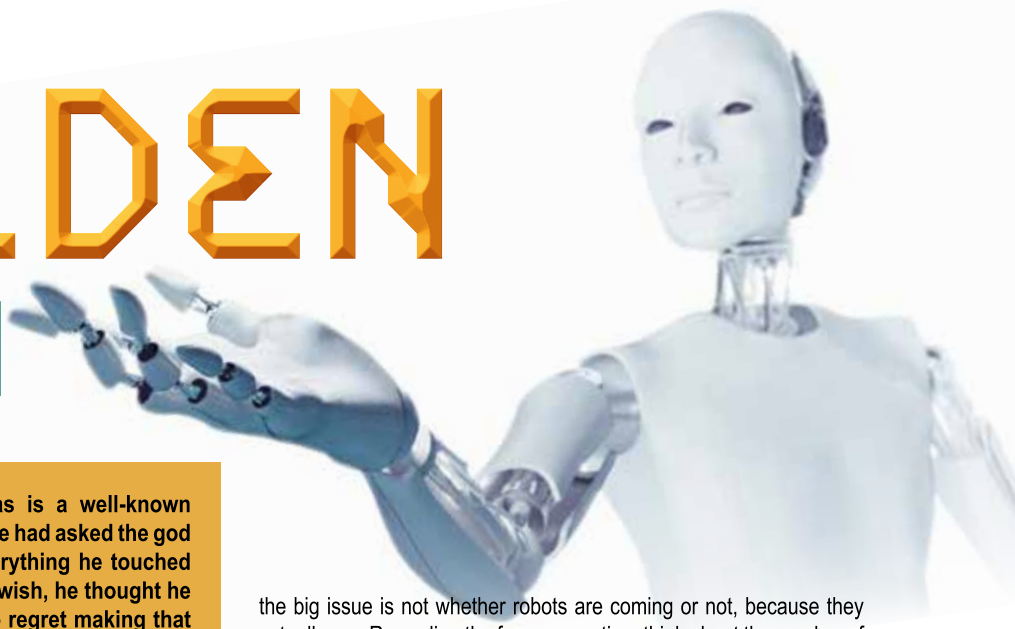
THE GOLDEN TOUCH



By: Esraa Ali

In Greek mythology, King Midas is a well-known figure famed for his bad judgment. He had asked the god Dionysus for the ability to turn everything he touched into gold; when he was granted his wish, he thought he had good fortune. He soon came to regret making that wish, for he just wanted to be rich, but did not actually want to turn his food and loved ones into gold!

In reality, in King Midas' story and his misjudgment, we can see clear echoes of what we are witnessing today. We admire the increasingly intelligent machines, while turning a blind eye to human values.

The concept of Artificial Intelligence (AI) was created in the 1950s by scientists who worked on developing futuristic intelligent machines that mimicked Natural Intelligence (NI) displayed by humans and animals. They sought to make AI solve human issues by mimicking the cognitive functions of the human mind, such as learning and problem solving.

Today, AI is no longer the future; it is seen in our homes, at the workplace, and everywhere. The technology is capable of perceiving sounds and images, understanding by processing language and information, and acting accordingly. AI systems are now capable of learning and adapting to new situations, in a human-like way, while disregarding human emotional values, which they were not optimized to take into account.

In the business world, for instance, that daily feeling of not having enough hours to accomplish everything has been replaced by smart computers, which can accomplish certain tasks while workers gain additional time to perform more important tasks. You can think, too, of contacting a customer service team that is supported by live chat sessions to answer basic customers' questions.

People have, thus, started to ask "Will robots take our jobs?" They fear that AI systems will one day replace human beings; however, the big issue is not whether robots are coming or not, because they actually are. Regarding the former question, think about the number of dangerous jobs humans need not do anymore, rather than thinking of AI taking our jobs away! Yet, we need to ask ourselves "Are we ready for the challenges of increasingly intelligent machines?"

Some might fear that empowering AI would lead robots to revolt in the future against humanity; however, scientists explain that AI agents optimize to whatever we tell them to do. The idea is to make sure they are optimized to do what would be of benefit. Similar to King Midas' wish, AI is considered a danger to humanity if it progresses unabatedly; it can be used for good and evil.

The problem of values' alignment is that human values are not the same and we need to define what these values actually are. Human beings understand emotional and sentimental values that they are familiarized with, but it would be hard to guarantee that robots will be programed too.

Human values differ according to several variables, including cultural differences and socioeconomic backgrounds. One man's good could be another man's evil, and that is the challenge we must remain aware of. This point of view was raised in 2015 by the British–American computer scientist Stuart Russell, Professor of Computer Science and Founder of the Center for Intelligent Systems at the University of California, as he drafted the first open letter calling researchers to look beyond the goal of merely empowering AI.

Scientists are now working on this prospect by asking people to agree on the nature of human values that AI needs to understand, identify what it means to have AI aligned with their own life goals, and to align at the same time with everyone's aspirations in the world.

A decade ago we made a wish and we were able to turn it into reality; since then, we have been replacing everything in our lives with technology. We are not sure if that wish will harm people in the future, or not, in a misguided attempt to do what AI is requested to do. Yet, we are more fortunate than King Midas, as we are not simply a myth or a machine; we are human beings and we still have the opportunity to turn our wishes into good deeds!

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Work is an indispensable means for survival; it provides us with our basic needs of food, clothing, and shelter. Throughout human history, no profession has remained unchanged though, as technology and consumers' habits evolve. The pace of technological advancement is accelerating significantly, and so is the nature of work and the way it is performed. Several jobs of today did not exist a decade ago and new jobs are continuously unfolding. While some professions are dangerous, others are endangered; that is why we always wonder how work would look like in the future?

As science is based on facts and we are not futurists—even futurists sometimes get it wrong—we can have a glimpse of jobs since Antiquity, and know when work has started to make predications for the coming years.

Once upon a time

Mankind's basic needs have always been the same since Antiquity, except for further life complexities. As human beings developed a more complex brain structure and linguistic communication, they developed more complex tools to conquer nature, differentiating themselves from any other species.

We do not know precisely when work was invented, but it is believed to be as early as the start of human civilization.

In Prehistoric times, work included simple tasks to cover Man's basic needs; such as child care, hunting animals, gathering plants, and finding shelter.

Later on, these tasks evolved along with the increase of human needs. The idea of work division may have aroused from the differences humans noted in age and physical appearances, as well as the proficiency some individuals showed in executing particular tasks. Accordingly, various specializations developed; such as potters, weavers, farmers, metalworkers, and physicians.

One day

Technology became a threat with the start of the Industrial Revolution; the professions Man had known remained unchanged for thousands of years, but the Revolution changed everything. People's way of life and their manufacturing methods were altered during the 18th and 19th centuries; people started discussing the transition from old to new after long ages of stability.

The Industrial Age brought major changes to life as it went through three major phases. The first phase was the revolutionary invention of machines, replacing hand tools. The second phase was the larger Industrial Revolution, which was facilitated thanks to the use

of steam and other kinds of power that replaced human muscles and animals. The third phase was the adaptation of factory systems and digitization of production; machines took over several tasks Man used to do, but cognitive tasks remained the same.

Following the Industrial Revolution, working hours for many workers decreased from 60 hours per week to 40 hours a week. More drastically, the Industrial Movement spawned mass unemployment; a situation that was not resolved until after World War II, more than 200 years later.

And so ...

The Industrial Revolution has caused a recurrent fear that technology will replace workers, simply making them become obsolete; such as horses after the rise of automobiles. As we are not horses, that prediction has proven incorrect, because technology actually creates more jobs, even as it wipes out existing ones.

Yet, as history repeats itself, concerns continue to arise; the more automation and artificial intelligence increase, the more concerned people are. Following the Industrial Revolution, Man was able to boost technological advancement; however, machines started to take on several cognitive tasks too, raising a new disturbing question: What is left for humans to do in the future?

Technology unlocks untapped areas of human creativity and its increasing pace of change will definitely reshape careers of the future. Job transformation in the future may entail humans working side by side with robots; similarly as they previously found themselves working with giant machines. By and large, people would always find other jobs, but possibly after a long time.

And then ...

The Fourth Industrial Revolution is here, are you ready? "Welcome to the Fourth Industrial Revolution" is a sentence we lately hear referring to major technological advancement nowadays; it builds on the Third Industrial Revolution of digitization by fusing the digital, physical, and biological worlds. It is marked by emerging technology advances in several fields, including robotics, artificial intelligence, nanotechnology, biotechnology, 3D printing, Internet of Things, autonomous vehicles, quantum computing, amongst others.

In this light, job automation and job disappearance in the near future have become an active subject for study. Several predictions have been made in this regard and the results may seem disappointing. Yet, while technologies are actual and important, and many jobs will disappear, the future of work is not that gloomy.

Automation will replace human work of any replicable or consistent manual or cognitive task. Studies show that 47% of jobs will be automated, but this does not mean 47% of unemployment. In reality, the Fourth Industrial Revolution and automation will help create new jobs, including new job categories. Other studies show that around 65% of children entering primary schools today will likely work in careers that do not currently exist.

Studies also show that a majority of businesses believe that investing in skills is the key to success and managing disorders of the labor market on the long term. Workers must be wise as they attempt to understand these shifts in order to anticipate them and make decisions. This could be achieved if only major reinvention of work takes place soon, and that is why governments should invest more in education of skills.

It would really sound as if we are facing the end of work as we know it. The truth is that no one knows exactly the number of jobs at stake, and I believe this has been the case since the First Industrial Revolution—maybe even since Antiquity. Every technology has a dark side, and science can and is changing the world; yet, for the better.

There were good days and bad days

The story of work is still unfolding and the human experience will always amaze us, as it reforms the world around us in a more accelerated fashion than before. Maybe someday robots will replace humans in all their careers, but there will always be jobs left that we prefer humans to do.

As social animals, we will always value and appreciate social and emotional intelligence; the irony in our technological future will be appreciating our humanity more than technology. The Artificial Intelligence Revolution is just helping us rediscover what makes us human. Robots will simply convey the human experience but no machine will truly experience life or love as we do.

Now, take a deep breath and remember we have been here before.

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The Office

By: Maissa Azab

The office—the actual one, not the TV show—is where many of us spend the majority of our weekdays, if not weekends as well, from the time we graduate from school or college, until we retire. This makes it literally the second most important place in our lives after our homes; it is, thus, no wonder that the evolution of the office reflects, to a great extent, our own evolution. Indeed, the history of the office illustrates not only how our work has changed, but also how physical workspaces respond to cultural, technological, and social forces.

Offices of Yesteryears

Offices have existed in some shape or form throughout history as a means of a person, or body of people, to conduct official administrative business. It is based on the Roman Latin *officium*; a term loosely meaning "bureau". In ancient Rome, it was not so much a specific place or building, but the people within it; hence, the phrase "The Office of the Prime Minister", for example.

In Medieval Times, however, offices were rare, as most people worked from home. It was not until the 17th century that lawyers, civil servants, and other new professionals began to work from offices in Amsterdam, London, and Paris. This led to a cultural distinction between the office, associated with work, and the home, associated with comfort, privacy, and intimacy.

It is difficult to fathom that gigantic, multi-functional organizations did not exist in quite the same size and relative complexity as Roman bureaucratic government until the 18th century. At that time, organizations were established to further Britain's interests overseas; to manage their incredibly varied tasks and organization, a central base of operations needed to be built.

In the early 20th century, many factors came together to give rise to the modern office. The invention of electric lighting allowed employees to work without expensive gas lighting or many windows. Typewriters and calculation machines allowed for the processing of vast amounts of information. Communication devices, as the telegraph and telephone, allowed office buildings to be situated away from factories, homes, and even countries of operation, without losing control over them.

The Ascension of the Office

The Industrial Revolution had completely modernized manual labor and production; office design would now modernize white collar labor in a similar fashion. Office designs have cycled through competing demands though; openness vs. privacy, interaction vs. autonomy. This evolution took place to reflect the changing attitudes towards work.

In the early 1900s, the earliest modern offices were remarkable for their emphasized efficiency and the adoption of a rigid, regimented office layout. The "Taylorist Office", following the methodology of American Engineer Frederick Taylor, crowded workers together in a completely open environment, while bosses looked on from private offices, much like on a factory floor. There has been much criticism of this approach, as it failed to take into consideration human and social elements, and focused exclusively on ensuring employers gained maximum productivity from their staff.

Expensive land prices, together with the invention of the lift and steel-frame

construction, allowed for the rise of skyscrapers in 20th-century Chicago and New York, leading to the rapid evolution of office design. Larger workforces could be moved into open plan offices, working in natural light or under electric lighting; soundproofing and partitioning provided the necessary isolation of employees.

As skyscrapers and other large commercial buildings were developed, the workplace altered to become a space where there was a mix of private offices and open plan workstations; in some cases, a dedicated staff kitchen or canteen. The 1930s gave rise to more aesthetically pleasing offices; the "Streamlined Office" was developed in tandem with architecturally modernist buildings based on "the coming together of a society". A more modern space for workers was achieved using bright lights, warm spaces, and cork ceilings, which played a major role in absorbing office acoustics, to compensate for the lack of interaction with the outside world.

The 1950s brought further advances into building with modern materials, as steel and glass. The smart, clinical architecture of the international modern movement was adopted as the new image of corporate business. With the widespread use of advanced air-conditioning and fluorescent lighting, high-rise buildings had very little need for natural light or ventilation through opening windows. With these technological developments, the corporate office became completely autonomous from the outside world, with wider, more open plan floors where workers could be placed virtually anywhere.

The Revolution of the Office

The German "Office Landscape" brought the socialist values of 1950s' Europe to the workplace; management was no longer indulged in executive suites. Based on progressive, socio-democratic principles, the system recognized and allowed for wide diversity of different office work; hence, encouraging staff of multiple levels to sit and work together, in an effort to improve collaboration and communication in the office environment.

Unlike its strict, regimented predecessors, Office Landscape consisted of free and open plans of furniture scattered in large, rather organically-divided spaces with different environments divided less rigidly and creatively using partitions and plants, depending on the type and function of workers inhabiting them. For example, workers in creative fields, like advertising or media, could be grouped loosely where they could easily interact more frequently; whereas more bureaucratic, corporate staff was situated in more regimented, subdivided areas.

The Subjection of the Office

The sheer nature of the Office Landscapes' open, scattered, and charmingly random layout did not lend itself well to worldwide adoption. As it evolved, a new approach created by Herman Miller and known as the "Action Office" emerged in the late 1960s. The first modular business furniture system, with low dividers and flexible work surfaces, it differed in that it included a variety of alternate work settings for staff, increased freedom of movement, provided a greater degree of privacy when working, and mitigated noise issues. The model is still in production today and is widely used; you probably know it by its generic, more disturbing name "the Cubicle".

In the 1980s, the "Cube Farm" was the cubicle concept taken to the extreme. As the ranks of middle managers swelled, a new class of employee was created; too important for a mere desk, but too junior for a window seat. Facilities' managers accommodated them in the cheapest way possible, with modular walls; the sea of cubicles was born. The manifestation of the Action Office taken to its absolute dystopian limits, the infamous Cubicle Farm was born because senior executives were less interested in the well-being of their workers than they were in their profitability.

Furniture designers tried to part the sea of cubicles and encourage sociability—without going nuts. Knoll, for example, created systems with movable, semi-enclosed pods and connected desks the shape of which separates work areas rather than dividers. However, it took the advent of technology in the workplace to force companies to look at office design in a more holistic, human-centered manner.

The Modern Office Conundrum

The character of office work evolves constantly, together with the scope of duties, technology development, changing management style, and employees' needs. The process of office evolution can be presented by three transitions: from stationary to mobile work, from routine to conceptual work, and from individual to team work.

As of the 1990s, the World Wide Web brought with it the development of an office phenomenon first seen at the turn of the 20th century. Widespread new technology, the Internet, laptops, and mobiles could move offices, workers, and work away from the typical office and their desk, ushering in a golden period for office design where new, more flexible ways of working such as Agile and Activity- Based Working (ABW) became increasingly popular.

Mobility means working in different office zones, not only at one's desk. External mobility is becoming popular as well; it is based on remote work from home, a cafe, business trips, or different departments. As mobility became the norm, office design began to embrace "Hot-Desking" where staff are not allocated space, but rather picked an available space to work from. This system saves space, utilizes new communication technology to save money, promotes a more flexible working environment, and encourages more collaboration.

These advances in office design seek to change the working culture of the organization; nevertheless, this type of "Virtual Office" has its drawbacks. In the actual office environment, it can be difficult for employees to identify or feel at home. Even the dreaded cubicle was territorial, allowing for workers to customize their own space; hot-desking, however, meant employees were less grounded.

Moreover, duties that were based on routine, repetitive tasks in the past are now changing into more conceptual mental work that requires focus and concentration. Modern offices based on the open space concept do not provide employees with proper conditions for performing those tasks. Research confirms that noise and lack of possibilities to work quietly are the biggest disadvantages of open spaces.

A great number of Dot-Com Companies in the late 1990s embraced smaller, quirkier, more colorful offices that aligned with their progressive, exciting new image. Designed to encourage highly-personalized workspaces suited for long hours spent programming, analyzing data, building links, or designing graphics, the quirky, casual offices retained elements of the Open Plan, only with zany, loud color schemes, and novel themes. A sense of fun was also instilled with the addition of leisure areas and creative spaces with pinball machines, beanbags, table tennis tables, and dart boards. The dress code had become much more relaxed than the conventional suits and ties of the previous century and the layouts had to reflect this.

The emergence of the "Casual Office" space, inspiring communication and collaboration amongst employees, shows significant flaws for many of its overly-sociable occupants. Miscellaneous noises, abrasive music, and other distractions are among the worst complaints, as well as lack of privacy. The lack of a quiet, territorial space also means many employees finding themselves interrupted by their colleagues, which in turn negatively impacts their work. However, locking employees away in private offices, never to communicate or collaborate with their colleagues, leads to other issues.

Contemporary, responsive spaces that remain open, but separate, allow for collaboration, inspiration, mobility, and the completion of specialist projects without the worry of crowding or disruptions from one working style to another. Agile working environments allow staff to work effectively in different environments within the same space. Workplace wellbeing initiatives not only save money through boosting productivity and reducing absence from work, but they also make staff feel valued, and produce a far more effective, cohesive, and motivated workforce.

For this reason, many forward-thinking companies have taken the changes necessary to improve workplace wellbeing into account when designing and fitting out a new office space. As the history of office design continues to unfold, today it has reached a point where the modern workplace takes inspiration from the home, through the use of warm colors, intimate lighting, and soft seating.

In a world that is becoming more and more conscious of the negative effects of greenhouse gases, the growing scarcity of fossil fuels, and the financial benefits of energy efficiency, office design has also started moving towards incorporating sustainability as a core principle. As well as benefitting the environment, energy efficiency and cutting waste benefit companies by saving significant amounts of money that would otherwise be wasted on fuel bills, stationery costs, and temporary "quick fixes" that do not ultimately remedy inefficiency problems.

Throughout the evolution of office design, many design elements have come, gone, resurfaced and repurposed. From the white-collar assembly line across the great factory floors of the Taylorist Office, to the territorial-yet-trapping Cubicle Farm, the majority of office design has been an extension of the capitalist business ethos: productivity, cost-efficiency, and growth. However, the employee has become the center of the office design blueprint. Companies are realizing that productivity begins with the producers, from the managers at the top to the trainees at the bottom.

The key to increasing productivity and the way forward for businesses is to look after their employees, nurture their growth, encourage their skill development, then retain them. The most important, basic elements of company success lie in employee cultivation, and that starts with the blueprints and evolution of the humble office space.

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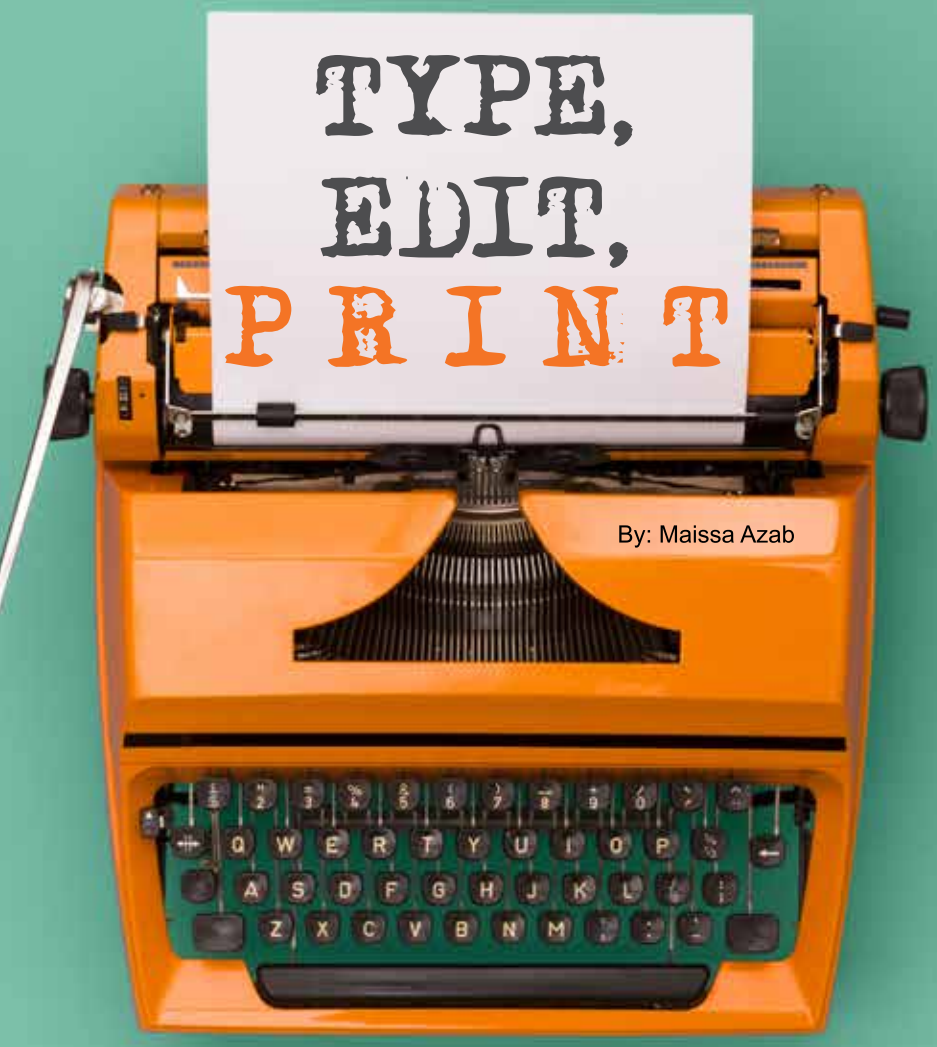


By: Maissa Azab

One of my forte's at work, if you may call it that, is typing; in all truth though, my typing is quite the standard level. However, because it is not common in Egypt, as it is in other countries, to teach typing at school, knowing how to type at all is considered kind of a skill here.

There are two reasons I bring that up. The first is the fact that, although I had enrolled in a course to learn how to type by an instructor, back in the early 2000s, we were actually taught using a software program, which means anyone can really, quite easily learn to type at home. The second reason is the fact that typing on a computer's keypad is a far, far cry from typing on a typewriter, even the most modern of them, and by modern I mean those of the late 20th century. I know because we had one at home and I cannot envy anyone who had to type for a living before the keypad was invented, simply because I can still remember how hard those letter buttons were to push down.

That said, we must not forget that the typewriter was once a breakthrough invention that had actually made office workers' lives much easier in comparison to how they had to do their jobs earlier. We must also remember that, for long centuries, all writing, illustration, and copying was done by hand. Several different materials were used back in history to transcribe documents and publications; however, it was not just anyone who was allowed to do this. Such work was reserved for scribes who lived and worked in monasteries. That was until Gutenberg finally invented the printing press in the 15th century.

First, there was the Printing Press

During the 1300s and 1400s, people had developed a very basic form of printing. It involved letters or images cut on blocks of wood; the block would be dipped in ink and then stamped onto paper. Around the late 1430s, quite desperate to find a way to make money, Johann Gutenberg realized that, if he could use cut blocks within a machine, he could make the printing process a lot faster; even better, he would be able to reproduce texts in great numbers.

Using metal instead of wood blocks, Gutenberg's machine was known as a "movable type machine", because the metal block letters could be moved around to create new words and sentences, albeit in reverse. Operated by hand, the blocks were inked and a sheet of paper is laid on them; when the paper lifted, the reader can see the inked letters normally as a result of the reversed blocks.

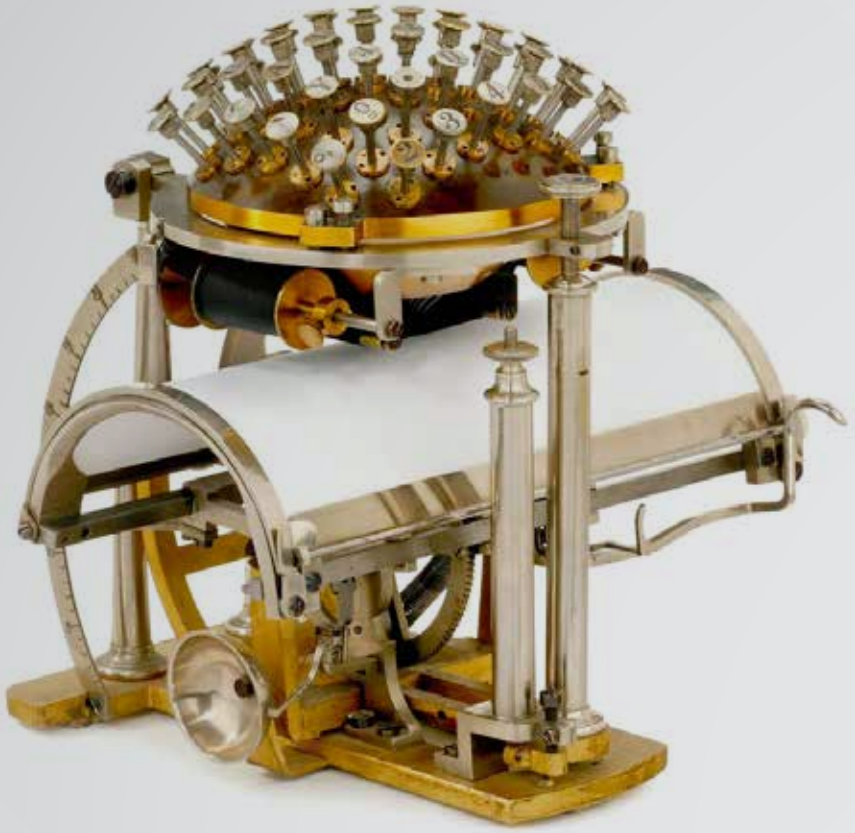
Towards the 19th century, steam-powered printing presses that did not require a hand operator were invented. Today's printing presses, however, are electronic and automated, and can print much faster than ever before. In a nutshell, modern offset printing involves using a computer to create a plate, which is then placed on a cylinder. Ink is applied to the plate cylinder, which rolls against a rubber cylinder, which in turn rolls the ink onto sheets of paper fed through the press.

Offset presses are used to mass produce newspapers, magazines, books, and other printed materials. However, it is not economical in low volumes; primarily, because plates can cost a lot to produce. That is insignificant when printing hundreds or thousands of the same item, but it can be costly when printing a few copies. Digital presses, on the other hand, make low-volume printing affordable, because they do not require plates. Instead, they use inkjet or Laser Jet technology to transfer ink onto paper.

For long centuries, all writing, illustration, and copying was done by hand.

Then, came the Personal Typewriter

The concept of a typewriter dates back at least to 1714, when Englishman Henry Mill filed a vaguely-worded patent for "an artificial machine or method for the impressing or transcribing of letters singly or progressively one after another". Yet, the first typewriter proven to have worked was built by Italian Pellegrino Turri in 1808.



Numerous inventors worked on typewriters in the 19th century, but successful commercial production began only with the "writing ball" of Rasmus Malling-Hansen in 1870; this well-engineered device looked rather like a pincushion. Much more influential was the Sholes & Glidden Typewriter, which began production in late 1873 and appeared on the American market in 1874.

Like many early typewriters, the S&G was a "blind" writer; the type-bars were arranged in a circular basket under the printing surface, which meant that the typist—confusingly called a "typewriter" in the early days—had to lift up the carriage to see the work. The S&G looked rather like a sewing machine, as it was manufactured by the Sewing-Machine Department of the Remington Arms Company.

The S&G typed only in capital letters. It introduced the QWERTY keyboard, later known as the "Universal" keyboard, which is very much with us today. The keyboard was probably designed to separate frequently-used pairs of type-bars so that the type-bars would not clash and get stuck at the printing point.

The Hammond, however, was on the scene in 1884 with its own keyboard; the two-row, curved "Ideal" keyboard. The Hammond prints from a type shuttle, a C-shaped piece of vulcanized rubber; the shuttle can easily be exchanged when you want to use a different typeface. There is no cylindrical platen as on type-bar typewriters; the paper is hit against the shuttle by a hammer.

The effort to create a visible rather than "blind" machine led to many ingenious ways of getting the type-bars to the platen. The Daugherty Visible typewriter of 1891 was the first front-stroke typewriter to go into production. The type-bars rest below the platen and hit the front of it. By 1920s, virtually all typewriters were "look-alikes"; front-stroke, QWERTY, type-bar machines printing through a ribbon, using one shift key and four banks of keys.

The early portable typewriters of the late 19th century were slow, awkward, type-wheel machines. In 1909, the first successful portables appeared on the market. By the 1950s, practically every typewriter manufacturer produced a portable typewriter; all of them were type-bar machines similar in operation to the office machines. Designed with lighter parts than those of standard models, portables are more compact, but less sturdy. Electrical operation of portable typewriters was introduced in 1956.

Then, the Electric Typewriter

In 1893, George Blickensderfer unveiled a manual typewriter that featured an interchangeable type-wheel at the Columbian Exposition in Chicago. Naming it the "Five Pound Secretary", this small machine featured long spider-like keys and an oak wood case. The machine struck a chord with the American public and its popularity skyrocketed. By 1896, 10,000 Five Pound Secretaries were produced per year.

In 1903, Blickensderfer introduced the first mass produced electric typewriter, the "Blick". Similar to its manual predecessor, the Blick featured a cylindrical type-wheel and the established QWERTY keyboard, but also carried light key touch, even typing, automatic carriage return, and line spacing. Customers who were unfamiliar with the QWERTY keyboard even had the option to choose a different style. Despite these clear electronic advancements, the Blick never became a success.

Electricity had still not been standardized and currents differed from place to place.

The machine was simple to use; electrical advancements at the time, however, hindered its progress. Electricity had still not been standardized and currents differed from place to place.

In 1920, James Fields Smathers invented a faster electric model and eventually sold it to the North East Electric Company in 1923. Looking to further develop this machine, the North East Electric Company partnered with Remington Electric in 1925, and successfully sold Remington Electric typewriters that were powered by North East Electric Motors. In 1928, North East Electric was purchased by Delco, which eventually decided to enter the typewriter business for itself. Delco then formed the business Electromatic Typewriters, Inc., and produced the first Electromatic Typewriter in 1929.

By 1933, Elecrtom Typewriters, Inc. had been acquired by the International Business Machines Corporation (IBM), which redesigned and perfected the machine. In 1961, IBM debuted the Selectric typewriter series, featuring a removable type-ball with reversed lettering on it that rotated to provide jam-free, multi-font documents. In 1964, when IBM introduced a magnetic-card recording device into a Selectric typewriter, the future of the office, and our expectations of it, changed forever. This early word processor could store information; it was the start of computer-based work and early fears of a jobless society due to automation.

Finally, the Word Processor

Word processing did not develop out of computer technology; it evolved from the needs of writers rather than those of mathematicians, only later merging with the computer field. The history of word processing is the story of the gradual automation of the physical aspects of writing and editing, and the refinement of the technology to make it available to individual and corporate users.

When IBM introduced the Magnetic Tape/Selectric Typewriter (MT/ST), the magnetic tape was the first reusable storage medium for typed information. With this, for the first time, typed material could be edited without having to retype the whole text or chop up a coded copy. On the tape, information could be stored, replayed, corrected, reprinted as many times as needed, then erased and reused for other projects. This development marked the beginning of word processing as it is known today.

The most important advance in word processing was the change from "hard wired" instructions built into the machinery to software on disks.

It also introduced word processing as a definite idea and concept: "electronic ways of handling a standard set of office activities—composing, revising, printing, and filing written documents". In 1969, IBM introduced MagCards, magnetic cards that were slipped into a box attached to the typewriter and recorded text as it was typed on paper. The cards could then be used to recall and reprint text; however, only about one page-worth of text could be stored on each card.

In 1972, Lexitron and Linolex developed a similar word processing system, but included video display screens and tape cassettes for storage. With the screen, text could be entered and corrected without having to produce a hard copy. Printing could be delayed until the writer was satisfied with the material.

Developed by IBM in the early 1970s, the floppy disk marked a new stage in the evolution of storage media. Previous storage media could only hold one or two pages of text, but the early disks were capable of holding 80–100 pages. The increased storage capacity permitted the creation and easy editing of multipage documents without the necessity of changing storage receptacles.

The most important advance in word processing was the change from "hard-wired" instructions built into the machinery to software on disks. When the programs were part of the equipment, they were difficult to change and expensive to upgrade. Programs on disks could be updated more economically, since a rewritten program could be loaded into and used with the same hardware as the previous one.

Before disk programs, most word processing packages were "dedicated" systems, which were bulky and expensive, and did not admit computing functions other than word processing. Disk programs made it practical to develop packages for use with personal computers. The separation of the software from the hardware also opened up the field to individuals; word processing is now one of the most common general applications for personal computers.

The evolution of the written word has been truly remarkable. Yet, it is most certainly the minds behind the words and the technologies that have made them so easy to process and document that hold the true power in the workplace and elsewhere for that matter.

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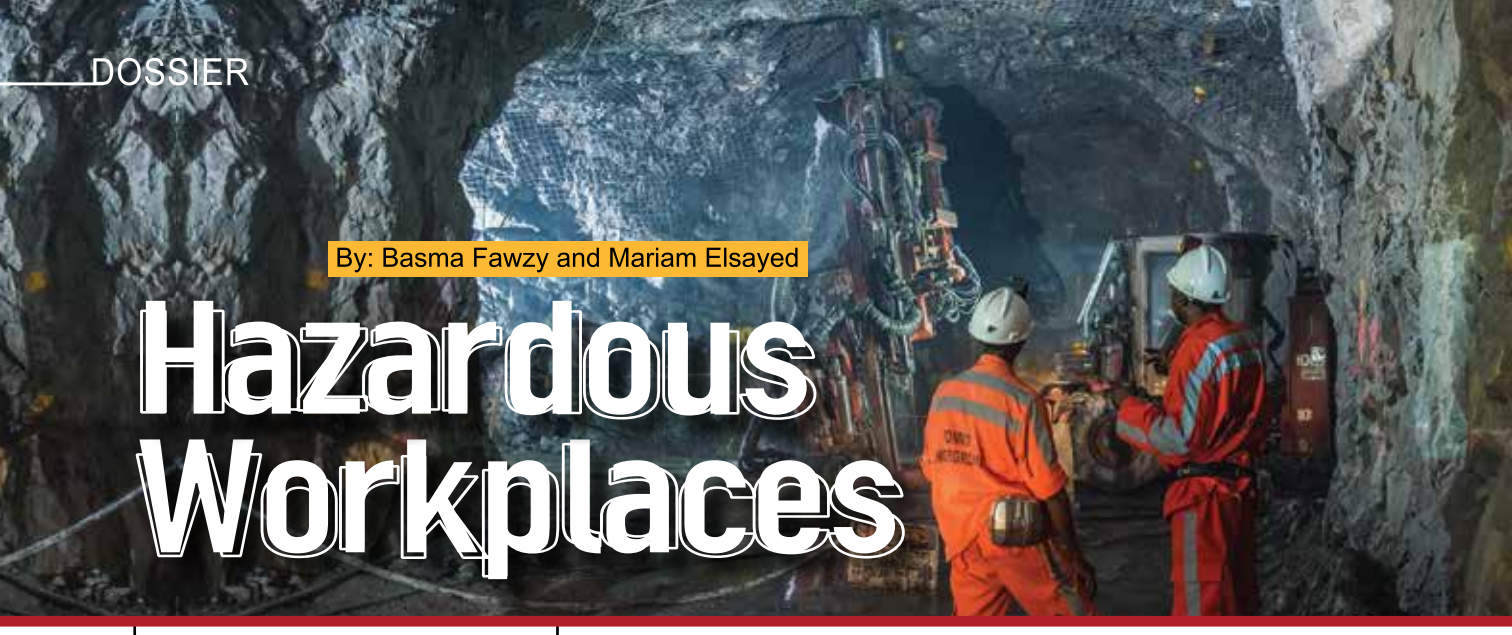

By: Basma Fawzy and Mariam Elsayed

Hazardous Workplaces

Working in hazardous areas entails several risks; from injuries to losing lives, hazards can occur sometimes in unlikely areas. Let us start with exposing the dangers of working below the surface of the Earth, then move to its surface and uncover the unknown risks behind building the Pyramids.

Mining has always been one of the most hazardous jobs; workers face many risks, including the collapse of mines, also known as cave-in. The hazard lies in the fall of heavy rocks on workers causing death or injuries; if nothing falls directly on workers, they can be trapped inside, but they are likely to starve or suffocate.

If cave-ins do not occur naturally, they might be induced by explosions, which are not unlikely in mines. Explosions occur due to the presence of methane gas, which is released during the mining process. Miners are also exposed to flooding of underground water or heavy rain water from outside. Risks in mines are not confined to cave-ins, flooding, or explosions; fine dust particles produced from the digging process may lead to dangerous lung diseases, such as silicosis and black lung due to dust accumulation. Mercury poisoning also occurs due to long exposure to it, as it can be found in 25% of mines.

Nowadays, raising awareness about the risks that are likely to occur while mining is a priority, as well as applying hazard prevention methods. In mines, underground mine ventilation is necessary to provide fresh air, remove the dust, and also regulate the temperature. Additionally, labels and signs that refer to dangerous areas are indispensable to the safety of workers.

Now, let us leave the mines and suffocating underground areas, and move to the surface. When building railroads, workers suffer from the substances used; for example, asbestos is a silicate material that resists burning and is used as heat insulator in manufacturing railroads. When its fibers are inhaled by workers for a long time, it causes asbestosis and other lung diseases. Long exposure to asbestos increases the chances of developing different types of cancer; because of its dangers, its usage was limited in the 20th century, but unfortunately it is still used in some countries.

To move from the known to the unknown, while building the Pyramids, major risks were definitely encountered. How the Pyramids were built raises a lot of questions; there are several theories, but there is no definite answer. Yet, based on the theories about the construction of the Pyramids, we can attempt to figure out an ignored aspect about them: the hazards faced at the construction site of the Pyramid.

The pharaohs had chosen different locations to build their Pyramids; for example, Khufu—the Great Pyramid of Giza—was built on a leveled rock, while Khafre and Menkaure were built on unleveled rock near it. Other pyramids were built on gravel, conglomerate, or just sand to be easily leveled; such as the layer step Pyramids.

It must have been very hard to transport the stones used in building the Pyramids as they weighed from one to hundreds of tons. Researches at Amsterdam University proved that the stones were pulled to the construction site on sledges, where the sand in front of it was wet to decrease the pulling force needed to the half. Lots of theories proved that Ancient Egyptians used ramps to lift the heavy stones depending on some paintings that included construction ramps; other theories declared that they used timber levers.

Considering the heavy rocks that were transported around from one place to another, one of the major risks might have been the falling of these rocks on the workers. Nothing confirms the conditions of the workers, safety measures involved, or the hazards found at that huge construction site. What we know is that the builders showed immense talent and that their knowledge of construction, despite their lack of our advanced equipment, has outweighed ours. Maybe more theories in the future will reveal the ignored aspect of workers' lives and their safety while building the Pyramids.

We work and dig to improve our quality of life, find minerals and valuables under the ground, build roads to reach far; we also build monuments to remind others of how glorious we are. However, we must not forget, reaching from the remote past to the present, that our greatest achievement should always be preserving lives through raising awareness of individual rights to a healthy and safe work environment.

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SAFETY FIRST

By: Basma Fawzy

Employees are a company's greatest asset; just as companies preserve and maintain their equipment, it is a priority to keep their employees safe, especially those working outdoors. Let us then review Personal Protective Equipment, also known as PPE.

Employees at a construction site are faced with several hazards, which include, but are not limited to, being exposed to harsh chemicals or loud noise that could impair their hearing. PPE are items you put on to protect yourself; such as gloves, helmets, safety shoes, protective glasses, ear plugs and muffs, etc. Each item plays an important role in personal safety:

• **Hand** injuries are common; hence, using a protective glove while working is important. Gloves differ depending on the task performed; for example, some gloves are cut-resistant, while others are heat-resistant. Therefore, it is important to know what you need gloves for to decide which ones to choose.

• **Eye** protection is also indispensable; protective glasses and shields prevent eye injuries that may result, for example, from chemical splashes, welding, etc., and vary accordingly.

• Safety shoes are also vital throughout the site; their importance lies in providing protection to the whole body, not just the **feet!**

They protect the feet from likely injuries, such as cuts that may result from a heavy object falling on to them, or a dangerous object that can penetrate regular shoes. Safety shoes protect also from tripping or falling, likely to occur when walking on a slippery surface.

• As for **ears**, they can be protected using ear plugs, ear muffs, or sometimes a combination of both is required; this, of course, depends on the intensity of the sound and its duration.

• Finally, the helmet or hard hat protects the **head** from numerous injuries that may occur if a heavy object falls on it.

PPE items discussed here are only basic. Each company identifies its requirements and educates its employees as to what items they should use and when. This leads us to the importance of raising employees' awareness; to get to know how, where, and when to use safety tools is the key to avoiding accidents on site. Knowledge is just as important as the availability of the tools.

To guarantee safety, companies provide training to ensure individuals are qualified to run certain equipment. They also raise employees' awareness of the dangers they may encounter while working at external sites. Repeatedly, companies remind their workers to never take their safety at work for granted, and that they should work on achieving that goal through vigilance and following safety measures to the letter. A company should ascertain that everyone has knowledge to stay safe and willingness to prevent likely injuries.

Additional measures are required to guarantee safety. Removing unnecessary objects from work sites is important to prevent tripping and ensuring no object is loose to prevent, for example, head injuries. During construction, some areas are barricaded so that nobody could walk on them; here comes the importance of signs.

Signs should be clear to achieve their purpose. They should be distributed throughout the site to ensure employees know which areas are safe and which are not. "Hard Hat Required", "Authorized Personnel Only", and "Open Pit Proceed with Caution" are among the signs that can be seen inside a construction site.

Your safety does not end at the equipment you use as some people may believe; it is a broader concept encompassing protection, vigilance, and knowledge of what to do, what to wear, where to walk, and how to prevent damage. It is, therefore, important to ask questions and share knowledge with others. Use common sense and remember it is better to be safe than sorry. Safety on site is everyone's responsibility, for as the Roman poet Horace once said: "Your own safety is at stake when your neighbor's wall is ablaze".

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Occupational DISEASES

By: Hend Fathy

Most of us adults spend at least one-third of our day at work. Sometimes, we get carried away with the several tasks we have to accomplish before the end of the working day, then suddenly feel physically exhausted or even pained. In fact, there are several factors contributing to our well-being at the workplace that are related to the work environment, the handled materials, the machinery, the postures, etc. Both work owners and employees have to consider these factors to maintain a healthy working power, increase productivity, and avoid occupational diseases.

The World Health Organization defines occupational diseases as those "contracted primarily as a result of an exposure to risk factors arising from work activity". Let us investigate some of the most notorious occupational diseases in detail and find out how to avoid them.

Occupational Overuse Syndrome

Occupational Overuse Syndrome (OOS) is among the most common occupational diseases. As the name suggests, this condition occurs when a certain activity is carried out over a period of time where there is an overuse of the affected area. In other words, it is caused by any repetitive work practice or activity that causes the muscles to be held tight and tense for long periods. For example, prolonged wrong seating postures for desk-based employees can lead to OOS.

The OOS symptoms develop gradually and worsen over time; if not treated, OOS can lead to losing muscle strength, burning sensations in the tissues, and sleep disturbances. Mild symptoms include fatigue, headaches, anxiety, and loss of concentration. Patients could also experience numbness, tingling, and spasms, as well as discomfort or persistent pain in muscles, joints, tendons, and nerves.

The treatment of OOS includes pain relieving and anti-inflammatory medications, relaxation exercises, and physiotherapy. To prevent OOS, workers and employers should avoid prolonged repetitive movements, take regular breaks, and maintain correct postures and a good level of general fitness.

Work-related Musculoskeletal Disorders (WMSDs)

These are a group of painful disorders of muscles, tendons, and nerves. They arise from repetitive, forceful, or speedy arm and hand movements; harsh temperatures and vibration also contribute to the development of WMSDs.

Muscle injuries occur due to prolonged muscle contractions that reduce the blood flow. As a result, some substances that are produced inside the muscles accumulate causing irritation and pains. The severity of the pain depends on the duration of the contractions and the intervals between activities to allow those irritating substances to move with the blood flow.

Tendon injuries can occur in tendons with sheaths found in the hand and wrist. With repetitive or excessive movement, the liquid that lubricates the tendon's friction with its sheath decreases or becomes less effective, causing inflammation and swelling of the tendon area. On the other hand, tendons without sheaths are found around the shoulder,

elbow, and forearm; fibers of these tendons can tear apart when repeatedly tensed.

Nerves damage as repetitive motions and awkward postures cause the tissues surrounding them to swell and compress them. The compression of nerves weakens muscles and causes sensations of numbness and tingling.

WMSDs can progress from mild to severe; hence, the treatment can vary from topical treatment to applying sophisticated surgeries. To avoid WMSDs, it is advisable that employers adopt mechanization for tasks that threaten human health; they should also apply a job rotation approach, which allows workers to move between different tasks, engaging different muscle groups.

Occupational Hearing Loss

Workers exposed to loud noises in the workplace can experience serious hearing deficiencies; a condition known as Occupational Hearing Loss (OHL). OHL is more prevalent in males and usually occurs during the first ten years of exposure; it is usually caused due to long exposure to noises over 85 dB. Around two-thirds of OHL cases occur in the manufacturing sector; other occupations include airline maintenance, mining, construction, orchestra, and the military.

OHL occurs when the air pressure resulting from prolonged exposure to noises damages inner ear receptors known as hair cells. Since hair cells do not regenerate, the hearing damage resulting from OHL is permanent. At early phases, OHL shows no symptoms, but it progresses gradually, causing inability to recognize speech in crowded areas and can even lead to permanent deafness. Moreover, OHL increases the risk of cardiovascular conditions, emotional stress, and depression.

OHL implies higher risk of industrial accidents and decreased productivity; workers should thus use ear protective equipment and undertake routine check-ups. Employers as well should apply the proper occupational safety measures; such as substituting sources of noise with less noisy alternatives, and designing tasks so that no one is exposed to loud noises for long periods.

Occupational Dermatitis

Exposure to harmful substances in the workplace causes what is known as occupational dermatitis. Most of the time, this occurs from direct contact with the substance; symptoms begin with redness, irritation, and swelling of the skin. In some cases, the exposure can cause a particular area of the skin to thicken forming small warts, which may turn cancerous over time.

Depending on the type of substance present, the patient may experience allergy or irritation. In both scenarios, the dermatitis is not infectious; if untreated, however, it may spread to other parts of the body. Therefore, it is essential to address the problem at an early stage. When workers develop an allergy to a particular substance, they will react whenever in contact with it; these reactions can be minor or serious. On the other hand, irritation occurs when the skin is exposed to a mild irritant, such as detergents, repeatedly over a long period of time. In this case, only the section of skin in contact with the substance will be affected.

To prevent occupational dermatitis, both employers and workers should be aware of the nature of each substance used at the workplace through reading the relevant labels and user manuals. Phrases such as “may cause skin sensitization” or “skin irritant” indicate that the substance can cause dermatitis. Protective barrier products, clothes, or Personal Protective Equipment (PPE) should be used all the time to prevent skin contact and absorption. Moreover, workers have to wash contaminated skin and change any contaminated clothing quickly.

I believe each and every one of us needs to revisit their daily experience at work and scan the possible threats and risk factors to our health and wellbeing. Speak to your employers and colleagues, share knowledge, and spread healthy practices. Last but not least, always remember that health comes first!

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SMART TECHNIQUES FOR SMARTER EDUCATION

Teaching has always been one of the hardest professions because of the effort teachers exert to deliver information to students. Teachers use different tools to facilitate their hard profession; one of which is the writing board, which is the oldest and best known tool. The board is the most important tool in the classroom; sometimes, it is the only tool the teacher uses to explain their subject. Boards have changed and developed over the years; from the wooden blackboard written on with chalk, to plastic white boards written on with markers, and finally the smart board.

The smart board is one of the latest advancements in educational tools; it is basically a large monitor connected to a computer and operates using a projector. Images and any stored data on the computer or available on the Internet can be easily displayed on the SMART Board.

The SMART Board is a huge touch screen; similar to any modern tablet or mobile that works by touch, responding to open, turn off, writing, and other commands. It works easily using the fingers or the smart pen; teachers can write on it, solve mathematical exercises, draw, open files and folders, or play videos, in addition to any other task a teacher needs to perform while teaching. In old versions, only one person could use the SMART Board at a time; however, newer versions support usage by multiple persons at the same time.

The SMART Board was invented by David Martin and Nancy Knowlton; it was first introduced in 1991, as a product of the"Smart Technology" Company. In 1992, the first smart board with "Rear Projection" was released; in 1999, the first plasma SMART Board was invented, then it was developed into the flat screen SMART Board in 2003. In 2007, the flat smart board was improved by adding a system that enables the teacher to record and monitor the students' performances and assess their examinations.

Smart educational techniques are not restricted to the SMART Board only.

The SMART Board has many advantages, which is why its usage in schools, lectures, and universities has been increasing in recent years. It completely changed the traditional writing experience on the Board, which used to consume most of the lecture or class time; moreover, when the writing was erased, it could not be restored again. The SMART Board does not require writing the lesson during the class; the lesson would be already stored on the computer to be displayed immediately on the Board whenever needed. Moreover, the lessons do not need to be erased after display, but can be displayed again anytime the teacher wants. The SMART Board has several features to adjust the display's resolution, the colors, and the displayed pictures size. This enables the teacher to make the lessons more attractive and easier to comprehend, especially for young students, through using cheerful colors, illustrations, and educational movies that facilitate the educational process.

Smart educational techniques are not restricted to the SMART Board only. Recently, school exams, especially international ones, have changed. Rather than essay questions that require a lot of writing, multiple choice questions are now more prevalent; as a result, the marking exam process has also changed.

Rather than teachers spending long hours marking hundreds of exam papers, which is an exhausting process that may entail errors, an exam correction machine has been invented. This machine is a scanner that reads the answers; it can detect the correct answers from the wrong ones through a program fed with the correct answers designed specifically for this machine. This correction machine saves time and effort; it also guarantees the marking accuracy. Its only disadvantage is that it cannot be used with all types of questions; it is only applied for multiple choice questions.

We have tackled only two among many techniques that have made education smarter today; there are many other examples that have enriched, and thankfully lightened the educational process.

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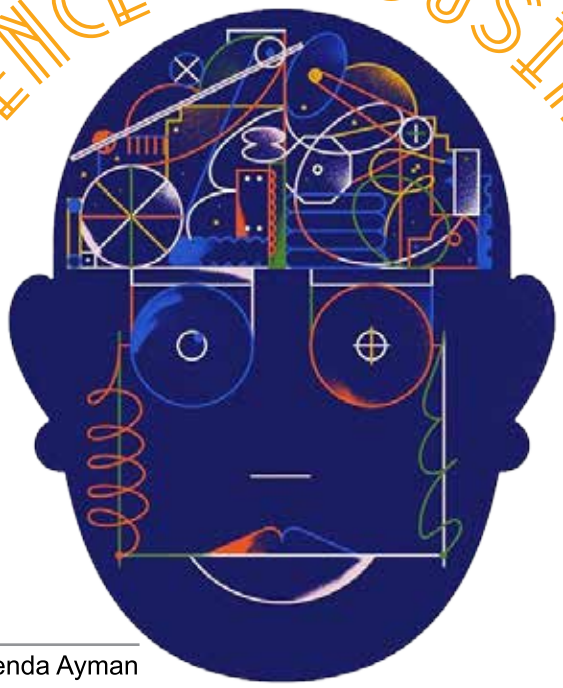

By: Shahenda Ayman

IT IS COMPLICATED!

While most agree that the outputs of science are beneficial to society, a large part of the general public does not know what scientists really do; they even often stereotype them as peculiar. Likewise, the cultural difference between science and business leads to major misunderstanding due to differences in expectations at both sides. Businesses rely on research to develop new solutions; however, there is a disconnection between the pace of industry and that of research and innovation.

Although it can be challenging for business people and scientists to appreciate each other's priorities, understanding the benefits of closer collaboration to get innovation to market can bring both parties closer. Unlike scientists who must withhold judgment until sufficient evidence has accumulated, business leaders generally have to act in a state of partial ignorance. Strategic calls have to be made and policies implemented; no matter how rigorously one tries to base one's decisions on evidence, some guesswork will be required.

According to Rosalind Le Feuvre, Director of Operations at the Manchester Institute of Biotechnology, UK, science and business can work well together. "I think the academic community is becoming more aware of the commercial potential of their science and how to exploit it, there is a more open culture and increased dialogue; however, collaboration is not always straightforward", adds Le Feuvre.

Hereunder are three attributes contributing to the thinking of a scientist, and how to apply them to wider contexts:

Skeptical curiosity

Scientists innovate, striking a careful balance between curiosity, intuition, and skepticism. However, techniques such as external and internal peer reviews and randomized control trials are also embedded in their way of thinking to avoid blind optimism and bias. Invite sceptics and non-experts in your organization and make sure that initiatives suggested in your organization are checked by someone outside your team, even outside your organization or industry.

Collaborative competitiveness

The best scientists are the ones who compete and collaborate with one another. Look at the problems and opportunities in your business or organization that cannot be solved in isolation and collaborate like a scientist. When corporations come together, they can make important things happen. Bringing together industry, government, and higher education can be even more powerful.

Confidence in the face of uncertainty

The scientist's business is the unknown; when something is unknown, it is an opportunity to be pursued rather than avoided. This requires the ability to deal with ambiguity and uncertainty, which most people find difficult. Break down problems into smaller hypotheses to be tested, evaluate probabilities and the interrelation between factors affecting probability, and move forward armed with that imperfect knowledge.

The scientific method is mostly responsible for the astonishing increase in our understanding of the world over the past few centuries; yet, it entered the business and marketing world only lately. If we have learned one thing from science, it is that the most conceivable explanation is not necessarily correct. Adopting a scientific approach to decision making requires to test our hypotheses with data.

While traditional statistics have always focused on using data to explain and predict, data science uses data to learn through constructing algorithms and programs that collect data from various sources and apply hybrids of mathematical and computer science methods to derive deeper insights. Whereas traditional analysis uses structured data sets, data science dares to ask further questions, looking at unstructured "big data" derived from millions of sources as well as non-traditional mediums such as text, video, and images.

Airbnb* is a prime example of how the tech industry is leveraging data science. It uses data science to help renters set their price; from understanding the demographics of renters to predicting availability and prices.

Receiving a large amount of data from customers, hosts, locations, and demand for rentals, Airbnb created a dynamic pricing system called Aerosolve using data science. Aerosolve predicts the optimal price for a rental based on its location, time of year, and a variety of other attributes using machine learning techniques. For Airbnb hosts, this system revolutionized the way in which rental owners can best set their prices in the market and maximize returns.

It seems that science and business are interdisciplinary although this is not recognized by many. The key to success in business and science is the question; getting an answer is a process, and you will get an answer. However, if you have an answer to the wrong question, or you do not think critically about what the correct question is your business will fail.

Glossary

***Airbnb** is an American company that operates an online marketplace and hospitality service for people to lease or rent short-term lodging.

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SECRETS of Oil

By: Hossam Ragab

The processes of oil exploration and extraction have always been quite the mystery to non-specialists. It might initially seem illogical that specialists can precisely define the location of underground oil. Can they see what is beneath the Earth's surface before they start the drilling process? What are the scientific theories behind oil excavation in different sites? Since all these questions, among others, are puzzling to many people, we shall try to simplify their answers in this article. Let us go on an interesting journey to explore the secrets of this industry and some of the scientific notions on which it is based.

The journey starts with a brief account of the history of oil discovery, which began one day in the USA, when a salt miner stumbled upon a black viscous liquid flowing from inside the Earth. None had known the importance of this bizarre substance before pharmacist Samuel Kier refined it in the laboratory, to acquire a pure quantity. Kier found out that this liquid could be used for lighting, heating, and combustion as a substitute for animal grease and fat. The importance of this liquid with multiple uses was realized in 1845; five years prior to the drilling of the very first oil well in 1859 in Titusville, Pennsylvania, USA, by Colonel Edwin Drake. The industry developed quite slowly at the time due to the limited use of oil in the industry of kerosene, oil lamps, and other lighting tools.

In the early 20th century, with the invention of cars and giant machine engines, the demand for oil increased. As a result, the continuous consumption led to the depletion of the discovered quantities in the USA in Ontario and Pennsylvania, causing an "oil crisis" in California, Oklahoma, and Texas. The crisis urged the excavation of oil in new places, and the investment of huge amounts of money to develop oil and natural gas excavation technologies.

Imagine we are currently in an excavation site; the first thing we should think of is how the oil company has defined this exact location for drilling? To answer this question, we need to know first that oil companies fall under two categories: owner and services companies. Owner companies rent the excavation regions from States and conduct the needed research to define the drilling areas. Services companies, on the other hand, provide services for the owner companies during the drilling processes.

A large group of geologists and geophysicists conduct vigorous research on the whole area to define a particular spot for drilling that entails the least cost and risk factors. Still, can we know what lies beneath the Earth's surface before drilling? The answer is simply “Yes”! This is achievable through a process known as "geological survey", which depends on sound waves. Yet, what is the relationship between sound waves and seeing what lies beneath the Earth's surface?

Imagine if you knock hardly on your wooden desk, what would happen? The resulting sound waves would spread around the desk and the whole room. This is exactly what takes place at the drilling location; large vehicles designed for this purpose hit the ground strongly in different spots at the site and the resulting sound waves spread through the different Earth layers of different condensities. These waves reflect to the surface in different timings according to the condensity of each layer; ground receptors receive these reflected waves and record them instantly.

Through assembling, analysing, and processing the recorded data using supercomputers, we obtain crucial data known as "seismic data". This data provides a preliminary detailed picture of the area in question; as such, we can say that we can see beneath the Earth's surface prior to any drilling. Then, a team of specialized geologists and geophysicists analyse and filter the data; a process that could take months to determine the best spot for drilling.

Having spotted the proper place for drilling the well, it is work time. Scientifically, it resembles inserting a straw inside a blown balloon, allowing the air to flow due to the strong pressure inside the balloon. Earth can be compared to a huge balloon, and the big driller can be compared to the straw. After pinning the drilling spot, the owner company contracts a services company to rent a giant oil rig. The rig is fixed accurately in place, and a whole crew is assigned to accomplish the task and reach for the oil reservoir.

Drilling difficulties arise due to the differences between the subsequent rock layers. Another problem arises from the

and Natural Gas Excavation Revealed

pressure of oil inside the reservoir, which, if not accurately controlled, could result in disastrous consequences, leading to the explosion of the driller. As such, drilling is amongst the most dangerous work fields in the world.

The used drilling liquids are known as "drilling muds" due to their muddy shape and composition. These liquids are important to keep the drilling bit cool and lubricated; they also drive the drilling byproducts—such as small rocks—to the surface. Water is the main constituent of drilling liquids; oil-based mud, on the other hand, can be used in layers of high temperatures or those vulnerable to water. Oil-based muds have two types: the first contains an external oily emulsion and 50% water, whereas the second is oil-based and contains little water.

Generally speaking, the deeper the well is, the more chemicals are needed to preserve the properties of fluids. These chemicals prevent the harmful effect of squashed rock materials that are caused by the drilling, and accordingly, affect liquidity, and consequently, the well's pressure. Failure to control the pressure column could lead to losing the whole well. The drilling mud coats the internal walls of the well with a delicate film known as the "mud cake", which helps consolidate the delicate materials and layers, preventing them from collapsing into the well during the drilling process. It also preserves the pressure of each isolated layer.

After accomplishing the drilling phase, the inside of the well is completely covered with a metal cylindrical coating, a process known as "casing" that precedes the production stage. Production is divided into three subsequent phases, and it marks the last stage in extracting oil and natural gas. The first phase is the build-up period, during which 5–15% of the well's contents are extracted. This phase is neither money- nor effort-consuming thanks to the high pressure inside the well. The pressure pushes the oil outside on its own, just like what happens in the blown balloon and straw example.

The second phase is the plateau period, during which 35–45% of the well's contents are extracted. During this phase, the pressure inside the well drops as oil gushes out. Consequently, there is a need to use other synthetic means to draw the oil products, such as water, air, or natural gas injection, using electric turbines, or using chemical additives. Finally, we reach the decline period. At this phase, the oil becomes too viscous to be extracted using electric turbines, so we resort to heating it. The heating process depends on the extracted gas to generate electric energy that is used to push hot water vapor into the well's bottom. Consequently, the oil gets heated, becomes less viscous, and easier to extract.

After extracting oil from underground reservoirs, it is transferred through huge pumping systems to initiate the "refining" process. This process takes place in distillation towers, where the raw material is subjected to high temperatures where different substances are derived at different temperatures. Heavy derivative materials are filtered at low temperatures from the low openings of the tower, while gaseous derivatives are filtered at high temperatures from higher openings due to their low condensity and volatile nature.

Now, we come to the end of our journey where we have explored the world of oil and natural gas excavation, and unveiled the mysteries that might have puzzled many people for a long time. We hope you have enjoyed it, and that you join us in future exciting journeys. Good bye.

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Workaholism

By: Rokaya Samir

Many people spend long hours at work hoping to increase their income and enjoy a more luxurious lifestyle. However, "too much of anything is not good for anyone"; too much work can affect your health and social relationships, not to mention the persistent feeling of exhaustion and fatigue. Even though the term "workaholism (work addiction)" has been known for more than 45 years, the contemporary fast-going lifestyle and modern technology have contributed a lot to the widespread of this phenomenon lately. How can we find out if we are addicted to work, and how can we get rid of this addiction to live a normal life devoid of any psychological issues?

There is no specific medical definition of work addiction, but we can say that it starts when work consumes all one's energy and absorbs one's time to the extent that he/she does not have time to do any other activity, in addition to constantly feeling stressed and continuously thinking about work problems, even after the end of the working hours. According to a study conducted by the Department of Psychological and Social Sciences at the University of Bergen, in Norway, work addiction is widely spread among young people nowadays due to their persistent concern about the future and their desire to secure a decent life.

Among the symptoms of work addiction is the constant desire to accomplish more work to achieve better income and spending much time at work without prior intention to do so. Symptoms also include the constant feeling of stress during and after working hours, as well as the inability to enjoy holidays and free time if there is no work. Moreover, work addiction affects health negatively as a result of restlessness.

Despite the negative connotation of the term "addiction" in general, some believe that work addiction aspires to increase productivity and work development, but this is not true. A study performed on people who work more than 50 hours per week proved that they are most at risk of dying due to work addiction. As opposed to expectations, another study performed in the University of Georgia, USA, proved that workaholics are the least productive even if they first appear to be the most enthusiastic and motivated people at work, unlike their colleagues who accomplish their work quickly and accurately at the same time.

Furthermore, workaholics can suffer psychological and neurological disorders; such as depression, anxiety, and selfishness. It may also lead to Obsessive-Compulsive Disorder; a mental disorder that makes people imagine thoughts and fears that do not exist in reality. Workaholics tend to be bossy; they are not capable of sharing their acquired skills and experiences with their coworkers, which negatively affects the work institution on the long run.

Workaholics also suffer from family instability, as well as weight gain due to sitting in front of electronic devices for long periods of time. They can also suffer from high blood pressure, persistent headache, irritable bowel syndrome, stomach ulcers, tiredness, physical and mental exhaustion, and sleep disorders.

One of the tips you can follow to get rid of work addiction is to ask for help from the people around you, and to go on long vacations away from work. You can also relax through yoga sessions and exercise, to get rid of the muscle strain caused by incorrect sitting positions during working hours; also dedicate time to be with your family and to meet friends.

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Sleeping during Working Hours!

By: Dr. Omar Fikry
Head, Planetarium Section, Planetarium Science Center

I visited Japan in 2001 on a scientific mission; it was my first trip to this uniquely and truly exceptional country. My mission entailed visiting the Taku-Yuca Institute located in a small and very clean city—as all cities, villages, and suburbs in Japan are. The Institute specializes in the theoretical study of astrophysical research. It was exactly as it looked in the pictures I saw before my travel; perfectly consistent in its colors everywhere I looked. It reflected the simplicity and distinctive architectural character of Japanese buildings and facilities, which cleverly convey Japan's blended ancient and modern characters.

Inside the Institute, I met my host who welcomed me with great hospitality and politeness. After going through my visit's program and the research I needed to conduct there, he accompanied me on a tour to get acquainted with the Institute's facilities. He gave me an ID card to access the library, and to use the photocopier, research room, and the super computer during my stay.

He also showed me how to get around the building and its floors, and introduced me to the secretariat. I was amazed by the accuracy and the discipline, but I was surprised when my host accompanied me to a very quiet, dimly lit place at the end of the building. We moved more quietly than usual and I saw closed cabins, each carrying a list of some researchers' names. At cabin no. 7, I found my name on the list; my host indicated that he would show me the place and explain what it was. Upon leaving this very cozy place, my host informed me that those were sleeping cabins to use during working hours!

I could not overcome my curiosity, having previously heard about the tradition of sleeping for an hour or two during working hours but not believing it. Now that I had seen it with my own eyes, I asked my host about it and he advised me to read a brief research on the topic. Upon returning to my place of residence I started reading the research right away. The most important points I read were:

• The Japanese practice of “inemuri” is often translated to “sleeping during work" although "sleeping while present" is more accurate as stated by the researcher Dr. Brigitte Steger; an eminent Lecturer of Japanese Studies at Downing College, Cambridge University, and the author of a book about this topic.

• Napping during work is common and accepted in the Japanese culture. In fact, it is often regarded as a sign of vigilance, diligence, and activity, because it indicates that you have worked hard until you became exhausted.

The Japanese practice of “inemuri” is often translated to “sleeping during work" although "sleeping while present" is more accurate as stated by the researcher Dr. Brigitte Steger

• This expression refers to how Japan handles working hours; the Japanese find in that concept an opportunity to handle several tasks simultaneously, albeit at a slower pace.

• Inemuri is common among senior employees in different careers; they often tend to stay awake throughout the day and be seen as energetic. However, those working on an assembly line, during guard shifts, or using machines at a factory, for example, cannot simply fall asleep.

• Inemuri has been practiced in Japan for one-thousand years, and it is not restricted to the workplace. People may nap in department stores, cafes, restaurants, or even a quiet spot on a crowded city pavement. Sleeping in public places is also prevalent on commuter trains, no matter how crowded they are; they often turn into de facto bedrooms. Luckily, Japan has a very low crime rate.

• Dr. Steger refers in the research to a statement by Dr. Theodore C. Bestor, Professor of Social Anthropology at Harvard University: "Sleeping in social situations can even enhance your reputation"; he recalls a group dinner at a restaurant, where a colleague of his fell asleep at the table. The other guests complimented his “gentlemanly behavior” as he chose to stay present and sleep, rather than not attending.

• One reason for public sleeping in Japan is because people get so little sleep at home. A 2015 Government study found that 39.5% of Japanese adults sleep less than six hours during nighttime.

• Dr. Steger explained that closing one's eyes does not always mean one is snoozing; a person may close his/her eyelids just to build a sphere of privacy in a society with little of it. That is part of why Dr. Steger said she could imagine Inemuri waning in Japan; these days, smartphones can transport people to their own private zones with their eyes wide open.

On the following day, I tried to nap in Cabin no. 7 during my rest time. Of course, I could not sleep as I felt I was committing a crime or encroaching with no right, even though it is perfectly legitimate in Japan to renew one's energy and activity during working hours, to accomplish more and more accurately.

SCIENCE FESTIVITY

By: Rania Farouk
Marketing Specialist, Planetarium Science Center

The aim of the event was to raise public awareness about marine life, and how to preserve and benefit from it.

Since 2006, the Planetarium Science Center has been organizing the "Science Festivity" in April annually, with a different overarching theme each year. This year, the Science Festivity was held 14-15 April 2018, under the overarching theme of "Marine Life", covering a number of sub-themes, such as marine living creatures, diving, fishing, marine and tourism problems, and underwater antiquities. The aim of the event was to raise public awareness about marine life, and how to preserve and benefit from it.

Within this context, the Festivity featured the "Science Village", which is the heart of the event, encompassing the booths of participants from different schools, universities, associations, and institutions from Alexandria and the neighboring Governorates. The Science Village enables participants to display their interactive activities to the public, to achieve the main aim of the Festivity, which is to raise awareness of the importance of science within the framework of fun. A large number of students and families attended the Festivity where they enjoyed a fun day with a scientific flavor.

Believing in the role of Bibliotheca Alexandrina in communicating science to the public, the PSC also participated in the activities of the "Egyptian Science Month"; an initiative to organize an annual science festivity in Egypt.

Parallel shows discussed the theme of Marine Life from different perspectives, such as the "Super Science Show", the black theater show "The Scientist Ultra", in addition to other theatrical shows that presented the theme of the Festivity in an entertaining manner, to create a more enthusiastic atmosphere. The Festivity also included some interactive science lectures, most prominently the lecture entitled "The Mansourasaorus Discovery: Behind the Scenes", which was delivered by Dr. Hesham Sallam, Director of the Center of Paleontology, Geology Department, Faculty of Science, Mansoura University.

The Science Festivity was held for two days at the Bibliotheca Alexandrina Plaza, and hosted a large number of visitors including individuals, families, groups, and trips. The Festivity was a great success, fulfilling the PSC's mission, "Science for All", which was evident in the faces of the visitors enjoying what they were learning and practicing. That is how the Center is a constructive model for building the society with its different components.

Believing in the role of Bibliotheca Alexandrina in communicating science to the public, the PSC also participated in the activities of the "Egyptian Science Month"; an initiative to organize an annual science festivity in Egypt. The event aims at increasing the public's awareness of the role of science and its impact on the advancement of the society and the development of the country, by presenting scientific and cultural activities to the public, in addition to special activities for researchers, as well as school and university students. Within this context, the PSC participated in the "Egyptian Science Month" by organizing a mini model of the "Science Festivity" in several locations inside and outside Alexandria, including Sinnari House in Cairo, and the Future Association for Borg El-Arab Women. As such, the Festivity is considered a real example of the Center's commitment to expanding its services for the benefit of all members of society.

Wait for us next year; wait for a new festivity with a new interesting theme as usual!

PLANETARIUM SCIENCE CENTER

"Science for All"

History of Science Museum

Opening Hours
Sunday–Thursday: 9:30–16:00
Saturday: 12:00–16:00

Guided Tours Schedule
Sunday–Thursday:
10:30, 11:30, 12:30, 13:30, 14:30, 15:30

Fees: EGP 2.- for non-audience of the Planetarium

ALEXploratorium

Discovery Zone

Opening Hours
Sunday, Monday, Wednesday, Thursday: 9:30–16:00
Tuesday: 9:30–12:30
Saturday: 12:00–16:00
Friday: 14:00–16:00

Guided Tours Schedule
Sunday, Monday, Wednesday, Thursday:
10:00, 11:00, 12:00, 13:00, 14:00, 15:00
Tuesday: 10:00, 11:00
Saturday: 12:00, 13:00, 14:00
Friday: 14:00, 15:00

Fees: EGP 10.- (EGP 5.- for students)

Listen and Discover

Fees:
DVD shows: EGP 4.- (EGP 2.- for students)
3D shows: EGP 10.- (EGP 5.- for students)
12D shows: EGP 20.-

Available Planetarium Shows

Enlightened Mind; 19 min.

The Mission; 24 min.

Stars Show; 45 min.

Oasis in Space; 25 min.

Stars of the Pharaohs; 35 min.

Seven Wonders; 30 min.

The Life of Trees; 33 min.

Kaluoka'hina:
The Enchanted Reef; 33 min.

To Space and Back; 25 min.

Alexandria, The Cradle of Astronomy; 22 min.

The Bibliotheca Alexandrina Planetarium Science Center (PSC) invites its visitors to spend a day of fun learning, where they can enjoy amazing scientific shows that cover a diverse variety of scientific fields and are suitable for a wide range of groups at the **Planetarium Theater**.

Visitors can also enjoy tours of the **History of Science Museum**, which highlights scientific discoveries throughout three eras: Pharaonic Egypt, Hellenistic Alexandria, and the Golden Age of Islam.

Moreover, visitors can enjoy a collection of interactive exhibits that targets children and adults, workshops, DVD and 3D shows at the **ALEXploratorium** as well as shows at the **12D Theater**.

For schedule and fees, please visit the Planetarium Science Center website.

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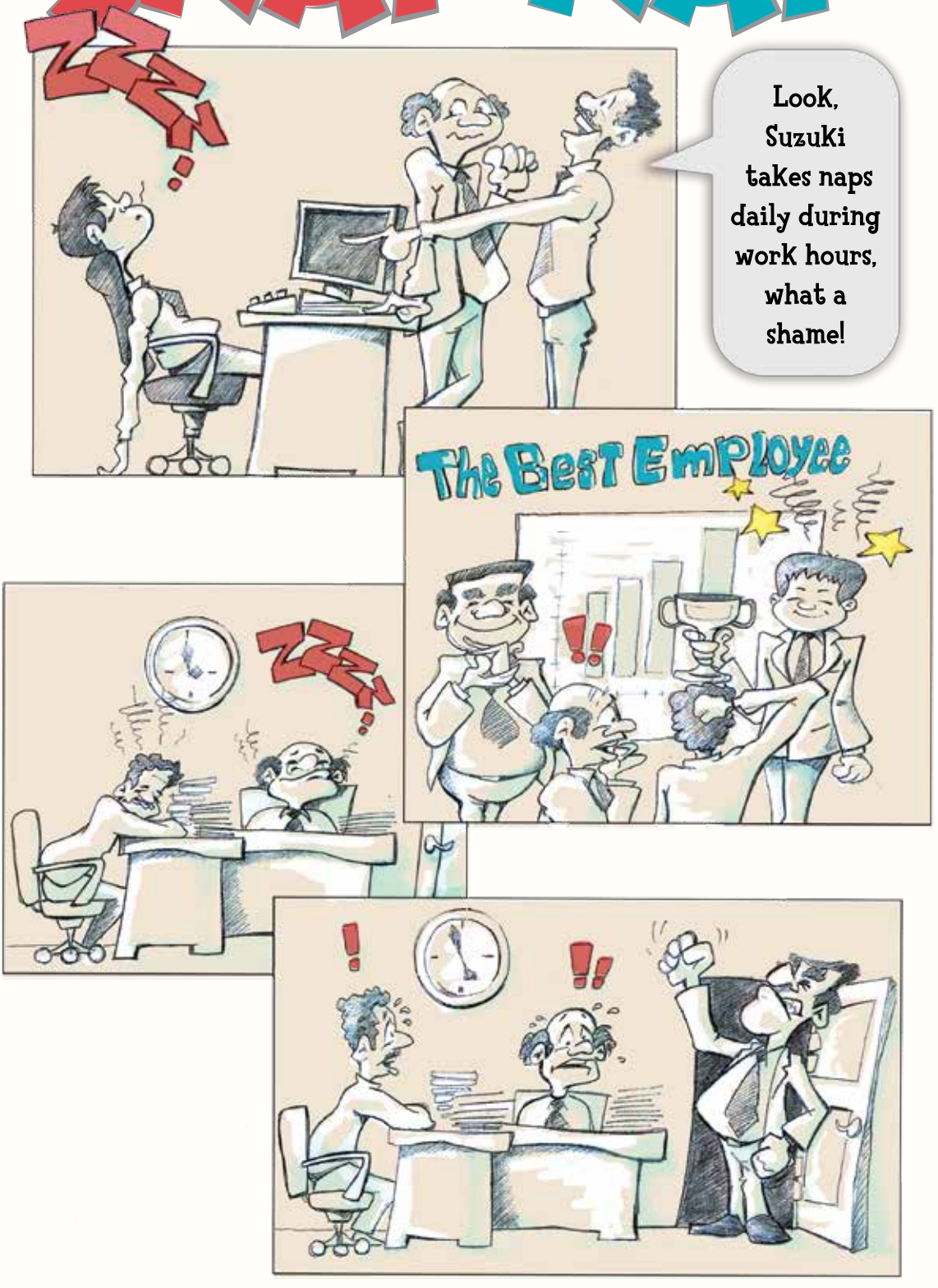

To know the story behind Suzuki's success, check the article on page 21.

Illustrated by: Mohamed Khamis