How safe are Indian laboratories?

Many students opt for science after their 10th standard examination and many of them study chemistry later. In case they fail to get into a professional course, they end up graduating in chemistry and even continue for their Masters and Doctoral degrees. How safe are the laboratories provided by the schools, colleges, Universities and research organizations (government and private) in India? One should not be surprised if the laboratories are located in dilapidated buildings, with paints peeling off and growth of fungi on the walls. A peep into many chemical laboratories would reveal any or all of the following:

Mandatory items like safety goggles, gloves and laboratory coats would normally be absent. In case these are present the experimenter, students and even the demonstrators themselves do not use them.

Auto pipettes and other safe devices for handling the chemicals are absent. (Do not be amazed if the experimenter is seen to suck harmful chemicals through pipettes!) No proper labelling of the chemicals, cautionary notes and warnings and a list of dos and don'ts can be seen in the laboratories. This is vital especially if the experimenter has a history of respiratory or other ailments. Gas cylinders may not be secured and at times could also be leaking.

Ventilation system is bad. Exhaust and ceiling fans are non-working or non-existent. Compounded to this would be scarcity of or non-functional fume hoods. Even if present, experiments would be performed outside them. Lack of first aid boxes, which if present would be found locked up and the key missing, have the essential items misplaced or the medicines would have crossed the expiry date. Improper storage, handling, transferring and transporting the chemical bottles and glass wares are common sights. No proper method of waste handling and disposal exists. Absence of emergency exists, sirens and smoke and fire detectors and extinguishers is more of a rule than exception. (It is not surprising to see experimenters smoking in the laboratories.) One can also observe leaking taps, plumbing problems and precariously located and over-hanging electrical wires.

The above is an open-ended list that could be suitably modified for a biology, biochemical, microbiology, physics or any other laboratory. Some of the laboratories could be time bombs ticking away slowly but surely. What needs to be done to make the work environment safer and user-friendly? The ensuing are a few suggestions. Probably these are adopted in some laboratories but they may be the exception rather than the rule.

Wherever and whenever possible, the laboratories should be designed keeping in mind the safety factors. Of course, budgetary constraints could be a hurdle but some ways (sponsorship?) should be evolved to overcome this problem. Furthermore, there should be scope for future modifications of the laboratories.

The creation of a laboratory safety group, consisting of 2–4 members, is important. The group would be responsible for regularly checking and updating the laboratory, training the users, documenting and putting up prominent cautionary notices. This group would need to have a checklist that pertains to the safety norms, have undergone first aid courses and be vested with powers for a ready redressal. The group should be ready to innovate and take quick remedial measures whenever required.

Since constant exposures to chemicals and other hazardous materials could have an adverse effect in the long run, there is an urgent need to look into and rectify the prevailing laboratory set-up in India. The well being of an experimenter could be at stake because of want of the minimum facility in the laboratory. It is not my intention to paint a bleak picture of the existing scenario but to bring to the fore the importance of safety in the laboratories. Although regulations pertaining to health and safety exist, how far these are implemented, in words, spirit and action, is anybody's guess. Ironically we 'celebrate' a safety week but what about the remaining 358 days?

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Vivid signatures of water on Mars surface strengthen the debate of microbial life

I read with interest the recent exchange of correspondence between Fred Hoyle and Chandra Wickramasinghe (*Curr. Sci.*, 2000, **78**, 1057–1059) and Manoj Komath (*Curr. Sci.*, 2000, **79**, 266–269). The correspondence made a reference in passing to microbial life on extra-solar planets and on Mars, in our solar system. At present, we are not in a position to say anything with certainty about life on other planets in the solar system as argued by Hoyle and Wickramasinghe. However, it may be noted that there exists a belt around our Sun where life could flourish. Earth is in the middle of this belt. Venus is closer and Mars is farther from the Sun but both the planets lie within this life-supporting terrestrial belt. The extended exploration by Pioneer Venus Orbiter (PVO) continuously for over twelve years has ruled out any possibility for existence of life on Venus. Mars is not yet extensively studied and therefore possibility of some form of life is not yet ruled out.

The scientific community is aware of the fast developments in space explora-

tions. Late Carl Sagan of Cornell University, USA was convinced of existence of life in our own solar system apart from earth (?). He made all out efforts to impress upon NASA to go for exploration of the outer space and settle the question of other life centres in space. It is quite natural to explore first of all our own solar system and get a final answer. Failures of Mars missions one after another have delayed our expectation for possible signatures of life on Mars. There have been in-depth discussions on the failures of Mars missions especially the one that ran into loss of seven lives of astronauts on 28 January 1986. This major failure delayed *in situ* exploration missions and landing on Mars. The Mars team was aware of inadequacies of the ill-fated mission but failed to persuade NASA officials to call of the flight and went ahead by saying: 'It is time to take off your engineering hat and put on your management hat'. Ignoring the warnings the launch went ahead and the tragic disaster took place. The Mars Global Surveyor (MGS) and Mars Orbiter Camera (MOC) are basically remote sensing missions and have provided highly interesting results. The recent findings of MGS–MCO and the pictures obtained are of general interest, as it appeared in *Science* on 30 June 2000:

> 'It began as a whisper on the Web a week ago Monday evening, grew to a noisy torrent of media babble by Wednesday, and on Thursday morning crashed onto the front pages. Moving at the light-speed pace of modern media, a wave of chatter about water and therefore possible life on Mars swept a paper at *Science* into headline news a week before its scheduled publication' (*Science*, 2000, **288**, 2295–2296 and 2000, **288**, 2330–2335).

As discussed by Malin and Edgett (*Science*, 2000, **288**, 2330–2335), the symptoms of life on Mars seem to be ample but the most discouraging fact is the existence of thin atmosphere and low temperature on Mars. Even if life exists, it is a matter of speculation as to what form of life it could be. If these limited efforts and observations made so far could yield this much of information, then we must have high expectations for existence of life on Mars in making. Let us hope that in the near future, Mars missions become a success and we get much more interesting information about this existing planet as compared to recently received beautiful pictures of mountain ridges, gully landform, channels of varying sizes which clearly depict free flow of water with no one around to check its flow and use it for any purpose. In fact what MGS–MCO pictures depict are only a part of the story whereas it seems that a good deal of exciting news is still to come. Closer looks and *in situ* observations may soon unfold the in-depth story of Mars in course of time.

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Publication lists, citation counts and the impact factor

The editorial on 'The impact of publication list (*Curr. Sci.*, 2000, **78**, 1177–1178) and its response (*Curr. Sci.*, 2000, **79**, 135–136) have stimulated me to express my views.

The list of publications being the linch pin in assessing the work of the academicians in the research institutes, universities and other places, has become the barometer for their selection and growth. Hence the correct assessment of the list of publications has become the cry of the day. The selections/assessments are always done through the 'peer review' by a team of learned experts. Since the learned experts for selection/assessment have neither the inclination nor the time for an informed and just judgement, the judgements are mostly subjective, prejudiced and accordingly, honest, objective, open, impersonal criteria free from limitations has become mandatory for the correct and just assessment.

Eugene Garfield, the father of 'science watching' has introduced the concept of 'citation counts' and the 'impact factors' in the 1970s. These concepts have been found to be adequately suitable in a digital age, particularly when we are travelling into the information super highway. Garfield's idea is simple. It means simply to look through the reference list in the papers and catalogue the number of times each paper is cited and the addition of these citations refers to the citation counts of the individual paper of the concerned author. Citation count being objective, impersonal and broad based (not confined to any narrow discipline) has become the acid test for the assessment of the quality of publications. Further, in order to assess the quality of a journal objectively, basing on the concept of citation counts, a derived concept like 'Impact factor' has been introduced and is defined as:

(Total number of current citation of articles published in a specific journal in a two years period)/(Total number of articles published in the same journal in the corresponding two years period).

Institute for Science Information (ISI) 'stresses that a journal's impact factor is a meaningful indicator only when considered in the context of similar journals covering a single field of investigation or subject of discipline'. Clearly the 'citation counts' are primary and are not confined to a narrow field or discipline and are much higher for original and seminal work and tend to diminish further and further more the work is extended and trendy. Accordingly, the emphasis on 'impact factor' as well as 'other considerations' rather than the 'citation counts' – the acid test of quality – can result in awarding Padmabhusan to some one having papers with 'citation counts' less than ten for about twenty five years covering the