HAL-Based Evolutionary Inference for Pattern Induction From Psychiatry Web Resources
Liang-Chih Yu¹, Chung-Hsien Wu¹,*, Jui-Feng Yeh², and Fong-Lin Jang³

¹Department of Computer Science and Information Engineering, National Cheng Kung University, Tainan, Taiwan, R.O.C.
²Department of Computer Science and Information Engineering, National Chiayi University, Chiayi, Taiwan, R.O.C.
³Department of Psychiatry, Chi-Mei Medical Center, Tainan, Taiwan, R.O.C.
chwu@csie.ncku.edu.tw


With the increased incidence of depression-related disorders, various Internet-based psychiatric services have emerged for individuals suffering from negative or stressful life events, such as the death of a family member, an argument with a spouse or the loss of a job, along with depressive symptoms, such as suicidal tendencies and anxiety. Individuals under these circumstances often search for help from psychiatric web sites by describing their mental health problems using message boards and other services, thus producing thousands of psychiatric documents, called psychiatry web resources. Knowing these negative life events can therefore enable psychiatric web sites to provide automatic psychiatric services.

Negative life events are often expressed in natural language segments (e.g., sentences, text passages). A critical step in identifying these segments is to transform the natural language segments into machine-interpretable semantic representation. This step involves the extraction of key patterns from the segments. Consider the following example.

Two years ago, I lost my parents. (Negative life event)
Since then, I have tried to kill myself several times. (Suicide)

In this example, the pattern comprises two words, indicating that the subject suffered from a negative life event triggering the symptom “Suicide”. A pattern can be considered as a semantically plausible combination of $k$ words, where $k$ denotes the length of the pattern. Accordingly, a pattern has a variable length. This study presents an evolutionary text-mining framework capable of inducing variable-length patterns from unannotated psychiatry web resources. The proposed framework, as shown in Fig. 1, can be divided into two parts: 1) a cognitive motivated model such as Hyperspace Analog to Language (HAL), and 2) an Evolutionary Inference Algorithm (EIA).
The HAL model constructs a high-dimensional context space to represent words as well as patterns. Each word/pattern in the HAL space is represented as a vector of its context, which means that the sense of a word/pattern can be inferred from its context. This notion is derived from observations of human behavior. Restated, human beings may determine the sense of an unknown word by referring to the words appearing in its context. Based on the cognitive behavior, two words/patterns sharing more common contexts are more similar semantically. Figure 2 shows an example of the context information of the words “boss”, “chief” and “flower”. “Boss” and “chief” have quite similar contexts, but these are quite different from the context of “flower”. Accordingly, the words “boss” and “chief” are more similar to each other semantically than “boss” and “flower”, and “chief” and “flower”.

Fig. 1. Framework for variable-length pattern induction.
Fig. 2. Example of the HAL model. The dimensions with a gray shadow denote the frequent words in the context of the target word.

The EIA bootstraps with a small set of seed patterns to induce additional relevant patterns once the HAL space is built. The EIA then creates the initial populations of the patterns with different lengths (from 2 to \( k \)). Each pattern of length \( k \) is created by selecting \( k \) distinct words from the vocabulary. Both the patterns and the seed patterns are represented by combining their constituent words over the HAL space. After initializing each population, i.e., generation=0, the fitness function is adopted to measure the fitness (similarity) of each pattern in each population based on the context information provided by the HAL model. Once all the populations are measured, the selection process chooses a number of patterns to be the parents according to their fitness values. The variation operators, i.e., crossover and mutation, are then applied to produce the offspring. The offspring is also evaluated by the fitness function, and the superior offspring replaces the inferior parents to form a new population. The relevance feedback is then applied to identify the relevant patterns in the population. This information can be adopted to refine the seed pattern to improve its similarity to the relevant set. The refined seed pattern is taken as the reference basis in the next generation. The induction process is performed iteratively until the termination criteria are satisfied. Table 1 shows parts of the seed patterns and the induced patterns with the seed pattern as input.

Table 1. Seed patterns and induced patterns.

<table>
<thead>
<tr>
<th>Types</th>
<th>Seed Pattern</th>
<th>Pattern Induction from Web</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>&lt;son, injure&gt;, &lt;husband, argue&gt;</td>
<td>&lt;husband, fight&gt;, &lt;husband, yell&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;wife, argue&gt;, &lt;spouse, fight&gt;</td>
</tr>
<tr>
<td></td>
<td>Love</td>
<td>&lt;husband, fight, money&gt;</td>
</tr>
<tr>
<td></td>
<td>School</td>
<td>&lt;wife, argue, money&gt;</td>
</tr>
<tr>
<td></td>
<td>Work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social</td>
<td></td>
</tr>
</tbody>
</table>

To evaluate the performance of the EIA, a total of 5,000 psychiatric documents were collected from the professional mental health web sites, such as PsychPark (http://www.psychpark.org) and John Tung Foundation (http://www.jtf.org.tw). The baseline system used herein is the association pattern mining.
(Apriori algorithm), which is a supervised corpus-based approach widely used in data mining community. The EIA and Apriori algorithm were then performed, respectively, for pattern induction, and the induced patterns were evaluated on the coverage of real data provided by 15 human subjects. The subjects provided their experienced negative life events in the form of natural language sentences. A total of 69 sentences were gathered as the test set. The evaluation metric adopted in this experiment was the out-of-pattern (OOP) rate, a ratio of unseen patterns occurred in the test set, which was calculated as the number of test sentences with a pattern not occurring in the set of discovered patterns, divided by the total number of test sentences. Additionally, a sign test for pairwise comparison was adopted to determine whether the performance difference was statistically significant. Table 2 shows the OOP rates of the EIA-based approaches and Apriori algorithm, where the rows denoted by * Multiple represent the OOP rates of the EIA obtained after 30 experiments, and the rows denoted by * Worst represent the worst OOP rates over the 30 experiments.

Table 2. Comparison of OOP rates between EIA and Apriori algorithm.

<table>
<thead>
<tr>
<th></th>
<th>OOP Rate</th>
<th>Reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>over</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apriori</td>
</tr>
<tr>
<td>Apriori</td>
<td>60.9% (42/69)</td>
<td>—</td>
</tr>
<tr>
<td>EIA_Worst</td>
<td>97.1% (67/69)</td>
<td>+59.4</td>
</tr>
<tr>
<td>EIA_Multiple</td>
<td>42.0% (29/69)</td>
<td>-31.0#</td>
</tr>
<tr>
<td>EIA_RF_Worst</td>
<td>40.6% (28/69)</td>
<td>-33.3#</td>
</tr>
<tr>
<td>EIA_RF_Multiple</td>
<td>27.5% (19/69)</td>
<td>-54.8#</td>
</tr>
</tbody>
</table>

# performance difference is statistically significant (p<0.05)

The experimental results indicate that the EIA is more effective than Apriori algorithm mainly due to the incorporation of the HAL model, the use of relevance feedback, and multiple experiments. The HAL model provides an informative infrastructure to represent the patterns in a high-dimensional context space. Based on the HAL space, the EIA can bootstrap with a set of seed patterns, and then induce more relevant patterns from unannotated corpora with the help of relevance feedback. Additionally, the use of EIA multiple experiments also improves performance. The proposed evolutionary framework only needs a small amount of annotated data, thus reducing the reliance on the availability of large annotated corpora, as required by corpus-based approaches.
Dimethyl Isotope-Coded Affinity Selection (DICAS) for the Analysis of Free and Blocked N-termini of Proteins Using LC-MS/MS

Po-Tsun Shen, Jue-Liang Hsu and Shu-Hui Chen*

Department of Chemistry, College of Sciences, National Cheng Kung University

shchen@mail.ncku.edu.tw


A

alysis of protein N-termini is of great importance in both biological and methodological areas. In the biological area, analysis on N-terminal sequences of proteins could provide many insights such as the proteolytic enzymes and modifications involved in protein synthesis process to assist in better understanding related mechanisms. For example, during the protein synthesis in many eukaryotes, the initiator methionine of proteins is hydrolyzed and an acetyl group is added to the new N-terminal amino acid.1-3 Proteins that are membrane bound or are destined for excretion contain a signal sequence in their N-termini and it will be removed during the co-translational process. Moreover, protein N-terminal processing steps are critical for regulating protein turnover in the cell.4,5 In methodological areas, analysis of protein N-termini is termed “positional proteomics”6 and it represents a selective strategy that simplifies the complexity of a proteome by selecting positionally defined peptides that could yield substantial information in protein identification strategies. Since the two positional locations within every protein are the extreme ends- the N-terminal and C-terminal peptides, analysis of protein N-termini anchors the peptides at a precise location within the parent protein and thus greatly increase the confidences for protein identification.6

Many methods have been reported for selective recovery of N-terminal peptides, including traditional Edman degradation and targeted chemical derivatizations designed to distinguish the N-terminal peptides and internal peptides. For example, acetylation of free amino groups is coupled with 2,4,6-trinitrobenzenesulfonic acid to cause a strong hydrophobic shift and segregate from the unlabeled N-terminal peptides7 or coupled with biotin-avidin affinity selection to isolate the acetylated N-terminal peptides6; guanidination of ε-amino groups of lysines with ω-methylisourea is coupled with biotinylcysteic acid reaction for affinity selection with the Nα-amino group of the protein.8 Isotope-coded N-terminal protein sulphonation has also been reported for simultaneous protein identification and quantitation.9 So far, these reported methods are primarily designed to identify the free N-termini sequence of proteins. In this report, we aim to analyze both the free and blocked N-termini of proteins simultaneously and demonstrate its potential usefulness in analyzing complex samples.

A general scheme depicting the procedure for analyzing N-terminal peptides of proteins is depicted in Figure 1. At the protein level, the disulfide bonds were reduced by DTT and all cysteines were S-
alkylated by iodoacetamide. All primary amines including lysine residues and the N-terminus of proteins were reductively aminated by formaldehyde-$d_2$ and sodium cyanoborohydride to produce dimethyl groups or monomethylated proline N-terminus. The labeled proteins were then digested by trypsin to result in Arg-C like digests. Internal peptides were then trapped by the solid support (POROS-AL) that contains aldehyde functionalities through the formation of covalent bonds with free amino groups generated by digestion. The flow-through fractions that contained in-vivo blocked or in-vitro formaldehyde-$d_2$ labeled N-terminal peptides were subjective to sequence analysis by nanoLC-Q-TOF MS/MS. Stable isotope-based dimethyl labeling strategy has been previously reported by our lab for quantitative proteomics. This labeling strategy is simple with high reaction yield (near 100%). More interestingly, this labeling strategy provides a$_i$ ion signal enhancement, which is useful for confirming N-terminal amino acids and modifications. We would like to take this advantage in developing a MS-based strategy for analyzing protein N-termini. The method is termed Dimethyl Isotope Coded Affinity Selection (DICAS).

![Diagram of the DICAS protocol for selecting protein N-termini](https://example.com/dicas Diagram)

Figure 1. Schematics of the DICAS protocol for selecting protein N-termini

The efficiency of dimethyl labeling at the protein level was first examined using myoglobin as the model. Dimethyl labeling at the peptide level was reported to be complete with a product yield near 100%. At the protein level, several factors such as the exposure of the labeling site and the steric hindrance could interfere with the reaction. To minimize these effects, proteins were denatured and alkylated before the labeling. Based on the sequence of myoglobin, there are 20 expected labeling sites including 19 lysine residues and the free N-terminus of the protein. Each labeling site will give a mass difference of 32.0564 Da and therefore, a mass difference around 640 Da is expected if all 20 sites are labeled. The multiple charge envelopes of both labeled and unlabeled myoglobin were shown in Figure 2. After deconvolution, only single peak with a molecular weight of 16974.14 Da and 17613.21 Da was yielded for the unlabelled and labelled myoglobin, respectively. Moreover, the mass difference between the labeled and unlabeled proteins was around 639.07 Da, which is close to the expected value based on the calculation.
Therefore, dimethyl labeling at the protein level was confirmed to be near complete.
To confirm the effectiveness of the proposed protocol, a standard protein mixture composed of α-lactalbumin, myoglobin, and hemoglobin was used. The standard mixture was reduced by DTT, S-alkylated by IAM, and then reductively aminated by formaldehyde-\(d_2\) and sodium cyanoborohydride. After trypsin digestion, the N-terminal peptides were isolated from the flow through fraction and then analyzed by MS. It was confirmed that the signal intensity of the internal peptides was greatly reduced after affinity removal. On the contrary, the signal of the N-terminal peptides was found to be enhanced after the isolation and it allowed the MS/MS spectra of N-terminal peptides to be successfully assigned. The N-termini of α-lactalbumin was assigned to be Glu (E) based on the \(a_1\) ion shown in Figure 3, which was the 20th residue in the translated protein. According to the Swissprot protein database, the sequence (MMSFVSLLLVGILFHATQA) from the first residue to 19th residue was destined to the signal peptide and therefore, the real N-termini of the secreted α-lactalbumin begins with the 20th residue, Glu (E). Our result is consistent with the report.
We further applied the strategy to the analysis of protein N-termini in MCF-7 cells. As a proof of the concept, we used the un-fractionated total lysate of MCF-7 cells for the analysis. A total of 28 proteins were identified from the analysis, among which 23 proteins were identified by single N-terminal peptides, indicating a near 82% of high isolation efficiency. There were 5 proteins identified from 6 internal peptides and two of them were keratin proteins which were likely to be introduced during the sample handling. Moreover, 14 out of 23 N-terminal proteins were identified to possess the methionine removal and N-terminal acetylation. It is notable that there is no detectable a$_1$ ion in the MS/MS spectrum for the N terminal peptide (AcSQAEFE*KAAEEVR, m/z 784.41, 2+) of Acyl-CoA-binding protein, indicating a lack of dimethyl labeling possibly due to the blockage of the N-termini. Instead, an acetylated serine N-terminus could be readily deduced from b and y ions with a high score. We further identified a novel signal sequence (1$^{st}$-32$^{th}$ aminoacid) in the termini of profilin, and the 33$^{th}$ aminoacid, alanine, was identified to be the real N-termini of profilin. Profilin is a ubiquitous eukaryotic protein that serves as a link between the phosphatidyl inositol cycle and actin polymerisation, and hence it acts as an essential component in the signaling pathway. Sequence similarity between profilins from different species is low. However, the N-terminal region, which is thought to be involved in actin binding, is relatively well conserved. Therefore, the removal of N-terminal signal sequence of profilin is
likely to affect the process of actin binding and polymerisation as well as cytoskeletal rearrangement.

Copyright 2008 National Cheng Kung University
White Light Emission From DBPPV and CdSe/ZnS Quantum Dots Dually Hybridized on InGaN Light-Emitting Diodes

Yan-Kuin Su*, Ping-Chieh Tsai, Chun-Yuan Huang, and Ying-Chih Chen

Institute of Microelectronics, Department of Electrical Engineering, Advanced Optoelectronic Technology Center

yksu@mail.ncku.edu.tw


Abstract

We have demonstrated the white light emission from the novel hybrid light-emitting diodes. With a polymer/QD composite film thickness of 0.61 μm, the Commission Internationale del'Eclairage chromaticity coordinates of the emitting light from the device attain (0.33, 0.36). The coordinates are shifted to (0.43, 0.46) as the thickness is further increased. Meanwhile, the luminescence spectrum shows that more than 90% of the blue light is effectively energy transferred to green and red lights. For a long-term operation, the luminescence intensity from the polymer is decreased by 62% within 5 h due to the photooxidation effect.

Index Terms-CdSe/ZnS quantum dots (QDs), GaN, hybrid light-emitting diode (LED), white light emission, 2,3-dibutoxy-1,4-poly (phenylene) (DBPPV).

I. INTRODUCTION

By using white light emitting diodes (WLEDs) as the solid-state lighting has attracted much attention worldwide because of their benefits including energy saving, environment protection, safety, and reliability. It is estimated that solid-state lighting can reduce 50% of the global electricity consumption for illumination, and within the next five years, it is expected the LED-based white light sources will completely replace conventional incandescent and fluorescent lamps. In fact, the techniques of fabrication of WLEDs have come a long way and been matured for commercialization. Nowadays, several methods are developed to achieve white light emission from LEDs, including multichip integration, multiple quantum wells or impurities doping in the monolithic chip, and phosphors for color conversion. Among them, the color-conversion WLEDs are the easiest and the most practical for mass production. In particular, with the mature development of solid-state LEDs, the optically pumped emissions from polymer phosphors have avoided the electrically induced degradation suffered by polymer LEDs during operation, which indicates that the hybrid polymer/solid-state WLEDs are more reliable white light sources. Quite a few studies have been reported for individual polymer or QD hybrid devices. However, rare investigations have dually hybridized the polymer and QDs on blue or UV LEDs. Demir et al. recently demonstrated the dual hybridization of QDs and polyfluorene on near-UV LEDs without further discussion about the reliability of their hybrid devices. In this letter, we have
demonstrated that the white light emission can be achieved via the dual hybridization of the 2,3-dibutoxy-1,4-poly(phenylene vinylene) (DBPPV) and CdSe/ZnS QDs on an InGaN LED with proper composite film thickness.

Fig. 1. Schematic structure of our hybrid LEDs, (b) a TEM image of CdSe/ZnS core/shell QDs, and (c) the chemical structure of DBPPV.

II. EXPERIMENTS
The device structure is shown in Fig. 1(a). CdSe/ZnS core/shell QDs and DBPPV composite film were spin coated on a fabricated InGaN blue LED chip. The QDs and DBPPV were chosen since they had been demonstrated to be excellent candidates for polymer-QD LEDs\(^7\). The transmission electron microscopy image of the QDs is shown in Fig. 1(b). The QDs with an average diameter of 5.5 nm were well dispersed in toluene first with a concentration of 10 mg/ml and have a photoluminescence (PL) emission peak at 610 nm as well as a full width at half maximum (FWHM) of 32 nm. Meanwhile, the DBPPV powder [the chemical structure is shown in Fig. 1(c)] was solved in toluene 1.5 wt. % and further blended with the QD solution in a volume ratio of 4:1 for more than 24 h to complete the DBPPV/QD composite. The InGaN LED consists of a 30-nm-thick GaN buffer layer, a 2-μm-thick undoped GaN layer, a 1-μm-thick Si-doped GaN layer, an InGaN/GaN multiple-quantum-well active layer, and a 200-nm-thick Mg-doped GaN layer. It has a peak wavelength \(\lambda_p\) of 436 nm and an FWHM of 15 nm. Afterward, to precisely control the thickness of composite film, four spin speeds—4000, 3000, 2000, and 1000 r/min—were used to optimize the light characteristics, which resulted four thicknesses of the composite film \(h=0.22, 0.30, 0.61,\) and 0.87 μm. They were thus marked as devices A, B, C, and D, respectively.

III. RESULTS AND DISCUSSION
Fig. 2. $I–L–V$ curves of the hybrid devices with composite film thicknesses of 0.22, 0.30, 0.61, and 0.87 μm, respectively.

The voltage–current ($V–I$) and light–current ($L–I$) curves of hybrid LEDs are shown in Fig. 2. The devices are turned on at 2.8 V, and the forward voltages (the biased voltage at 20 mA) are around 3.25, 3.25, 3.24, and 3.31 V for devices A, B, C, and D, respectively. The increase of forward voltage for device D should be resulted from the incomplete removal of the electrically resistive DBPPV/QD composite between probe tips and metal pads, i.e., the series resistance of about 3Ω. from the difference of that between device D and the others. On the other hand, the $L–I$ possesses the same condition that is less luminance intensity in device D. Since the output light was measured by a silicon detector whose spectral responsivity was not corrected according to the human eye sensitivity function, the measured data could definitely be influenced by both the color-conversion efficiency of composite and the responsivity of the detector.
The EL spectra of devices measured at 20 mA are shown in Fig. 3. To clearly observe the variations, the spectra are normalized to peak at 436 nm, the emission from InGaN QWs (E_{QW}). Aside from this peak, three additional peaks can also be observed as expected. Namely, the broader band located at about 550 nm is the emission from DBPPV (E_{DBPPV}), which consists of two peaks at 525 and 563 nm, respectively. As previously reported, the peak at shorter wavelength (E_1) is from the single polymer chain (or intrachain) exciton emissions, whereas the other peak (E_2) is related to the emissions from the interchain species such as excimers or aggregates. At lower spin speeds (thicker thicknesses), most of the polymer chains are stuck and less extended, which results in the less aggregated morphology and E_1 dominant spectra. Since the QDs are with higher absorption coefficient at shorter wavelength, the emission from QDs at 610 nm (E_{QD}) is mainly excited by the blue light. With the increase of composite film thickness, the color of emission light is gradually changed, and the white light emission can be obtained for device C. The corresponding Commission Internationale de l’Eclairage (CIE) chromaticity coordinates are (0.33, 0.36), and the correlated color temperature (CCT) is about 5300 K. After calibration, the luminous flux of device C at 20 mA is 0.5 lm, which corresponds to a luminous efficiency of 8.7 lm/W. However, the coordinates are shifted to the yellow region (0.43, 0.46) as the thickness is further increased to 0.87 μm. Meanwhile, the luminescence spectrum showed that more than 90% of the blue light is energy transferred to green and red lights.
To investigate the stability of the DBPPV/QD composite, device D was steadily operated at an injection current of 20 mA at room temperature, and the luminescence spectra were constantly analyzed. The integrated luminescence intensities of $E_{QW}$, $E_{DBPPV}$, and $E_{QD}$ were also separately recorded as a function of operation time. The time-dependent EL spectra are shown in Fig. 4, and the inset shows the variations of intensities of $E_{QW}$, $E_{DBPPV}$, and $E_{QD}$. Obviously, $E_{DBPPV}$ ($E_1 + E_2$) is decreased by 62% within 5 h, whereas $E_{QW}$ is rapidly increased and $E_{QD}$ is almost constant. Since the reliability test was in the air environment, the simultaneous oxygen penetration and photoexcitation lead to the well-known photooxidation effect, which is one of the main causes of the photodegradation in PPV derivates\textsuperscript{10}. Accordingly, the chain scission of the vinylene double bond originated from the oxygen-related photochemical reaction gradually reduces the excitons and causes the peak blue shift (bandgap widening) \textsuperscript{11}. The PL efficiency of DBPPV is decreased, and the composite film becomes transparent, which results in the rapid increase of $E_{QW}$.

The current-dependent emission colors of devices biased from 6 to 60 mA are shown in Fig. 5. With the increase of composite thickness, the variations of current-dependent CIE coordinates are decreased, and no observable fluctuation is measured when the film is thicker than 0.61 μm. Also shown are the time-dependent CIE coordinates of device D derived from Fig. 4. Within the first 30 min, the coordinates are shifted toward the pink region. After the blue component becomes dominant, they are monotonously shifted toward the blue region and eventually turn to be the purple light.
**IV. SUMMARY**

For achieving white light emission, synthesized red-emitting CdSe/ZnS QDs in combination with the green-emitting DBPPV were dually hybridized on the blue InGaN LEDs. With the thickness of the capped DBPPV/QD composite film reaching 0.61 μm, the corresponding CIE chromaticity coordinates attain (0.33, 0.36), which are located within the white region of the diagram, and the CCT is about 5300 K. However, the coordinates are shifted to the yellow region (0.43, 0.46) as the thickness is further increased to 0.87 μm. Meanwhile, the luminescence spectrum shows that more than 90% of the blue light is effectively energy transferred to green and red lights. Finally, for a long-term operation, the integrated luminescence intensity from the DBPPV is significantly decreased to be 38% of its original value within 5 h.

**Reference**


Copyright 2008 National Chiao Tung University
Book of Heart and Ink
Rong-Fu Wu

Department of Chinese Literature, College of Liberal Arts, National Cheng Kung University
z7108004@email.ncku.edu.tw


A frequently asked question is whether it is significant to write classical poems in modern times. I would reply explicitly and affirmatively in the following way. While it is considered natural for science researchers who work with laboratories to present scientific results from lab experiments, literary researchers have to search for their own laboratories from everyday life and the wider universe. A poet is, of course, a literary researcher. To a poet in modern times, creative writing is a form of literary experiment, especially in the area of classical poetry. To some extent, that explains why “Selected Poetry and Writing Practice” features classical Chinese poetry as a required course for students in the Department of Chinese Literature at National Cheng Kung University (hereinafter NCKU).

When it comes to classical Chinese poetry, contemporary scholars are apt to articulate the meaning of it in flowery language with extravagance. They would think too much of working on things that had already been mulled over and examined by their ancient counterparts. No wonder Su Shi, a major poet of the Song Dynasty, once criticized, “Better to eat pork than to talk all the time about dragon meat.” His comment points to a universal problem from ancient to modern times that people would “keep their eyes high and hands low” and have things better said than done. Since I have long been experimenting with classical Chinese poetry, I am fully aware of the common problems students have with the course of Selected Poetry and Writing Practice. What have they learned from this course? How many misconceptions remain or are sown? Where are the blind spots for students? How do students resolve their problems? All these questions have been carefully considered and addressed, and thinking about such issues is helpful when I work on my research.

Book of Heart and Ink is composed of three volumes. The first volume covers the span of my life from 1968, when I began my complimentary education at a junior high school, to my graduation from National Cheng Kung University, from which I have excluded my writings and knocking-on-bowl poetry dating back to my private tutoring stage, but collected a number of works on everyday life. Take for instance the poem Going to School on a Rainy Day:

Caught, both clothes and face wet, in the pouring evening rain,
Yet my ambition unfulfilled, I have to withstand the pain.
Wait to see my streams overflow into the ocean of academics,
Make big waves to achieve a success as great as river and mountain.

(Professor Xiao Qiongrui said, ‘This Book of Heart and Ink has already fulfilled your ambition of making big waves to achieve a success as great as river and mountain.’)

At NCKU, I won Phoenix Literary Award five times. Especially on its eighth anniversary, I composed the following three poems of Emulating the Untitled.

(1)
The light rain in late spring drizzles flowers away,
Like a lady with a facial makeup on one half.
A colorful phoenix sings exclusively on an auspicious day,
And the rhino remains speechless throughout its life.
The concubines of Xiang had shed tears on the bamboos,
And the pitiful emperor of Shu Han sought everywhere for a house.
A romantic mood for a girl swimming in the Han River is but a dream,
And the poet himself intends no evils.

(2)
Some birds in the far forest cry in deep sorrow,
I feel sad and gloomy in the smoky rain.
Where is the goddess of Mount Wu?
Thinking of the goddess at the Rou water is only an empty dream.
With flowers withered, riverside willows have grown in green,
A lit candle continues to shed its blood tears to its end.
A sunflower always looks silently to the sun,
Not envious of the fairer southeasterly wind.

(3)
The past memory like smoke fades away,
Only the silent orchid misses its old fragrance.
A roll of lovesickness spreads from the buds of bananas,
With sorrows like long slender branches of willows.
One prays with a golden needle to a weaving maid for a match,
I stay alone with a cowherd in straw shoes.
The bridge of magpies falls apart with shadow remaining on the Milky Way.
I will feel heartbroken till the end of heaven and earth.

As one of the judges, Professor Chang Meng-Chi commented, ‘The three poems of Emulating the Untitled are the most outstanding work in the final selection. Personally I would pick them as my favorite. The three untitled poems are syntactically flexible and full of literary wit and intellectual brilliance. The couplets such as ‘A colorful phoenix sings exclusively on an auspicious day, And the rhino remains speechless throughout its life’, ‘Where is the lady in Mount Wu? No spirit is around at Rou water and it is only an empty dream’, and ‘Withered flowers fail to compete with river willows green, A lit candle bears to see tears shed in red.’ take patterns after the poetic scenery of Li Shangyin, a poet of the late Tang Dynasty. It is worth my congratulation for you to have such a talented student.’
In the year when I graduated from NCKU, our class published a collection of my poems in *Ching-Chin-Shih-Chih* whose preface was written by Professor Chang Meng-Chi. At that time, Chair Tang Yi-Nan of the department went to him personally and asked, “You speak highly of Wu Rong-Fu in your preface. Is it a matter of truth or a matter of courtesy?” In reply, Professor said, “It takes three years to graduate a Master of Art. However, it may take thirty years or more to cultivate somebody like Wu Rong-Fu.” Afterwards, I was employed to work as a teaching assistant in the department. (It should be noted that I was not informed of this episode by Professor Chang until three years ago, and Professor Tang also confirmed the information.)

The second volume recounts the years during which I served as a teaching assistant, and continued to pursue graduate studies for master’s and doctoral degrees. In my capacity as a TA, I was assigned to take charge of Phoenix Poetry Society and Lanting Poetry Society. The assignment required me to take students to join national contests every year. In order to train them into well-prepared contestants as soon as possible, I was compelled to review my teaching approaches from time to time. As a result, I had developed an approach of shadowboxing to help students learn step by step the Pingze rhythm spectum. With more than twenty years of teaching experiments, I was quite confident that the approach could help students learn well.

Meanwhile, I had come up gradually with a self-conscious direction of writing from the experiment of poetic creation. I began to “use the old to create the new” in my efforts to write of modern times and new feelings. For instance, I composed the poem *Computer* to address the addiction of modern people to Internet surfing and Internet cafes.

So crazy are modern humans everywhere,
Busy with Internet surfing day and night.
They press the keyboard and move the mouse continuously,
Logging onto the Internet to look for any sheep lost.
Three cups would not suffice for a spiritual lift,
And remedy software programs are always modified.
I laugh at myself as a survivor from the Tang Dynasty,
Using old rhythms to have modern poems composed.

In compliance with the metrical and antithetic patterns of Chinese poetry, the poem presents an image of contemporary social craze.

On another instance, when the Tuntex Group, a business conglomerate in Taiwan, announced its plan to construct a steel industrial zone in the Cigu habitat for black-faced spoonbills, I was so concerned about environmental conservation that I composed the poem *Black-faced Spoonbills*.

A white-faced scholar looks adorably handsome,
A black-faced bird lives hard.
There are only five hundred of them in the world.
They find no shelter in a large sky.
At the mouth of the Tsengwen River,
Standing on fist-shaped feet against the northerly wind.
It has its neck hidden all day long,
And occasionally have its furs combed.
Taking a bite every ten steps,
In an attempt to seek a source of food.
So loathsome are the mean rich,
Eyeing the long bank of my homeland.
Too powerless is my blunt mouth,
To challenge the force of silver and gold.
Looking at the gloomy sea surface,
I feel more sorrowful and hopeless in my heart.

A third example is the poem *Taiwan 921*:

Taiwan 921,
Divine Gunggung head-butted the Buzho mountain.
An earthbull turned around and stood up,
Stretching its tongue to roll in high rises.
Huge mansions fell broken by halves,
Thousands of people slipped deep into its throat.
Spacious was its stomach with four compartments,
Allowing it to again and again ruminate;
As if it would swallow the whole island,
Trembling the universe with its aftershakes.
The scenes were vivid and frightening,
A feeling of sorrow in human sympathy was sensed.
Although a heavenly punishment was seemingly possible,
Human errors should be held accountable as well;
How can we comfort young orphans?
How can we settle old women?
When the Moon was clouded by wind and rain,
Who would care to think of the mid-autumn?

Also collected in this volume is the poem *911 Explosion of Twin Towers, New York, USA*.

Alas! How strange!
Was it a mistake that a silver hawk bumped onto the window?
Suddenly the skyscrapers began to smoke,
With ghosts and souls crying terrifyingly for unknown reasons.
Red flames stretched tongues out, scorch-licking the two pillars.
A hundred thousand men and women were in there,
Whose lives thousands of firefighters tried to recover.
The gargantuan structure collapsed from the sky,
A victim was seen jumping off like a falling horse.
One aircraft crashed and another followed,
Making trouble for the Pentagon.
When the news of a lost flight was heard,
The whole world went into a state of terror!
The disaster was gradually known,
As a result of crazy anger from Al-Qaeda.
They would not care to turn the living souls into ash,
And the financial center into a grave yard.
America, the world’s greatest power, could never expect such a woe.
The innocent ran pitifully into this misfortune.
Which god could they appeal to for their justice?
Heard of was bin Laden wanted,
And Hussein targeted for his ammunition depots.
Three hundred thousand American and British soldiers were deployed,
With numerous fighter aircrafts and warships.
The war was seen coming near,
And the step of peace ceased to walk.
The world hurried to get even to a quick relief,
But none learned a lesson of reprisal breeding reprisal!
He who kills will be killed,
How many people can break free and find an exit?

Dean Chen Chao-Ming of the College of Liberal Arts read the poem, saying: “With its intense and vivid description, this poem is terrifying and shocking.” This is what I mean to write about modern times in the style of classical poetry.

The third volume is a record of my life from my graduation as a Ph.D. of Chinese literature from NCKU to 2007 when I first made it to the top of Mt. Jade, the highest mountain in Taiwan. During this period, I had keener observations and understandings about life and politics, as is illustrated in White Mouse (Guinea Pig):

Born of jade nature with a pitiful life,
How difficult it is to survive as a mouse!
Not only bullied by cats and barked by dogs,
But also threatened by eagles or snakes as a food source.
Willing to be used by Bianchuei in search of meridians,
And cut open by Hua Tuo for its liver and gall.
How many of those back to life would remember this little thing?
All beings of the same kind would feel chill.

The first four lines depict the pitiful life of a white mouse. It not only endures the bullying by cats, barks by dogs, and threats by eagles and snake, but also is sacrificed as a subject of experimentation for medical science. Owing to its sacrifice, millions of lives have been saved. However, “How many of those back to life would remember the little creature?” Such a passage describes critically how human beings tend to forget gratitude. But that is not the main point of the poem. The gist lies in the last sentence: “All beings of the same kind would feel cold.” Who is, one may ask, not the same as a white mouse? Thus,
Professor Wang Wen-Chin said, “This poem, written with refined and solemn diction which transforms semantically from time to time, is so great that it excites me to pound the table as an expression of admiration.”

On another occasion, I was assigned to grade tests for the college entrance examination for designated courses. Lest I should be late for the grading job, I arrived in Taipei one day earlier and took a trip to the township of Tamshui. Thus, I wrote the poem *A Tour of Tamshui On the Eve of Grading Papers for the College Entrance Examination for Designated Courses*.

The examination for designated courses involved ten thousand examinees,
I took a voyage to Tamshui for a spiritual lift.
A floating light flashed over the ocean of yin and yang,
The feeling of win and loss is hard to be removed from an ordinary mind.
Going up and down on waves high and low,
Flying free in the cloudy sky near and afar.
The rulers of talent measure sizes with care,
Lest it should have a sardine caught but a whale let go.

Classical Chinese poetry is a kind of solid scholarship that takes a lot of study and practice. A saying goes that an expert sees how people perform. A performance speaks for itself. An expert also knows to what extend one has learned. That is why an ancient saying runs, “Show your sword to a swordsman, and produce no poem to a non-poet.” Students often asked me: “Hu Shih advocated “Eight Nos” and referred to meters, antithesis and rhymes as hand and foot cuffs, didn’t he?” I would ask them, “Don’t you think that the poetry produced in the Tang dynasty is regarded the best in Chinese history? The Song Ci poetry was much stricter than the Tang poetry. Both of them were hand-and-foot cuffed, why were they composed so beautifully? There must be a lot to learn from classical Chinese poetry.

*Copyright 2008 National Cheng Kung University*
Effects of surface characteristics of activated carbon on the adsorption of 2-Methylisobornel (MIB) and geosmin from natural water

Jianwei Yu¹, Min Yang¹,*, Tsair-Fuh Lin², Zhaohai Guo¹, Yu Zhang¹, Junnong Gu³, Suxia Zhang³

¹SKLEAC, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, P.O. Box 2871, Beijing 100085, China
²Department of Environmental Engineering, National Cheng Kung University, Tainan City 70101, Taiwan (Email:tflin@mail.ncku.edu.tw)
³Beijing Waterworks (Group) Co. Ltd., 100085, China


Musty/earthy odor is present in many drinking water systems in North America, Japan, Australia, Europe, Taiwan, and China. Two organic chemicals, trans-1, 10-dimethyl-trans-9-decalol (geosmin) and 2-methyl-isoborneol (2-MIB) are often responsible for the odor. These two compounds are noticeable at a concentration of ng-L⁻¹ in drinking water, and are difficult to remove using conventional water treatment processes. One promising means of removing geosmin and 2-MIB from drinking water is powdered activated carbon (PAC) adsorption. However, previous studies indicate that the adsorption efficiency of such contaminants is very dependent on the types of PAC, and the basis for the PAC selection has been empirical. In this study, an effective method for selecting activated carbon for the adsorption of MIB and geosmin was developed based on the physic-chemical properties of activated carbon. Five commercially available activated carbons (including one fruit-based, one wood-based, and three bituminous coal-based) were selected. The carbons were characterized with low-temperature nitrogen adsorption for pore size distribution and surface area, Fourier transform infra-red (FTIR) spectroscopy for surface functional groups and structural oxygen species, and X-ray photoelectron spectroscopy (XPS) for oxygen and carbon compositions. A statistical analysis method was employed to correlate carbon properties and the adsorption capacities of MIB and geosmin. Then, the main rational for the selection of PAC to remove MIB and geosmin was established.

To find the governing factors affecting the adsorption of MIB and geosmin, the Spearman Rank correlation method (SPSS 11.0) was employed for the analysis of the relationship among the adsorption capacities and different carbon surface parameters (O content, C=O and C-O chemical group contents, the surface area, different pore volumes, iodine number and methylene blue number). The Spearman Rank coefficients (r, P) were calculated, and a P-value less than 0.05 is considered statistically significant for all analyses. Table 1 summarized the results of the correlation analysis. According to the Spearman rank, the adsorption capacities for both MIB and geosmin were highly correlated with
micropore volumes of activated carbons with \( r=1.00, \ P=0.000 \) for MIB and \( r=0.90, \ P=0.037 \) for geosmin, respectively. In contrast, the two most often used parameters for the evaluation of activated carbon, iodine number and methylene blue number, were not significant in correlation with the adsorption capacities of MIB and geosmin. Although there was also a positive trend for meso and total pore volumes and surface area, and a negative trend for O and C-O content with adsorption capacities, none of these were statistically significant.

Table 1. Results of Spearman rank correlation between adsorption capacities of MIB and geosmin and carbon characteristics

<table>
<thead>
<tr>
<th>Carbon characteristics</th>
<th>MIB adsorbed (^d) (ng/mg)</th>
<th>Geosmin adsorbed (^d) (ng/mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coeff. (r)</td>
<td>P</td>
</tr>
<tr>
<td>O (Atom %)</td>
<td>-0.500</td>
<td>0.391</td>
</tr>
<tr>
<td>C=O (%)</td>
<td>0.800</td>
<td>0.104</td>
</tr>
<tr>
<td>C-O (%)</td>
<td>-0.800</td>
<td>0.104</td>
</tr>
<tr>
<td>( S_{BET} ) (m(^2)/g)</td>
<td>0.700</td>
<td>0.188</td>
</tr>
<tr>
<td>( V_{tot} ) (ml/g)</td>
<td>0.700</td>
<td>0.188</td>
</tr>
<tr>
<td>( V_{meso} ) (ml/g)</td>
<td>0.400</td>
<td>0.505</td>
</tr>
<tr>
<td>( V_{micro} ) (ml/g)</td>
<td>1.000</td>
<td>0.000</td>
</tr>
<tr>
<td>( V_{\text{micro}}^{10-12\text{Å}} ) (ml/g)</td>
<td>0.800</td>
<td>0.104</td>
</tr>
<tr>
<td>Iodine number (^c) (mg/g)</td>
<td>0.300</td>
<td>0.624</td>
</tr>
<tr>
<td>Methylene blue number (^c) (mg/g)</td>
<td>0.300</td>
<td>0.624</td>
</tr>
</tbody>
</table>

\(^a\) total micropore volumes; \(^b\) micropore volumes between 10-12 Å; \(^c\) data as shown in Table 2; \(^d\) mass MIB or geosmin adsorbed at an equilibrium concentration of 10 ng/L.

To demonstrate the correlation between the micropore volumes and amount of MIB or geosmin adsorbed by the carbon, the two parameters were plotted in Fig. 1 for all the carbon/odorant combination tested at an equilibrium concentration of 10 ng/L. It is clear that the adsorption capacities increase almost linearly with the increase of micropore volumes of carbons, indicating that the micropore volume measured by nitrogen adsorption might be a good parameter for evaluating the adsorption capacities of carbons for both MIB and geosmin. MIB and geosmin are generally treated as hydrophobic compounds with molecular sizes of about 6 Å. The most likely adsorption mechanism is hydrophobic attraction to the carbon surface, and the compounds would be preferentially adsorbed into the micropores. The results suggested that micropore volume may be used as a surrogate parameter for the selection of activated carbon used in the adsorption of geosmin and MIB in drinking water treatment.
Fig. 1. Relationship between surface concentrations of MIB and geosmin, and micropore volumes of activated carbons