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Professor Soon Guan Tan: A dedicated academician and researcher in protein electrophoretic study

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Introduction

In this editorial paper, I would like to take this golden opportunity to show my deep and sincere expression of esteem about my respectable former lecturer and research project co-supervisor, research collaborator and ex-colleague: Professor Soon Guan Tan (SGT). He was former Chief Editor of Pertanika Journal of Tropical Agricultural Science at Universiti Putra Malaysia (UPM). He is an expert specializing protein electrophoresis since 1970s. The objectives of this paper are 1) to review some selected publications on protein electrophoresis of Prof SGT, and 2) to honor Prof. SGT via this form of publication.

Prof. SGT is an old timer who has served in UPM for more than 30 years. He has been a dedicated academician because he has done honest research, taught students of undergraduate and graduate levels and published his research findings. In this editorial paper, I will focus on his 1) legacy and experience, 2) influential impact, and 3) momentum of continuity, which have become three very important cornerstones to be taken into consideration why I honor him in this paper.

Definition and background of protein electrophoresis

According to [2], protein electrophoresis can be employed to detect allozyme variation. These protein variants are called allozymes because they are encoded by different alleles at an enzyme gene locus. According to [8], 'enzymes are proteins consisting of amino acids, some of which are electrically charged. As a result, enzymes have a net electric charge, depending on the stretch of amino acids comprising the protein. When a mutation in the DNA results in an amino acid being replaced, the net electric charge of the protein may be modified, and the overall shape (conformation) of the molecule can change.'

Some 40 years ago, gel electrophoresis (GE) of allozyme become available as a novel and relatively simplistic techniques. This technique revolutionized research in population study (Shaw and Prasad). The GE is the traditional standard for the allozyme analysis [9]. Briefly, electrophoresis is the migration of charged particles such as protein molecules, cells, subcellular organelles and small organic molecules in an electrolyte under an influence of electrical field [7]. The technique of electrophoresis enables visualization of enzymes, the gene products, directly. It has opened up new and exciting areas of research in both biochemical and population genetics. In addition, allozyme polymorphism is becoming an interesting biomarker of heavy metal pollution, from ecotoxicological biomonitoring point of view [21,22]. According to Dennison [4], GE is ideal for large-scale screening even other type of gel electrophoresis are created and introduced. This is due to starch gels are non-toxic and bio-degradable.

Selected published papers by Prof. SGT since 1970s

The use of allozyme had shown to be powerful in the biochemical studies as found in the literature (Table 1). Based on Scopus database, the first paper published by Prof. TST was that in Human Heredity published in 1976. Based on allozyme study, Tan [12] reported that esterases from human saliva have been demonstrated by the zymogram technique. Later, Tan and Ashton [14] reported glucose 6 phosphate dehydrogenase from human saliva that was demonstrated by the zymogram technique. Tan and Teng [15] showed several Senoi and aboriginal Malays of Peninsular Malaysia, were also polymorphic for SOD B. Malays, Chinese and Indians from Malaysia were phenotyped for SOD A and SOD B, using saliva. Based on 18 loci [17], the GE had shown to prove that Kadazans of Sabah were found to be polymorphic for selected enzymes.

Green et al. [5] reported mixtures of chromosomal forms A, B, C and D in natural populations of *Anopheles dirus* in Thailand show significant positive values of Wright's fixation

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index for six enzyme-electromorph loci. Tan et al. [16] analyzed nine populations of three species of *Nephotettix* from Peninsular Malaysia for nine enzymes comprising 11 loci. Barker et al. [1] examined genetic variation at 53 protein-coding loci (25 polymorphic) was analyzed for 17 water buffalo

populations - 12 swamp, three Lankan and two of the Murrah breed (river type). Based on horizontal starch gel electrophoresis and histochemical staining techniques, Leesa-Ng et al. [6] investigated genetic variation within and among eight wild and one hatchery populations of yellow catfish, *Mystus nemums* from northern, northeastern, central and southern Thailand.

Under my collaboration with Prof TSG, at the Department of Biology, based on electrophoresis of allozyme study, we have successfully published at least five publications related to genetic polymorphism in marine mussels *Perna viridis* [23,24] small terrestrial snails (Opeas sp., *Subulina* sp. and *Huttonella bicolor*) [3] , Changes of allozymes (GOT, EST and ME) of *Perna viridis* subjected to zinc stress [16] , and allozyme polymorphism in the horseshoe crabs *Carcinoscorpius rotundicauda* [22]

Table 1: Some selected reported studies that based on gel electrophoresis of allozymes published/ co-authored by Prof. Soon Guan Tan.

No.	Samples/ Species	Findings	Reference
1	Human saliva	Family and population studies suggested that these phenotypes are the products of an autosomal locus with two alleles.	Tan (1976)
2.	Human saliva	Family and population studies suggested that these phenotypes are the products of an autosomal locus with 2 alleles.	Tan and Ashton (1976)
3	Human saliva	Senoi and aboriginal Malays of Peninsular Malaysia, were also polymorphic for SOD B. Malays, Chinese and Indians from Malaysia were phenotyped for SOD A and SOD B, using saliva.	Tan and Teng (1978)
4	Human saliva	Based on 18 loci, the gel electrophoresis had shown to prove that Kadazans of Sabah were found to be polymorphic for 12 loci.	Tan et al. (1979)
5	*Anopheles dirus*	Mixtures of chromosomal forms A, B, C and D in natural populations of in Thailand show significant positive values of Wright's fixation index for six enzyme-electromorph loci.	Green et al. (1992);
6	*Nephotettix*	Nine populations of three species of *Nephotettix* from Peninsular Malaysia were analysed for nine enzymes comprising 11 loci.	Tan et al. (1994)
7	*Bubalus bubalis*	Genetic variation at 53 protein-coding loci (25 polymorphic) was analysed for 17 water buffalo populations	Barker et al. (1997)
8	*Mystus nemurus*	Fifteen of the 23 loci examined (65.22%). were polymorphic at the 0.95 level.	Leesa-Nga et al. (2000)
9	*Perna viridis*	Fourteen polymorphic loci were observed.	Yap et al. (2002)
10	*Perna viridis*	Mussel from contaminated site showed highest percentage of polymorphic loci and highest excess of heterozygosity compared to those from uncontaminated sites.	Yap et al. (2004)
11	*Opeas* sp., *Subulina sp*. and *Huttonella bicolor*.	Ten polymorphic loci were observed.	Choh et al. (2006)
12	*Perna viridis*	There were changes in the enzymes GOT, EST and ME in respond to zinc stress.	Yap et al.(2007)
13	*Carcinoscorpius rotundicauda*	Nine polymorphic loci were observed in C. *rotundicauda*. The current results suggest that allozyme polymorphism in horseshoe crabs is a potential biomonitoring tool for metal contamination	Yap et al. (2011)

Below the three important cornerstones explained in detail which have been the reasons of my admiration to Prof. SGT.

First: Legacy and experience of Prof. SGT

Having done genuine research work and published more than 400 refereed papers (with an H-index of 28 based on Scopus as searched on 28 February 2017; 2513 citations with 233 papers indexed in Scopus), he is now fully retired from UPM. Formerly, he served at the Department of Biology, Faculty of Science UPM before moved to the Department of Cell and Molecular Biology, Faculty of Biotechnology and Biomolecular Sciences, UPM. With an unbiased view on academic matters, Prof. SGT has honestly supervised and co-supervised numerous PhD students, including foreign students, at the Genetics Laboratory since 1976 at the Department of Biology, Faculty of Science, in UPM and I was one of them. Beginning as a PhD candidate back in 1999, I was not confident at all with my research work and my writing ability. With some papers rejected, I could not find any other way to get my papers accepted. I think I still cannot write properly and publish any paper until my first experience of having my paper read and commented upon by Prof. SGT in 2000.

Being a molecular population geneticist for more than a quarter century [13] , Prof. SGT read and commented on my first draft on allozyme study of green-lipped mussel P. viridis. The

much improved draft was then submitted by mail post to an ISI journal Zoological Studies (Taiwan) in 2000. With his invaluable experience in writing, my first paper was finally accepted for publication in 2002 although it took about 20 months and after a major revision. It is quite a surprise that the first paper in my academic life was a paper about genetic variation and but not on heavy metals (since I work on heavy metal ecotoxicology). That was my first experience with a paper co-authored with Prof. SGT.

Second: Influential impact of Prof. SGT

Knowing Prof SGT since 1994 when I started on my Bachelor's study, he is a serious man. He is also a sincere, focussed and patient man in writing. His body language signalled a strong message about the importance of staying focussed on writing, simple but organized and a peaceful mind in life. His quick responses and comments on my paper drafts often within 24 hours have taught me that procrastination is a bad habit and should be avoided. Also, I have learnt from him that good knowledge should be disseminated and we can do it through journal publications. I essentially learnt by practice that the ways of good writing are self-discipline and consistency. I do believe that is the way we can enjoy our lives as a true academician. As a lecturer and researcher now in UPM, I continue the academic writing culture, which I think is good, constructive and should be shared [18] especially when I train my postgraduate students nowadays.

His presence in UPM has given me a strong positive sense of 'working hard and honesty' in research. Since a research project is incomplete until the findings are published in journals, writing becomes an indispensable element in academic life [10,19]. Directly or not, writing has become 'a continuous learning process' in my life [18] and this is very much related to my learning of how to write from Prof. SGT. Hence, I am very grateful and lucky to have known Prof. SGT and learnt one of the most important lessons in my life from him, by practice- Learning is a lifelong process. Prof. SGT is certainly 'The Most Influential Person in My Academic Career'.

Third: Momentum of continuity of Prof. SGT

Without Prof. SGT as my research collaborator when I was first appointed as a lecturer in 2003, I was totally helpless in terms of research funding. I was lucky that Prof. SGT's readily usable research grants had supported my research project so that I need not have to wait for my UPM Grant for New Lecturers Scheme research proposal to be approved. Thus, the momentum of my research activities from my PhD study can be continued and my publication activities kept going on with the full support of a prominent researcher- Prof. SGT. The incessantly great momentum of continuity from Prof SGT has become one of major reasons why I can continuously publish research papers every year.

Finally, in this editorial paper, I also want to note that Prof. SGT has played very significant roles in the development of research activities particularly in Malaysia and Asia. In general, the contributions and spirit of these old timers like Prof. SGT should be appreciated and valued. Perhaps, this editorial paper can serve as a platform for such a purpose.

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