A Guide to Chinese Technical Translation for Scientists

Part II

Peter Buriks
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FOREWORD

The reader may be surprised to find himself confronted with five longish and not very easy translation exercises after the relatively small number of general remarks made in Part I of this Guide. We realize that the transition is somewhat sudden, but do not consider this a disadvantage, since the reader is not compelled to go full tilt at this second volume. On the contrary. We hope that the reader will find time to "work through" the present text several times after fairly long intervals, taking the expression "work through" in its literal sense!

The Character Index at the end of this volume gives all the characters contained in this part of the Guide. In addition to at least one meaning the characters are assigned the numbers under which they are listed in the dictionaries referred to in Part I. We also give here for the last time the stroke sequence of the "new" characters, i.e. those not contained in Part I.
Part III of this Guide, which will be appearing in the not too distant future, will give further exercises and, equally important, notes on how Chinese characters can be found in the dictionaries.

Peter Buriks

Karlsruhe Nuclear Research Centre, December 1970
一，Szilard-Chalmers 效应基本原理

大家知道，凡有一作用
tà - chiā chīh - taö，fän - yǔ i tsö - yùng -

力，必有——大小相等方向
lì，pì - yǔ i tà - hsiāö hsiāng - tōng fāng - hsiāng

相反的反作用力，这就是
hsiāng - fän ti fän - tsö - yùng - lì，chè chiu shīh

著名的牛顿第三定律。这
chù - mǐng ti niú - tūn ti - sän ting - lū，chè

种作用也存在于核反应
chūng tsö yùng yēh ts'ün tsai yú hō fän yīng

中，例如，在核转变时，原子
chūng，lī jú，tsai hō chuăn piēn shīh，yūān tsū
核放出不同的粒子（α-或β-粒子等），使这个原子核受到一反作用，因而产生"反冲"。受反冲的原子称为反冲原子。理论计算表明，反冲原子所具有的反冲能量一般至少为几百电子伏。
结合能只不过3-5电子伏

chieh ho neng chieh pu kuo tien tsu fu

特左右。这里，可用氢氧
t'e ts'o yu che le, k'o yung lu, hsiu,

碘在(m,2)反应中所获得
tien tsai fan ying chung so huo te

的反冲能量为例来说
ti fan ch'ung neng liang wei lie lai shuo

明(表)。因此，反冲能量足
ming piao yin tz'u fan ch'ung neng liang tsu

以使分子中化学键断裂
yi shih fen tz'u chung huah hsueh chien tuan

裂，致使生成的反冲原
lieh, chieh shih sheng ch'eng ti fan ch'ung yu'an

子处于游离态。由于这
tz'u ch'u yu yu li t'ai. yu yu che

种现象在1934年被 Szilard-

chung hsiyen hsiang tsai niyen pel
lard-Chalmers 效应。直到 1947 年后，
hsiao yīng, chīn tāo nièn hou,
才对这方面的工作开
ts'ai tū ché fāng mièn ti kūng tsào k'ai
始了系统的，大量的研
shēn la hsei t'ūng ti tà liàng ti yén
究。
chì

表 7 反冲能 $E_M$ 与 C-X 键能的比较
piao 7 fǎn ch'ūng néng $E_M$ yǔ C-X chèn néng ti pǐ chiaó

<table>
<thead>
<tr>
<th>元素</th>
<th>$E_M$ 最大 (百万电子伏特)</th>
<th>$E_M$ 最大 (电子伏特)</th>
<th>$E_{C-X}$ 键能 (电子伏特)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl</td>
<td>6.2</td>
<td>543</td>
<td>2.9</td>
</tr>
<tr>
<td>Br</td>
<td>5.1</td>
<td>174</td>
<td>2.3</td>
</tr>
<tr>
<td>J</td>
<td>4.8</td>
<td>96</td>
<td>2.0</td>
</tr>
</tbody>
</table>
近十几年来,由于加速器和反应堆的建立,

以及近代分析分离方法

面新技术的出现,诸如气体验质谱、磁质谱、磁分析

等,使得对效应研究更为广泛和深入。

\textsuperscript{1)}

\footnote{In studying the characters used in this volume the Alphabetical Character Index given on p. 55 ff should be referred to. The reader should study the characters initially with the aid of this index and then on the basis of the three dictionaries concerned. He should not shrink from trying to prepare his own translation, even at this early stage. The author's remarks should be read last of all. Trying for oneself, however difficult it may be to begin with, is the surest way of succeeding, especially if the trial is carried out assiduously.}
On reading the two names Szilard and Chalmers we note right away that the Chinese do not always render foreign names by characters, as we found to be the case with the names "Newton" and "Ukraine" in Part I of this Guide (Part I, pp. 29 and 32). We Europeans would of course find it easier if surnames, names of countries and names of towns were always written in the Latin alphabet. Unfortunately, however, the names rendered by Chinese characters far outnumber the alphabetized ones. Thus, Doppler, Coulomb and Auger are in Chinese: 多普勒 tō-p'ū-lè, 库伦 k'ū-lún and 俄歇 wó-hsiēh. Since in rendering non-Chinese names the characters are selected simply on the basis of their reading and not their meaning, the two- and three-character combinations representing a foreign name simply have the sound value which to the Chinese ear corresponds to the actual (or presumed) pronunciation of the name concerned. Such combinations do not make any sense. This is often the only way in which the character combinations can be identified as names. Immediately the translator of Chinese texts comes up against character combinations with a meaning, if any, which is quite extraneous to the context, he should consider the possibility that a name is involved (this may even be a Chinese name!).

The name combination Szilard-Chalmers immediately suggests a well-known effect described in many scientific reference books. We thus have here a trail to follow right from the start. Now we try to find out whether the character 效 hsiāò or the binome 效应 hsiāò-yīng could mean "effect". We first check this possibility on the basis of the meanings of the individual characters given in the Character Index. Combining the meanings "efficacious" and "to correspond" does not refute this possibility, at least. We next refer to the numbers given alongside the character hsiāò in our Index; these are the serial numbers under which the character concerned appears in the dictionaries of Mathews, Rüdenberg and Stange, and Oshanin (see Part I, p. 14, Note 8). Under the multicharacter combinations given we look for a binome "hsiāò-yīng", which can have the meaning "effect". The first two dictionaries mentioned do not help us, but Oshanin
confirms our assumption. Now since the characters 及 and
其 mean "and" and "its" respectively, it seems likely that
应用 yìng-yìng means "application". To confirm our assumption
we again refer to our three dictionaries. In Mathews' dictionary we find
on the basis of the number indicated, 7477, on page 1119, the required
character 应 written in the simplified form 应 in our text (we give both
variants in our Character Index). In contrast with the other two dictionaries
we find that Mathews gives the possible meanings of a character not simply
one after the other but in more or less coherent groups followed immediately
by the related binomes. To save time we leave aside the first group "ought,
should, must" etc., since we fail to see how the combination "should use"
can yield the required meaning "application". We therefore look among
the second set of meanings given under a) "to reply, to respond, to echo" etc.,
and find our binome 应用 as the 48th example in the meaning
"application". As a further example we find the character combination 52
应用化学 "applied chemistry". The second dictionary quotes
similar meanings but does not specifically give the word "application"
required by us, which makes us somewhat uncertain again. Fortunately,
however, the Russian dictionary gives the expression "yìng-yìng" again
in the specific meaning "to apply", "practical application" (применять,
практическое применение).
The expression "applied chemistry" (прикладная химия) also appears
here, which should eliminate all doubt. 2)

We know that the title of the paper is "The Szilard-Chalmers effect
and its application". The title suggests a review article. If the reader
had the complete Chinese paper in front of him, he would be confirmed
in this supposition by the unusually long list of references given at the
end of the paper. The second work listed is in fact the historic note
The translator thus already knows enough to get a rough idea of the
contents of the first (-1 in fact means one) section of the paper;

2) With the assistance of the above and what was learned in Part I the
reader should have no difficulty in translating the expression 应
用化学研究所. Translated literally: "to
apply (yìng-yìng) - nucleus (hū) - physics (wù-lǐ-hsūch) - research
(yén-chiù) - place (sǒ) = Institute of Applied Nuclear Physics.
the first section is likely to give a brief account of the principles of the effect. This means, however, that expressions such as "recoil", "recoil energy", "recoil atom", "binding energy" must be reckoned with. We must first check carefully therefore whether our assumption is correct or not.

The second line soon clarifies the position completely. It reads:
one, that is: (part) I, The Szilard-Chalmers effect ........ there then follow two characters whose meanings are mutually complementary and very similar to one another; these should therefore be considered as a single combination of characters. "Basis-root" chī-pēn can only signify something like basis or basic. The last character lǐ, already familiar to us in the expression for physics ( 物理学 ), also signifies something like basis. The penultimate character has much the same meaning. We met it earlier in the binome for atom yūán-tzǔ = "original" - thing. We can now translate this as we wish, say "basic principles", in English: Section I, The principles of the Szilard-Chalmers effect.

We discussed the first sentence of this text in Part I of this Guide (see Part I, p. 22 ff). We therefore proceed and translate literally with the aid of the meanings given in our Character Index: this sort action also to be in existence - to be in in nuclear reactions middle. Only the character chūng "middle" is not quite clear to us here. The only thing we need to know is the fact that prepositions like 于 are commonly combined with a character such as "middle", which then goes at the end of the sentence. Thus, 于 is associated with 和 and simply means "in". In English: This type of action (i. e. the occurrence of a force and an opposing force) is also found in nuclear reactions. To make sure, we look up the binome tsʻun-tsai in the dictionaries. It must be a binome having the meaning "to exist", since the two characters have almost identical meanings. In such cases, wading through the dictionaries can be dispensed with, but in our first attempts at translation any additional support for our ideas is welcome. All three dictionaries give us the required support. Mathews: being in
existence; Rüdenberg and Stange: vorhanden, anwesend; Oshanin: 
существовать (to exist), быть (to be). Here too, surprisingly, 
Oshanin's dictionary again gives the most applicable meaning. 
However, the simple fact that Russia and China have a long and 
longstanding common frontier must surely have had its effect on 
the status of Russian sinology.

It is clear from the meanings of the individual characters that 
例 如 must signify "for example". A dictionary check 
confirms this. Once we realize that 例 and 如 go together - as 
1 and 0 earlier! - we have no difficulty finding the meaning 
of the next phrase: "in the time of the nucleus changes" = in nuclear 
transformations. Now, since the nucleus emits quanta or particles 
in a nuclear transformation the following phrase presents no 
difficulty either: "in nuclear transformations the nucleus to let 
go - to go out not-equal particles 3) (γ-, α-or β-particles etc.) 
cause this piece atomic nucleus to suffer-to arrive a counter action, 
"to rely on (this!) and thereby" (=consequently) to produce-to live 
"recoil"; the atom undergoing the recoil to name-to make (to) recoil 
atom". The above sentence should be fairly intelligible to the scientist. 
Discussion can be confined here to one or two grammatical points. 
It is easy to see that "not-equal" signifies "various". Even the 
layman will be aware of the fundamental difference between γ-quanta, 
α-particles, and electrons, etc. Dictionaries II (Rüdenberg and Stange) 
and III (Oshanin) confirm our supposition. From what was said in Part I, 
p. 28, the toneless "ti" must be regarded as an adjectival suffix affixed 
to the two-syllable adjective "pù-t'úng". The sentence "the nucleus 
emits various particles" typifies the normal word order in Chinese: 
subject - verb - object. We are not surprised that the nuclear physics 
technical term "to emit" "fàng-ch'ü" fails to appear in any of our three 
dictionaries. However, we wouldn't have looked if only we had known 
that many characters having in themselves an intransitive verbal meaning

3) Unless our memory fails us, we shall recognize here the expression 
粒子 ī-tzū with the meaning "particle", which we encountered 
in Part I, p. 21, note 25.
(to go out) can very often be used directly in a causative sense (to cause to go out = "to send out"). Thus, ch’ū 可 can have a transitive meaning, i.e., an object. Bearing in mind this theoretically always conceivable possibility we quickly come up with the right meaning of fàng-ch’ū = to emit. 4)

We find the same phenomenon a few characters later in the verb "to produce - to live" ch’ān-shēng. Taking "to live" in the causative sense "to cause to live" = to bear, then "to produce - to live" turns into the transitive verb to create, for which "recoil" is a suitable object.

This "piece" atomic nucleus ........ the Chinese frequently insert so-called classifiers between a demonstrative pronoun or a cardinal number and the following noun. There are quite a large number of classifiers. 5)

Naturally, if one wanted to learn to speak Chinese one would have to know exactly which classifier goes with which noun. The translator, however, to begin with at least, simply requires to know that classifiers

4) The English verb "to go" would generally be classed as an intransitive verb. However, the present author has frequently seen signs bearing the words "food to go" in many restaurants in the vicinity of Los Angeles and elsewhere. This expression presumably means "food to take away". The fact is however that here "to go" must be regarded as a causative verb "to cause to go". Chinese binomes can often be usefully deciphered by taking one of the two characters as a causative verb.

5) 把 pā "handle"; one chair = 一把 yī-tzu 一把椅子
one "handle" chair

张 zhāng "extent"; one table = 一张 yī 张桌子
一张 chēng-tzu = one extent table

根 pén "root", that book = 那本那本书 nà běn shū
那本书

架 chā "frame", three aircraft = 三架飞机 sān jià fēi - 架
三架飞机

枝 zhī "branch", one brush = 一支 chī一支 pǐ 一支笔
一支笔

封 fēng "to seal", this letter = 封信 fēng xìn
这封信
exist. He will see from the text which classifier precedes which noun. By far the most commonly used classifier is 个 kò. The fact that there are also nouns which when preceded by a cardinal number or a demonstrative pronoun do not require a classifier, is evident from this same sentence: an opposing force 反-作用 - 反作用.

"to suffer - to arrive". This binome is not given in our dictionaries and thus presents some difficulty to the learner translator. Experience is required here, to know that in binomes starting with 受 "to suffer" the second character can often be interpreted as a noun. One should try therefore, as a feeler, to translate the two-character combination as "to suffer the arrival", "to suffer the incidence" (i.e. of an opposing force). From the material viewpoint, shòu-taò must simply mean "to suffer", since the particle emission must bring about the recoil. However, the translator won't be satisfied until he has broken down the binome in the way indicated above. It should generally be borne in mind that two-character combinations can often be interpreted as verb-verb or verb-noun compounds.

The character 的 in 受反冲的原子 must again be taken as an adjective suffix. Here, however the adjective comprises a verb and its object: "to suffer a recoil".

Freely translated the second sentence of our text reads: "Force and opposing force arise also in nuclear reactions, e.g. during the nuclear transformation on emission of various particles (such as γ-quanta, α- or β-particles) by the nucleus. The atom then undergoes a recoil, the atom undergoing the recoil being called a recoil atom".

The first six characters of the third sentence are easy to translate, since they comprise three binomes featuring in all our dictionaries. The reader can automatically recognize these as two-character combinations on looking-up the first character 理 - this procedure should always be tried first - in the hope of finding a binome 理论.
This hope is not deceived: ǐ-lùn means "theory". The reader should then look up the third character  计 , again in the hope of finding a binome. All our dictionaries serve him well, chi-suàn means "calculation". We are also lucky with the fifth character 表 piao. Mathews renders the binome piao-ming as "to make clear", Rüdenberg and Stange give the meaning "anzeigen", while Oshanin mentions делать очевидным.

6) 理论物理学 thus means: theoretical physics.

We can ourselves formulate the expression for "experimental physics". From Part I, p. 29, Note 29, we find that "test, experiment" is 实验 shî-hên. Thus, experimental physics must be 实验物理学 and Institute for Experimental Nuclear Physics must be shî-hên yüan-tzŭ-hô 物理学研究所.  

All this may appear "dizzifying", but provided we do not allow ourselves to get confused and patiently examine the characters one by one, given time and practice we can finally make it. The expression 理論 is a common one. It will thus pay us to understand how it is made up. The primary meaning of lí is veining of precious stones, skin, and wood, etc. Hence the secondary meanings: outlines, principles. Thus, ǐ-lùn has the meaning, say, "basic discussion" = theory.

7) 计算机 chi-suàn-chî means computer.  
计算尺 chi-suàn-ch'ih means slide rule.
We thus translate: theoretical calculations show. Then, [1] in the
text refers to a work which in the List of References turns out to
be a Chinese book ⁸).

⁸) The List of References gives 射线化学

The first two characters are the name of the author of the book
(Ch'ünk Li). Generally a Chinese name consists of three characters:
the first character is the surname, while the forename comprises
the second and third characters (their significance need not trouble
us at this stage.) In Chiang Kai-shek, Mao Tse-tung, Chou En-lai,
Lin Piao, etc. the surnames are Chiang, Mao, Chou and Lin (Chiang
Kai-shek is the reading of the three name characters in a southern
Chinese dialect. In our north Chinese National Language he is called:
Chiang Chieh-shih). The name Lin Piao is a further example of a
monosyllabic forename: Piao.

The three commonest Chinese surnames, which are encountered as
frequently as say Smith, Jones and Brown in England, are 王 Wang
("king"), 李 Li ("plum") and 张 Chăng ("to extend": we met this
character as a classifier in Note 5).

The book title following the name Ch'ünk Li, 射线化学 is
known already to the reader as "radiochemistry", from Part I, pp. 33
and 34.

下册 hsia-t'sê means Volume II (or Volume III), in other
words the last volume. If the work consists of two volumes, then the
first volume is called 上册 shang-t'sê ("top" volume), and the
second volume 下册 hsia-t'sê ("bottom" volume). If it consisted
of three volumes, then they would be called respectively 上册,
中册  ("middle" volume = Volume II), and 下册 .

The final seven characters mean "Publishing House of Education of
the People". The characters 人民 jën-mín signify "people". This
expression is used fairly frequently in western daily newspapers
in connection with the Organ of the Central Committee of the Communist
Party of China, the "National Newspaper" 人民日报 jën-mín
jih-pao; 日 jih means "sun" and thus also "day", while the character
pao was one of the first Chinese characters we met in Part I, p. 17.
Jih-pao means simply a daily newspaper.

教育 chia̍-yū means "instruction, education", and the last
three characters 出版社 ch'ǔ-pān-shè "to issue - the printing
block - company" represent the normal everyday word for publishing
house.
The second part of the third sentence gives a first-class example of the use of the construction 所 with the participial suffix 了 which we mentioned in Part I, p. 36. Taken literally this gives: the recoil energy "had" by the recoil atoms; this clearly means: the recoil energy of the recoil atoms. If we simply relied on the dictionaries of Mathews and Rüdenberg and Stange, however, we might have doubts, since the binome 具有 chū-yǔ does not appear in them. Moreover - which is worse - none of the numerous meanings given for 具 could be equated even approximately with the meaning "to have, to possess". Only Oshanin, who has evidently paid more attention to the modern Chinese everyday speech than the Western sinologists, gives the binome 具有 in the required meanings "to have" (иметь) and "to possess" (обладать). The two words иметь and обладать also appear in second place as meanings for the single character 具.

The remainder of the sentence is simple, since we again find one binome after another in our dictionaries. 一般 l-pān ist listed (binome No. 217) in Mathews as "common, general". In Rüdenberg and Stange (p. 95, column 1, middle) we find the meanings "gewöhnlich, allgemein", while Oshanin (p. 16, column 1, top) has the meaning "вообще"; thus, l-pān signifies "usually, in general". Both Rüdenberg and Stange and Oshanin give the meaning "at least" for chū-h-shāo. Thus, on taking weī not in the meaning "to do, to make" but as a copula (to be), a literal translation giving good sense is possible. Theoretical calculations [1] show that the recoil energy of the recoil atoms generally amounts to (wei) at least several (chī) hundred (pā) electrons (tien-tzū). We naturally press on, running straight into the trap: on the basis of individual meanings of the characters fú (to prostrate oneself) and t'è (specially) we seek to

9) The way in which l-pān ("one sort") comes to mean "usually" might be reconstructed as follows: one manner → always the one manner → always the same manner → almost always → usually.
discover a possible meaning for a binome fú-t'è. According to Mathews, fú can also mean "to lie in ambush, to conceal" or something say like "to breed". A binome "to breed the particular", "to conceal the particular", we feel, could represent some complex physical concept. What a mysterious thing this Chinese language is! So different from other languages! Turning to Oshanin, however, from the quoted meaning "volt" we find somewhat to our annoyance that fú-t'è is in fact meaningless, simply being the rendering to the Chinese ear of the (English) word "volt". Thus, tiên-tźú-fú-t'è means electron volt.

The final part of the third sentence no longer presents any difficulty once we find that 结合能 chiēn-hó-néng means "binding energy". Of course, the expression is not given in any of our dictionaries. It would only appear in specialist dictionaries of which there are very few or none for Chinese. The of the must be taken here as an adjectival suffix, i.e. the six characters must be interpreted as a type of adjectival modifier of the noun "binding energy". The meaning is clear: the binding energy of the atom in the ( 再 ........ 中 again belong together) molecule. Our first two dictionaries give the three-character combination 只不过 , but its meaning can also be determined by a literal translation: "only not to exceed" 10) 3-5 eV. As our dictionaries tell us, tsō-yu means "approximately".

The third sentence as a whole can be translated roughly as: calculations based on theoretical considerations have shown [1] that the recoil energy usually amounts to several hundred eV. The binding energy of the atom in the molecule, on the other hand ( 而 érh = "and moreover") is 3-5 eV at most.

10) 过 掌 kuò. The primary meaning of this character is to cross, to cross over (road, river). Secondary meanings include: to exceed, to pass by, to pass (night).
In the fourth sentence "这里" (chē-lǐ) signifies "here". The next two characters mean "can use". Taking the next three characters (chlorine, bromine, iodine) as the object of the verb "to use", we end up in a blind alley. It is necessary to recognize the presence of the common construction "所 " (sō). This means that the characters lù, hsiù, tiēn (Cl, Br, I) belong to "所 " (sō), while the object belonging to the verb "to use" must be another noun; only the "recoil energy" (făn-ch'ūng nêng-liăng) then remains over as object. "Here the recoil energy absorbed (huò-té 获 得 ) by Cl, Br and I in a (n, γ) reaction could be utilized (and) made into an example for purposes of (lái) clarification (shuō-míng) (Table I)."

"来 " (lái) usually means "to come" and is widely used in everyday language. Here it introduces a final clause and means "in order to". Shuō-míng appears in all three dictionaries as a binome with the meaning "to clarify, to explain". We have already met 費 piaō as a verb in the expression piaō-míng (see p. 12). Here it appears with the meaning "table". Since kê 可 "to be able" can often be rendered as "it will do", the fourth sentence of our text is translatable as: Here for clarification we will indicate the recoil energies absorbed by Cl, Br and I in a (n, γ) reaction (Table I).

The table heading should not be difficult to decipher, since the text has already referred to a comparison of the recoil and the binding energies. Now the last two characters pî-chiao 比較 mean

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11 On p. 2 of Part I of this Guide we stated that - with the unavoidable exceptions which prove the rule - a Chinese character always has the same reading. The character 說 (shuō) is such an exception. The commonest reading is shuō. Then the character means to speak; to explain. Other readings are shuî and yûèh - but these are virtually confined to ancient texts and their meanings can be ignored in this Guide, which is exclusively concerned with modern Chinese. We will simply mention here the meaning of yûèh "to be pleased", since the character 說 appears with this reading in the saying of Confucius which prefaced Part I of this Guide.
"comparison", as the dictionaries will tell us. The antepenultimate character 的 is again an adjectival suffix, i.e. in this case all the characters preceding this suffix further define the mode of comparison. We can translate "the recoil energy $E_M$" and assume that this $M$ is an abbreviation for maximum, since the third column contains in addition to $M$ two characters 最大 tsui-tä meaning "maximum".

The superlative character, while 大 tà means "large".

We are familiar with this character from the expressions 大学 tà-hsüeh ("large study" = university) and 大家 tà-chia ("large family" = all). Since 与 yu means "and", the next two characters 鍵能 chien-nêng must mean "binding energy", because the Table compares the recoil and the binding energies of Cl, Br and I. It is a good thing to know chien-nêng must mean "binding energy". Otherwise we might be suspicious of a second expression appearing here for "binding energy" instead of, as in the text, the expression "chieh-ho-nêng". Two expressions for the same term seems wasteful to us. In the interest of accuracy Chinese scientists also try to standardize one expression for one thing. However, as we stated in Part I, the facility of the Chinese language for coining new words is so great that the Chinese often - as it were without thinking - allow different character combinations for the same term to run off their brush, the speed of writing of which incidentally appears to be directly proportional to the "coining facility". Anyway, the translator should not be confused to find various synonymous expressions.

We met the binome 元素 yuán-sù (element) in Part I, p. 36. We note that the unit eV is employed in columns 3 and 4. In column 2, however, eV (tien-tzu fu-t'e) is preceded by the two characters 百 paì (hundred) and 万 wàn (ten thousand). We naturally assume that the character combination as a whole signifies MeV, but how this is so is not immediately apparent to us. Here it is necessary to know the three basic rules of Chinese numbering:
1. smaller number (here = 100) before larger number (here = 10 000) means multiplication (i.e. \(10^2 \times 10^4 = 10^6\));

2. smaller number after larger number means addition;

3. for numbers exceeding ten thousand or exceeding one hundred millions the numbers 万 万 (10^4) and 億 億 (10^8) are used.

Examples:

12 十二 shih-èrh
22 二十二 èrh-shih-èrh
98 九十八 chiù-shih-pā
357 三百五十七 sān-pai wū-shih-ch'ī
5846 五千八百四十六 wū-ch'iën pā-pai szù-shih liù
13684 一万三千六百八十四 1-wàn sān-ch'iën liù-pai pā-shih-szù
673124533 六億七千三百一十二万四千五百 sixty thousand shih-szù pū-shih szù-shih

Table I

Comparison of recoil energy \(E_{\text{max}}\) and binding energy \(E_{c-x}\)

<table>
<thead>
<tr>
<th>Element</th>
<th>(E_{\gamma \text{max}}) (MeV)</th>
<th>(E_{\text{max}}) (eV)</th>
<th>(E_{c-x}) (eV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl</td>
<td>6,2</td>
<td>543</td>
<td>2,9</td>
</tr>
<tr>
<td>Br</td>
<td>5,1</td>
<td>174</td>
<td>2,3</td>
</tr>
<tr>
<td>I</td>
<td>4,8</td>
<td>96</td>
<td>2,0</td>
</tr>
</tbody>
</table>

(12) Very good practice in making one's tongue familiar with Chinese sounds is provided by the sentence: 14 is not 40! 十四不是

四十 shih-szù pū-shih szù-shih.
The fifth sentence starts with 因此 yīn-tz'ŭ, "to rely on this". Since "this" refers to the Table, the meaning is clear and the expression can be translated say "as the Table shows". The next characters fān-ch'ung nèng-liànɡ of course mean recoil energy, which however, was denoted in the Table heading by fān-ch'ung-nèng. Here, suddenly, a liànɡ ("measure") is appended. The reason is the same as earlier, when we found two different expressions for "binding energy". Since the Chinese can line up his characters more or less at will, he does just that. The translator's confidence should not be undermined by this.

The binome 是 sì is given in all our dictionaries; sì means sufficient to. We thus translate (without bothering yet about style): as the Table shows, the recoil energies are sufficient to cause (shīh) the chemical bond (huà-hsūeh-chiēn) in the molecule (fēn-tzū-chūng) to be broken. We realize of course that the expression tuàn-liēh will not be given in the dictionaries. This would be asking too much with such a specialist expression. However, we do not need to get this binome from the dictionary, because the situation is quite clear. Tuàn-liēh simply must mean "to break". The only thing we could do - and this we should do - is to study carefully the individual meanings of the two characters tuàn and liēh in the dictionaries, to see whether the meanings listed can be combined more or less to give the term "to break". Obviously, experience counts a good deal here, although even with ample experience the translator can be deluded. On the other hand if he is too critical he won't dare to take a step without confirmation from his dictionary, and this is hardly likely to be guaranteed in difficult passages of a text. We are fully aware of the difficulty of translation. And for this very reason we should resign ourselves to the possibility of errors in translation. These are quite unavoidable.
Chih-shih 致使 can be translated as one wishes. Since chih means say, "to bring about" and shih equates with "to cause", obviously here we have to do with a binome, the components of which are roughly equivalent and thus supplement or consolidate each other. As we know, the meaning of the binome in such cases is the same as that of its component parts. Thus, chih-shih means to effect, to cause. All that is being said here is what the effect is of breaking of the chemical bond. The binome sheng-ch'eng has the meaning "to become" in all three dictionaries ("sheng" here therefore does not mean either "to live " or "to bring to life, to bear" - as in the expression "ch'AN-sheng" considered earlier (p. 10) - instead it means "to be born, to arise"). The verbal significance of sheng-ch'eng indicates that 俞 here functions as a participle suffix: the recoil atoms formed.

The last five remaining characters of the sentence could be rated as difficult to translate, since the technical term yu-li-t'al ("free state") is not so easy to identify, even if the translator knows that the recoil atoms are changed from the molecular binding (i.e. the bound state) to the free state by the energy absorbed. The meanings "to wander, to float, to swim" for yu 游 and "to leave" for li 离 are not the clearest signposts to the translator, especially since t'al ("state") normally means "behaviour". On the other hand, once one knows that yu-li-t'al means "free state", one realizes that the expression is well-chosen. The free state of an atom is the behaviour (t'al) of moving around (yu) to its heart's content and of leaving (li) its fixed site. If there were good specialist dictionaries, then one would soon find the true meaning of yu-li-t'al, and immediately recognize the sense of ch'u-yu "to be placed in", a meaning of ch'u which is given by Oshanin only (ПОМЕЩАТЬСЯ, and which comes at the top of his list of meanings.

In the next sentence fa-hsien means "to discover", as all the dictionaries show. This should enable us to make a literal translation of the sentence: "Since this effect was discovered in the year 1934 by Szilard-Chalmers, it is called the Szilard-Chalmers effect [2]". Freely
translated, this might read "This effect was named after Szilard and Chalmers, who discovered it in 1934 [2]."

The seventh sentence, taken literally, will offend our western ear, but it should be immediately understandable: "immediately arrive 1947th year thereafter" = only after 1947, "only then relative to works (kūng-tsò) of this field (fāng-mièn) (one) has (la) started (kîa-t-shîh) systematic (hsî-t'îng ti) comprehensive (tà-liàng ti) investigations (yên-chiû)". Freely translated this might read: Only after 1947 was systematic and exhaustive research started on this effect.

In the last sentence of this text the fifth character laî appears in a meaning which is unfamiliar to us. We have met this character in the meaning "to come" (cf. Part I, p. 27, note 28) and "in order to" (cf. Part II, p. 16). A third meaning of laî is "since (the time that)". For this, however, laî (often the form ǐ- laî is used) must follow a time indication. This is the case in the present sentence: "since 10 or so years". Which years are meant? The 10 or so years which are "near" (chîn) to us, i.e. the last 10 years up to the present moment. The passage thus reads: over the last decade. Here yû-yû - just like yû-yû .... fâ-hsiên - is dependent on the last binome in the second part of the sentence: yû-yû .... chiên-li: through (proceeding from) the construction of accelerators and reactors.

In the third part of the sentence yû-yû still governs the last binome chî-hsiên, which means, "to appear, to arise". The binome ì-chî is given by Rüdenberg and Stange and by Oshanin in the meaning: also, and also. We therefore translate the third part of the sentence: and through the appearance of new techniques in the field (fāng-mièn) of modern (chîn-tâi) analysis and separation.

Chû-jû is not given by our dictionaries, but it is obvious (already the character têng = etc. indicates listing of the modern separating methods) that the binome must mean "e.g."

13)
Ch'î-tü is the normal expression for gas. The three multi-character combinations are then easy to understand. Naturally, gas chromatography (chî-tü sè-p'û), mass spectroscopy (chî-h-p'û) and magnetic analysis (tz'û-fên-hsi) are meant.

The end of the sentence is also easy to understand on the basis of a literal translation: to cause - to obtain opposite to investigations of the Szilard-Chalmers effect more to do (to) broad-far reaching and deep-entering. The translator can put this into good English as he will. The Chinese simply says that in the last decade more breadth (kuâng-fân) and depth (shên-jù) have been achieved in research into the effect mentioned, as a result of the construction of accelerators etc. and the development of modern analysis and separation methods such as gas chromatography etc.

In this present translation exercise we have met the following expressions, which the reader should assimilate sufficiently to enable him to recognize them immediately if they reappear in a text (even though he may have forgotten the reading and tone of this or that character):

13) The pluralizing character chû, which appears in certain expressions (such as chû-hou 諸侯 the feudal princes), indicates that several examples are mentioned.
效应

应用

应用核物理学研究所

基本原理

大家

知道

必有

方向

定律

核反应

核转变

原子核

放出

粒子

反冲

反冲原子

理论
实验 shíh-yèn = experiment

实验物理学 shíh-yèn wū-lǐ-hsūh = experimental physics

计算 chi-suàn = calculation

具有 chū-yǔ = to have, to possess

反冲能量 fǎn-ch’ung nèng-liàng = recoil energy

电子伏特 tièn-tzǔ fú-t’è = eV

百万电子伏特 pài-wàn tièn-tzǔ fú-t’è = MeV

结合能 chieh-hó-nèng = binding energy

键能 chien-nèng = binding energy

原子能 yún-tzǔ-nèng = atomic energy

反应 fǎn-yìng = reaction

反应堆 fǎn-yìng-tuí = reactor

加速器 chiā-sū-ch’ī = accelerator

获得 huò-tè = to absorb (energy)

表 pia̍o = table

化学键 huà-hsūh-chiān = chemical bond

断裂 tuàn-lièh = to break (a chemical bond)

游离态 yú-lī-t’āi = free state
發現 fā-hsìèn = to discover (land, effect)
工作 kūng-tsō = work, to work
開始 k'ai-shīn = to begin (research)
系統的研究 hsi-t'äng ti yén-chiu = systematic investigations
大量的研究 t'à-liàng ti yén-chiu = extensive investigations
比較 pǐ-chiāo = comparison
最大 tsúl-tà = maximum
最小 tsúl-hsiao = minimum
元素 yuán-sù = element
分析 fēn-hsí = analysis
分析化学 fēn-hsí huà-hsüeh = analytical chemistry
分离 fēn-lǐ = separation
技术 chì-shū = technique
气体 ch'í-t'ý = gas
气体色谱 ch'í-t'ý sè-p'ū = gas chromatography
质谱 chíh-p'ū = mass spectroscopy
磁分析 tz'ū-fēn-hsí = magnetic analysis
Translation Exercise II

韜 huí 前 ch’iěn 南 nán

旋 hsüán 西 hsi 行 pū 卡 k'ā

加 chiā 德 té 巴 pā 爾 ūr

速 sù 主 chǔ 登 tēng 斯 szǔ 德 té

器 ch'i 要 yaö 維 wei 魯 lǔ 卡 k'ā

又 yù 的 ti 爾 ūr 率 al

是 shih 原 yüán 登 tēng 原 yüán

在 tsai 子 tzǔ 堡 pào 研 yén 原 yüán

歐 oʊ 能 nēng 邦 pāng 核 hō 原 yüán

洲 chou 研 yén 首 shoǔ 研 yén

最 tsul 究 chiù 都 tū 研 yén 究 chiu

大 tā 機 chī 門 k'ā 研 hō

的 ti 口 koǔ 研 hō

由 yū 最 tsuł 斯 szǔ 研 shè 究 chiu

于 yū 近 lü 究 chüng

它 t'ā 近 lü 究 chüng

和 hō 成 wéi 為 wèi

歐 ow 的 ti 目 mù

西 hsi 西 hsi
For a correct translation of the second Translation Exercise the reader should know to begin with that the text is written in the Old Chinese style, i.e. the title is on the extreme right of page 26 and reads from top to bottom: hsi te k'ā erh . . . . . . etc. The next sentence, i.e. the first sentence of the actual text, is immediately to the left of this. It is also read from top (k'ā erh . . . . . . .) to bottom (te hsi). Then comes nán pù. The last characters of the last sentence are chih ί.

The reader should now try and establish whether he is faced with a Red Chinese or a Nationalist Chinese text. If the text came from the mainland, simplified characters would be found. If it came from Formosa, then (cf. Part I, p. 11) unsimplified characters would be used. We simply read down until we find characters we are familiar with in simplified and unsimplified form. The first character enabling us to resolve the problem is 爲 wei (line 3, penultimate character). Going on, we find 機 chî (line 4, 12th character), 器 ch'î (line 5, 5th character), 爲 wei (page 27, line 2, 4th character), and finally 國 kuō (line 2, last character). In our Character Index we
find two forms for these characters, a simplified and a non-simplified form. We find that the non-simplified form is used throughout in this present Exercise, where a simplified form was always resorted to in the first Translation Exercise:

We conclude therefore, that this is a Nationalist Chinese text.

We will now try and "crack" the title, with the aid of the meanings given in the Character Index. The beginning is simple: the virtue of the west, Western virtue. With the normal Chinese subject-verb-object sentence construction we should now reckon on meeting a verb. However, the Character Index does not give us any meaning at all for the next character k'ā, indicating that at this stage there is no point in noting its meaning. Nevertheless, we consult the dictionaries and find in Mathews "a guard-house at a pass, to cough", and in Rüdenberg and Stange "Pass, in der Kehle stecken". Taking the third character in a verbal connotation would give something like "the virtue of the west coughs" or "Western virtue sticks in one's throat", all of which may raise a smile but does not produce anything meaningful. We thus decide to take the third character (possibly in conjunction with the fourth) as a noun, say "mountain pass" or "mountain-pass guard-house". The first two characters could then qualify as the name of the pass. Now although the name "Western virtue" appears somewhat unusual for a pass or a guard-house, it could well be that this name goes back to some primeval legend; thus it is difficult to reject it a priori as meaningless. However, if this assumption is valid, the fourth character ērh should either form a binome with k'ā with some meaning indicative of "mountain pass, guard-house", or say something meaningful about our "Western virtue" pass. But we find no meaning given in our Index for this character either. Reference to the dictionaries yields the meaning "you". Mathews even adduces the opinion of a Chinese scholar on the
significance of this character, showing that its interpretation even presents difficulties to the Chinese. Now, if not before, we realize that the characters have no meaning here, what is involved is a name. Starting at the beginning again, we try to discover whose name begins with "hsī-té-k'ā-ērh". Since we find this impossible, we decide to take the first character in its real meaning "west" and begin the name with the second character "té". This brings us success:

why should not "té-k'ā-ērh" mean "Descartes". Since the dictionaries have told us that hsī can also mean "European" we now guess that the title begins "The European Descartes". The next character is "szū"; this could be the "s" of "Descartes", the Chinese ear having noted the "s" but not the "t", although it also is clearly audible. This would not refute our argument, however, for we know that the Chinese do not hear foreign sounds in anything like the way we Europeans would expect. We now consider the meaning of lū-āl, but again find no meaning quoted in the Index. Thus these characters are meaningless (at this stage), and again represent a name or part of a name. Failing to find anything for the name lū-āl or szū-lū-āl, we hit upon the idea of taking these two or three characters as a Chinese family and forename. Why should there not be a (famous) Chinese scholar called, Szu Lu-ai or Lu Ai? If only we had a Chinese Who's Who in which we could also look up historical persons, we reckon we would soon know. This guess is quite correct and such a compendium (there actually is one!) would also be a very suitable aid for the European translator in his work. One might say that every means available can, may and should be used in translating from Chinese. But why not first try overcome the difficulties in some more simpler way. Reading on, in fact, does bring us to solid ground, for the expression "yūán-tzū-hó" is an old friend of ours, "nucleus".

We also know the binome yén-chiù: it means investigation, research. Naturally we now try to find a binome "chung-hsing". All three dictionaries give one, in the meaning "centre". Thus, "yūán-tzū-hó yén-chiù chung-hsin" means nuclear research centre, translated literally from the English. We now know that the name we are looking for is the name of a nuclear research centre.
Even at this stage, however, we refrain from tackling our earlier riddle. Instead, we read on. Perhaps the name will be repeated and we shall be able to elucidate just how many characters it contains. Here also we come on apace, for the second line repeats the name, but this time without hši-té. The name of the nuclear research centre is thus: k'ā-črh-szū-lū-āl.

If the name does not emerge from this rightaway, say the characters out aloud, and rapidly, so that the foreign sound comes "loud and clear". It can't be Calder Hall, or Cadarache, but why not Karlsruhe?

The reader has so far been taken on a long and tortuous trip through a coughing guard-house at a mountain pass in company with Descartes and an alleged Chinese scholar. Was this mystery tour in fact simply a diversion? No. The object of detailing this particular example was to emphasize in all seriousness that this technique of slowly feeling one's way is the only way in which the learner translator can extricate himself from the surfeit of difficulties facing him. A warning may also be implicit here. Nobody without the patience or the desire to unravel the text systematically in the way we have illustrated, can hope to attain even a half-correct translation and hence the capacity to assess things with sufficient certainty.

Given a certain amount of experience the translator would have been able to avoid clambering up the mountain pass: he would have been familiar with the expression hši-té ("West Germany"). Otherwise, even though the binome does not figure in our dictionaries, he would soon have deciphered the expression, from a knowledge that the character tē (virtue) is used to mean Germany. He would also have realized that the characters k’ā, črh and szū are often used to render foreign names. These two facts alone would have told him it must be a question here of the name of a nuclear research centre in West Germany; he would then have had no difficulty in deciding whether "Jülich" or "Karlsruhe" was meant.
We tiros, however, who still have to acquire experience in translation, can only arrive in Karlsruhe via a mountain pass. Once there, however, we stand a relatively good chance of discovering that hsī-te means the country in which Karlsruhe lies, especially if we dare to read to the end of the first line of the text. This reads: shè tsâi, the Karlsruhe Nuclear Research Centre is located in . . . . . The last five characters of the phrase again mean Karlsruhe, and we can now translate starting from the end of the phrase. We see from the dictionary that shou-tū means "capital (city)", and have no difficulty recognizing "Baden" in "pā-tōng" and Württemberg in "weī-ērh-tōng-pǎō". We have thus learned that Karlsruhe is the capital of the State of Baden-Württemberg. We are quite willing to forgive the Chinese reporter for confusing Karlsruhe and Stuttgart here, otherwise we might have been faced with the additional job for deciphering the Chinese transliteration of Stuttgart. Note that pāng means "state" while kuō "country" means the higher unit (chüng-kuō = China, té-kuō, yīng-kuō, etc.). We now come to the exact details of the geographic location of Baden-Württemberg: hsī-nān-pǔ = the south-western part. We should note in passing that the Chinese perversely call the south west "the western south" but the final product is the same. And now we can finally reassure ourselves as to the meaning of hsī-te, the mysterious binome which has defeated us for so long. Assuming we have still not discovered it from the title, we are now assured that hsī-te = West Germany;

14) In Chinese, Germany is té-kuō and France fâ-kuō. Since té, yīng and fâ (third tone!) mean "virtue", "brave" and "law" respectively, one might assume that in choosing these characters the Chinese were politely showing deference to the countries mentioned. We would not categorically deny the possibility of the well-known Asiatic politeness having played a part in word coinage. However, not too much weight should be attached to this thesis, since - as we shall see very shortly - Europe is ouch in Chinese (choü means continent). The basic meaning of ouch is "to vomit". Did the Chinese here want to revenge themselves on the "European invaders"? We find this hard to believe. With the sounds "Deutsch", "Eng"
we are not really interested at this stage that the dictionaries have again left us in the lurch here.

We will defer deciding whether weí is here the copula "to be" or the verb "to make" until we have found some binomes in the dictionary. We first find mü-ch'ián in the meaning "now". The expression literally means "before the eyes". Just why "before our eyes" should mean "now" is not quite clear. The meanings "visible, clear, here, immediately" would certainly be less surprising.

Apparently the binome coiner's sights were time-based. In his view, that which lay hidden over the horizon before him was the future, while that behind him was the past and that directly in front of his eyes was the "now-time". However this may be, we must accept the meaning, especially since it ties in satisfactorily with our sentence. We also find the meaning "most important" for the binome "chú-yáò" in all our dictionaries, and thus conclude that weí must be a copula here, since this meaning gives good sense: The Karlsruhe Nuclear Research Centre is at present West Germany's main nuclear energy research - , what indeed? We really couldn't care less what meaning the dictionaries assign to the binome "chǐ-kòù" here. The translation must read "nuclear research establishment or centre". We realize, however, that on the basis of its components chǐ ("machine") - kòù (roofing, to unite), the two-character combination should mean something like "machinery, equipment". In scientific texts a good rendering is "mechanism" (e.g. of a chemical reaction).

The next sentence is also simple, once one realizes that the ti preceding the by now familiar five-character combination huí-hsüán-
chiā-sū-ch'īl = cyclotron (see Part I, p. 12) is again a participial suffix. The character ch'ēng 𪴚 "to become" very often has the meaning of "to become finished". This meaning is suitable here: "the recently completed cyclotron also (yù) is (shīh) in the European continent (ōū-chōū) the largest".

Do we hear the irritated reader asking why yù is here translated as "also" whereas in the Character Index it is given as "again", i.e. "once more"? The answer to this question is that the Character Index mostly concentrates on giving only one meaning since, in our opinion, one meaning can be memorized effectively whereas if several meanings are given there is a risk that none of them will be memorized. This single meaning can only be a basic meaning, however, which the reader should modify as he considers fit, on the basis of his translating experience. "Moreover, further, in addition" would have been equally applicable translations here. Just how one translates is of secondary importance. It is simply necessary to note that two prominent features of the Karlsruhe Nuclear Research Centre are mentioned, the second feature being introduced by yù. On the one hand, the Chinese reporter indicates that the Karlsruhe Centre is at present the most important nuclear research establishment in West Germany. Furthermore (yù) the cyclotron at the Centre is the biggest in Europe (in the opinion of the reporter).

The last character in the sentence 的 must of course be taken here in the meaning "one who", "that which" (see Part I, p. 27). This must be so, since the everyday-language copula shīh 是 in Chinese can never be combined with an adjective, in contrast with English. "This book is new" is therefore in Chinese either "this piece book new" (i.e. without copula) 这本书新 che pēn shū hsin, or this piece book is one which new (i.e. with copula, but also with ti) 这本書是新的.

The last sentence of the second Translation Exercise is easy, since we can draw on previous experience here. In the last sentence of the first Translation Exercise (see p. 12) we saw that yú yú can be associated
with nouns (namely chiên-lì and ch'ū-hsiên) coming some distance from yú yú. These nouns were preceded by the genitive sign の . We find this construction occurring here again: yú yú ....

ti hō-tsò.

We now immediately concentrate our attention on the characters hō-tsò, which turn out to be a binome quoted in the dictionaries of Mathews and Oshanin in the meaning "cooperation". Cooperation between whom? The two cooperating parties are obviously indicated before the genitive character and separated by hō (and). The first institution is t'ī = he, i.e. in this connection the Karlsruhe Nuclear Research Centre. The character hō is followed immediately by the familiar binomes ǒu-choû (Europe) and yúan-tzū (atom). Since atoms cannot be "European", this ǒu-choû must relate to the last two characters, which are given in our dictionaries as a binome with the meaning "organization". The sentence thus means: through cooperation between the Karlsruhe Nuclear Research Centre and Euratom.

Yú reappears in the last part of the sentence and is here best translated as "moreover" or "furthermore", since a further feature of the Karlsruhe Nuclear Research Centre is mentioned. Ch'ēng-wei as a binome is only given in Oshanin and means "to become", as the meanings of the individual characters "to become - to be" would indicate. What it has become, we would learn if we could find a few binomes in our dictionaries. Chung-yâo is everywhere "important, significant" (we met the expression in Part I, page 33). Chī-tī, surprisingly, is only given by Oshanin, and means basis, as might be guessed. Thus, the eight characters between the two genitive signs ti and chīh mean: important basis of atomic research.

Since the expression "Western Europe" (hsī-oū) figures among the five characters preceding ti の , we naturally assume that the story will concern the important Karlsruhe Nuclear Research Centre in Western Europe. This means that the character の is here a genitive character or - what is basically the same thing - an adjectival suffix, the adjective here having "degenerated" into an
adjectival modification consisting of four characters. We certainly find that the other common meaning of 具, namely as a participial suffix, is inapplicable here. The analysis of grammatical relationships is a legitimate tool of the learner translator. With more experience we would never have taken ti as a participial suffix here. This would have necessitated 間 chiên being a verb. Admittedly, when read in the 4th tone this character can have the verbal meaning of "to separate", but we would have been puzzled to find it in this meaning as a single character, the combination chí-chièn being impossible, simply because chí belongs to kuo: the expression kuo'-chí is in fact the technical term for "Internationale" and is even more commonly used in the sense of "international". We would thus immediately have translated: Western European international field, and then - since it makes good sense - realized that this must be a further modification of "important nuclear research centre".

Chíh is the genitive character of the written language. It is also found in the everyday language, however, especially before numbers. Thus the whole sentence reads: Through its cooperation with Euratom the Karlsruhe Nuclear Research Centre has also become one of the most important nuclear research centres in the countries of Western Europe.

The observant reader will recognize in the genitive character chíh used here a character which appeared in the saying of Confucius quoted on the first page of Part I. The Master said: "To learn and continuously practise what you have learned, is that not also a joy? "There, however, chíh does not have the meaning of a genitive character, it signifies the accusative, simply the object, governed by the verb hsí (to practise). It should be translated literally as "it" (in the accusative). The dictionary of Rüdenberg and Stange gives at the end of a list of combinations containing this character a very fine example in which chíh appears twice, once in each of its two meanings: 無處不可用之之燈 wú-ch'ù p'ù-k'ō-yòng-chíh chíh tēng: not to be (wú) a place (ch'ù) (where) not (pù) can (k'ō) use
(yùng) it (= the lamp in the accusative, object of yùng = chīh). This whole phrase is then turned into an adjectival modification of tēng (= lamp) by the second chīh, which is now used as a genitive character: a lamp which can be used anywhere. It would be very hard to find a better example of the chameleon-like nature of the Chinese characters.

The following expressions encountered in this second Translation Exercise should be imprinted on the memory:

西德  hsī-te = West Germany
西歐  hsī-oū = West Europe
歐洲  oū-choū = Europe
原子核研究中心  yūán-tzǔ-hó yén-chiù chūng-hsīn = nuclear research centre
首都  shōu-tū = capital (city)
目前  mù-ch'ien = now
主要  chū-yaō = most important
機構  chī-kou = mechanism
迴旋加速器  hui-hsüăn chiă-sū-ch'ī = cyclotron
 Euratom
歐洲原子組織  oū-choū yuán-tzǔ tsū-chīh =
合作  hō-tsò = cooperation
重要  chung-yaō = significant
基地  chī-tī = basis
Translation Exercise III

磁镜系统内高能

tz'ú ch'ing hsi t'üng neî kaô néng

粒子的注入和积累

lî tzû ti chû jù hò chî chû

本文提出一个在磁

pën wên t'î ch'ü i kò tzal tz'ú

镜系统中同时注入\( H^+ \)

ch'ing hsi t'üng chüng t'üng shîh chû jù

束和\( H^0 \)束的方法。通过

shû hò shû ti făng fâ t'üng kuô

系统内中性剩余气体

hsi t'üng neî chüng hsîng shêng yû ch'î t'î

流动过程的分析，得到

liú tùng kuô ch'êng ti fën hsi tê taâ

了质子积聚率的基本

la chîh tzû chî chû lù ti chî pën

方程和质子密度作指

fâng ch'êng hò chîh tzû mî tû tsô chîh
数 增 长 的 条 件 . 对 系 统

工作 参 量 的 分 析 表 明

了 在 10-100 千 电 子 伏 范 围

内 , 高 磁 场 对 于 研 究 粒

子 的 积 聚 是 有 利 的 , 但

最 佳 能 量 的 选 择 则 远

较 Post 等 从 低 为 宜 的 说

法 来 得 复 杂 , 需 依 照 试

验 的 目 的 确 定 , 在 几 种

情 况 下 较 高 的 能 量 是
This Exercise may be considered representative of what the scientist engaged in documentation will encounter. The job is to determine the contents of certain Chinese technical journal articles, to see whether they could be of interest to certain teams of scientists or even a nuclear research centre as a whole. We have in fact to deal with the title and the subsequent short summary of a scientific article. If the translator has not previously done any translating in the technical field concerned, then deciphering a summary can be extremely difficult, at least more difficult than the translation of the paper itself. On translating the entire paper, in the majority of instances, there is an initial introduction where we have a good chance of identifying certain expressions - as we saw in the work on the Szilard-Chalmers effect. The subsequent text also, where the author has to present his argument point by point, generally offers various possibilities for establishing something with certainty. If only the title and the summary have to be translated, however, there is little hope of help being forthcoming, since here especially nothing is ever explained, things are merely summarized. Thus, if one is required from the start to translate the entire paper, for the moment one will simply make a preliminary attempt at translating the summary of contents, only returning to it once the entire work has been translated. In the present instance, however, a complete translation is not required. We simply want to know whether the work is of interest to us or any of our colleagues.

The difficulties confronting us here can only be overcome by applying our usual translating tactics much more rigorously than ever. It is completely pointless to try and skim through the text. Such an approach would be useless. Instead, we have to remain "cool, calm and collected" and look for something which is already familiar to us in the sentence or still better the part of the sentence to be translated.
Then on the basis of our findings we must draw grammatical conclusions, in order ultimately to unravel the entire sentence while reconnoitring both to the left and right of our "oasis of rescue".

Such an oasis is clearly visible in the present title, and moreover is no mirage. The reader knows the binome "li-tzu" = particle. From his knowledge that this binome is a noun, conclusions can be drawn concerning the nature of the versatile ti of the characters following ti. Thus, li-tzu being a noun, i.e. not a verb, we know that ti cannot be a participial suffix here. Ti must be a genitive character or else - which is tantamount to the same thing - some or all of the characters preceding it must be some kind of adjectival modification of the characters following ti. The five characters following ti are split up by the character hō "and" into the two binomes chù-jù and chî-chû. Chù-jù means "to pour into - to enter". We are also familiar with the trick of assigning a causative meaning to the character jù ("to make to enter" = to introduce). Hence li-tzu ti chù-jù must mean: "the introduction of particles". This immediately suggests the term "particle injection".

The binome chî-chû consists of two verbs roughly having the same meaning as each other. We have met this sort of thing several times already and know that the binome will have virtually the same meaning as the single characters. For the moment we defer deciding whether to translate chî-chû as "collection", "heaping" or "accumulation", since this is not a matter of basic importance. We now proceed to the left and meet an expression which we turn up in our memory or in our word lists. The reader with a good memory - lucky chap!- will recall the expression "kaō-néng fú-shè" which he met in Part I of this Guide on pp. 33 and 36 in the meaning "high-energy radiation". The more unfortunate reader with a bad memory should compile a card index of all the multicharacter combinations given in this Guide and arrange the cards, with their translation, in simple alphabetic order. He will be amazed at the assistance he will get from having his own dictionary. We too have such a card index which enables us to forget some dozens of complicated expressions. Our second memory, once we have entrusted something to it, never leaves us in the lurch.
Once we have identified the four-character combination kaǒ-néng lǐ-tzŭ "high-energy particles" by rapid consultation of our card index, the only other difficulty in the title of the paper should be easily overcome. Our card index also gives us the expression 系統的研究 hsl-t'ūng ti yén-chiù = systematic investigations. The character ti is again a suffix here which turns the noun hsl-t'ūng into an adjective. Hsl-t'ūng thus means a system, into which (nel) high-energy particles are injected. The characters tz'li-chüng give further information concerning the type of system involved: a system of magnetic mirrors = the mirror machine of plasma physics. The title is therefore: (on) the injection of high-energy particles into a mirror machine and proton accumulation 15).

The structure of the first two sentences of the summary of contents (pěn-wén ... fāng-fà and t'ūng-kuò ... t'iao-ch'ien) is so typically Chinese that we will consider it in detail. In the first sentence fāng-fà, the meaning of which "method, procedure", is given in all three dictionaries, is the object of the verb t'f-ch'ü (to present) which follows the subject pěn-wén ("the present work"). Thus, the standard subject-verb-object sequence is complied with. The content of the method is described in an adjectival modification preceding the object and terminating in ti. The second sentence appears to have exactly the same structure. Here, however, further information is given of the "subject" fēn-hsē (analysis), again in the form of an adjectival modification terminating in ti; but fēn-hsē must not be taken as the subject. One can be led into this error by the fact that all three dictionaries quote only the verbal meaning "to pass through" for t'ūng-kuò. We are thus inclined to relate this "transmission" to the residual gases (shèng-yú ch'i-t'ī) and to take "the system interior" (hsl-t'ūng-nei) as the object of t'ūng-kuò. In fact, however, t'ūng-kuò goes with fēn-hsē: "through" = by means of a (specific) analysis. The subject ("we", "the authors") of the verb tē-taò (to obtain, only given in Oshanin: приобрести ) is not mentioned. Tē-taò here governs not one but two objects, which are separated by hō (and). These objects are fāng-ch'ēng (equation) 16) and t'iao-ch'ien (conditions). Further details
are also given of both objects, each time terminating in ti 点. It
would seem that 点 is the commonest Chinese character. It certainly
always represents a point in the Chinese sentence where one can and
should begin the attempt at translation.

The subject of the first sentence pen-wen is not given in any of our
dictionaries. All the more reason for hastening to record this binome
in our card index.

We will not try to explain the derivation of the meaning "present work"
from the basic meanings of the two individual characters 根 "root"
and 文 "literature". The reader should by now have progressed far
enough to be able to make such attempts for himself. In this connection
he should study the meanings listed at the points in the three dictionaries
indicated by us in our Character Index. In the vast majority of cases he
will get a satisfactorily result straightaway. The main thing at this stage
is that the result should satisfy him, since the primary requirement of
his interpretation is to serve as a memory aid for the rapid recognition
of the binome concerned. The reader will also revise his interpretation
over the course of time, i.e. as his knowledge of the characters deepens.
Finally, of course, the fact is that there are a great many character
combinations which are difficult to understand. Just how 方程 式
fang-ch'êng-shih should actually mean "equation" might appear highly
perplexing at first glance. No doubt several wondrous explanations might
occur to us at second glance. But wondrous and correct are by no means
synonymous with each other.

In a literal translation the first sentence might read as follows:
"The present work (pen-wén) presents (t'i-ch'ū) one piece method

15) The reader learns a few lines further on that proton accumulation is
concerned here. It is in anticipation of this fact that we have here
introduced the word "proton" into our translation.

16) The expanded expression 坦 方程 方 程 式
fang-ch'êng is also used for this
important word. Einstein's equation (E = mc²) should not cause
the translator to rack his brain in Chinese at least: 方程 式
坦 方程 坦 方程 方 程 式
al-yīn-szu-t'an fäng-ch'êng. 爱因斯
The translator should have no difficulty in turning the above literal translation into reasonable English. Since the subject ("one", "the experimenter", "the author of the work") of the verb chù-jù (to inject) is not mentioned, the translator would perhaps do best to employ a passive-voice construction, thus obviating the need to introduce a subject: In the present work a method is discussed for the simultaneous injection of an $H_2^+$- and an $H^0$-beam into a mirror machine.

The second sentence reads literally: "Through an analysis (fēn-hsī) of the process (kuó-ch'êng) of flow (liú-tâng) of the neutral (chüng-hsîng) residual gases (shêng-yû chî-lî-tî!) in the system (hsî-t'üng-neî) have (la) (the authors) obtained (tê-tâô) the basic (chî-pên) equation (fâng-ch'êng) for the proton accumulation rate (chîh-tzû chî-chû-lû) and the conditions (t'iao-chiên) that the proton density (chîh-tzû-mî-tû) makes (tsô) an exponential (chîh-shû) increase (tsêng-ch'ăng). Freely translated, one could say: We derived the basic equation for the proton accumulation rate from an analysis of the residual gas transformations in the system. We also determined the conditions for the exponential increase in the proton density. The binome fēn-hsī, analysis, functions as the subject in the next sentence. Something more is obviously said about the analysis - the genitive character again reveals this - but we will leave this untranslated for the moment, since we first want to establish the structure of the sentence as a whole. This lies within the realm of possibility, because we are already familiar with the verb "piaô-mîng" associated with the subject: the analysis has (la) shown that . . .
It is necessary to realize here that tsal and nel are a combination. In Part I, pp. 31 and 32 we saw that tsal can be coupled with shàng to study nuclear reactions on the cyclotron. We met shih ("time") coupled with tsal in the first Translation Exercise above: tsal hó-chuăn-piên shih: "during a nuclear transformation", "in nuclear transformations". We have also encountered the combination tsal... chüng several times above, e.g. on pp. 3 and 16, in the expression

\[ (n,\gamma) \text{ tsaï (n, }\gamma) \text{ fän-ying chüng: in a (n,}\gamma\text{) reaction.} \]

In the last sentence of this Exercise we shall also come across the combination tsal...... hsià = under (some circumstances = certain conditions). Here tsal is combined with nel and means "within". We are already familiar with the binome nèng-liàng in the meaning "energy". The binome fän-weí appears in all three dictionaries, but only Oshanin gives the typically scientific expression "range" (область). The literal translation of fú 伏 ("to prostrate oneself") does not help us here; it is simply an abbreviation of the expression fú-t'è 伏特 "volt". Hence the passage reads:
in the 10-100 keV energy range.

The structure of the next part of the sentence is easy to determine. The subject of course is "a strong magnetic field" (kaô-tz'ú-ch'áng). The copula shih 是 , as we know, requires a following noun, formed here by the "eternal" ti 的 which is so inevitable in Chinese: that which is advantageous. For what is a strong magnetic field advantageous? For (tul-yú: literally = opposite to) a study of particle accumulation.

Returning now to the subject "analysis" we try and discover what sort of analysis is involved. We know the binomes hsi-t'üng (system) and kúng-tsò (work, to work), but are let down by our dictionaries in the case of the expression "ts'än-liàng". Our difficulties are thus still unresolved. Here too, however, they are due not so much to the alleged great difficulty of the Chinese language as to the inadequacy of our dictionaries and lack of suitable specialist dictionaries. Once we know that "ts'än - liàng" means "parameter" ("ts'än-shù") is also often used in this meaning), all our difficulties are resolved: "an analysis of the parameters
relative to working of the system" = "A study of the operating parameters of the system made it clear that in the 10-100 keV energy range a strong magnetic field is advantageous for studying particle accumulation".

The first half of the next part of the sentence is simple, involving the genitive character 他的: "but (tàn) the choice (hsüan-tsé) of the optimum (tsul-chiâ) energy (néng-liàng) thereupon (tsé) .......

The next part of the sentence is difficult and requires some explanation. The object of the verb chiaò (to compare) is shuō-fā, which binome presents a further difficulty to the reader, since only Oshanin gives its meaning which is applicable to this context: formulation, argument. Once we know that shuō-fā here means say "argument", we realize that what is involved is the "argument", i.e. the opinion, the theory of Post et al. (těng), which is indicated in further detail by the expression tī tī weī í. The combination tī X weī Y is a very common one. It means "to take X and make into Y" → to take X for Y, to regard X as Y. Thus, the theory of Post et al. is that a low energy is suitable. We now translate: "chiaò ....... shuō-fā" as "on comparison with the theory of Post et al., according to which the lowest possible energy is the best".

Lái-te (to come - to obtain) is possibly best translated as: it comes to. Té (to obtain) is a transitive verb, the object of which could be fú-tsá 17. Now on assigning a causative significance to lái (to get to arrive = to give rise to), the binome lái-te would become a transitive verb with the meaning say: to introduce, to give rise to (complications). And once we realize that yǔǎn (far, distant) here means "very", we have deciphered this passage: But choosing the optimum energy is a far more complex problem than that postulated by Post et al., in their theory of the lowest possible energy.

Now "the choice" is still the subject of the next part of this sentence:

17) Fú-tsá means "complex, e.g. in the sentence: this physical problem is extremely complex: 这个物理问题很复杂 chè kò wù-lǐ wèn-tí hěn fú-tsá.
(it) must (hsū) according (ǐ-chaò) the test's (shih-yèn) purpose (mù-tì) be accurately determined (ch'ūeh-tìng). In mü-tì, the character 會 which has occupied us in nearly all our Chinese sentences, is in its original meaning "target". The same character 會, coming before mü-tì, is simply our old friend the genitive character, however. Even though the example of the "lamp which can be used anywhere" (see p. 35) may have taught us a thing or two, any surprise we evince at this latest manifestation of the chameleonlike nature of Chinese characters is surely excusable.

The last part of the sentence is again easy to translate: under certain conditions ch'íng-k'uang) a relatively (chiaò) high (kaō) energy can be advantageous.
无机反响分配
wu chi fan hsiang fen pei

色层法
se ts'eng fa

最近，出现了一种新
tsui chin ch'ü hsiên la i chüng hsìn
的分离方法，这就是无
ti fen li fang fa che chiù shih wu
机反相分配色层法。这
chi fan hsiang fen pei se ts'eng fa che
方面的工作，引起了许
fang miên ti kung ts'ò yin ch'i la hsü
多化学家们的注意，得
to huà hsüeh cha men ti chiù lì tè
出了满意的研究结果。
ch'ū la mân lì ti yén chiù ch'ì ch'èn kuo

但迄今为止，尚没有一
tànn ch'i chén wei ch'ih shàng mei yu
篇评述性的文章。本文
p'ien p'ing shù hsing ti wen chäng pên wen
Translating the title of this paper presents us with considerable difficulties. If the reader recalls the binome fāng-fǎ (method) he may realize that fǎ, in addition to "law" also means "method, procedure". A method is involved here, the "method of the coloured (sè) layers (tsěng)" i.e. "chromatography". Since fèn-p’ēi means "distribution" - Nernst's distribution law would be in Chinese nèng-szǔ-tō fèn-p’ēi tīng-î 能斯脱分配定律 - we easily hit upon "partition chromatography". Here, however, we become lost, simply through not knowing that 相 is often read in the fourth tone in physico-chemical texts, with the meaning "phase". Thus the stationary and moving phases in partition chromatography are kū-tūng-hsiăng 固定相 and liú-tūng-hsiăng 流動相. The apparently insoluble puzzle presented by fān-hsiăng would be automatically resolved by translating the actual paper. It would become clear that exchange of the phases is employed, i.e. the moving phase, which is usually an organic liquid in partition chromatography, becomes the stationary phase in partition chromatography with "exchanged phases". The binome wú-chî appears in the meaning "inorganic" in all our dictionaries 19).

18) The reader will be disturbed to note the use here of such a common character as nèng (energy; able to) in the phonetic rendering of a foreign name. In the case of "Karlsruhe" more or less obsolete characters were used, thus as it were warning against taking them in their true meaning. Occasionally, however, as in the case of the characters tō (many) and p'ū (everywhere) in the name Doppler, quite common characters are used in transliterating. Mathews' dictionary very often indicates that this or that character is used in transliterating. As is confirmed e.g. by the character nèng, these indications are incomplete.
Hence the full title reads in translation: Reversed phase partition chromatography in inorganic chemistry.

The short summary should hardly present any difficulty. The verb yīn-ch‘ī, which we have met in the expression "to initiate (reactions)" (see Part I, p. 29, Note 30), here has as its object the attention (chū-l) of many (hsū-tō) chemists (huà-hsūh-chiā) 20). The subject of the verb tē-ch‘ū ("to obtain - to cause to go out (= to produce)") is still the research (kūng-tsō = works) in the field (fāng-mièn) of partition chromatography, the object being the satisfactory (mān-lī ti) research data (yēn-chiū chiēh-kuō). P‘iēn is a classifier for papers (wēn-ch‘āng), again indicated in our dictionaries (Mathews: N.A. = numerary adjunct = classifier; Rüdenberg and Stange: Zahlwort für Aufsätze usw.; Oshanin: счётное слово для списков, сочинений).

P‘īng-shū-hsīng ti is an adjective meaning "critically reporting". "Chiēh-shaō" is a very well-known binome meaning "to introduce, to present, to recommend" as is confirmed by all our dictionaries. A literal translation would read say:

19)

<table>
<thead>
<tr>
<th>Chinese</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>wū-chī huà-hsūh</td>
<td>inorganic chemistry</td>
</tr>
<tr>
<td>wū-chī jūng-yèh</td>
<td>inorganic solution</td>
</tr>
<tr>
<td>yū-chī huà-hsūh</td>
<td>organic chemistry</td>
</tr>
<tr>
<td>yū-chī-jūng-chī</td>
<td>organic solvent</td>
</tr>
<tr>
<td>yū-chī-suān</td>
<td>organic acid</td>
</tr>
<tr>
<td>yū-chī-hsīāng</td>
<td>organic phase</td>
</tr>
</tbody>
</table>

20) men is simply a pluralizer, the plural being emphasized here. Chiā as the final character of a multi-character combination indicates a profession, specialty or even eminence in a specific technical field. Thus, a chemist cannot call himself huà-hsūh-chiā. He terms himself hsūh-huà-hsūh ti.
Recently (tsui-chin) has (la) appeared (chu-hsièn)\(^{21}\) a\(^{22}\) new (hsin-ti) separation method (fen-hfang-fa) this thereupon is (shih) reversed phase partition chromatography in inorganic chemistry. The works in this field have (la) caught (yin-ch'i) the attention (chu-i) of many chemists (and) have (la) resulted in (te-ch'ü) satisfactory research data. But "until-today-to make-stop" (= as yet) still (shang) not (mei) present (yu) one piece (p'ien) critically reporting paper (wen-ch'ang). The purpose (mu-ti) of the present work (pen-wen) thereupon (chiu) to be (tsai) in (yu) to introduce (chieh-sha) the works (kung-tso) in this field.

This could be freely translated as: Recently a new separation method, reversed phase partition chromatography, was developed, which has attracted the attention of many chemists and resulted in satisfactory research data. As yet, however, no critical evaluation has been made of this method. Such an evaluation is attempted in the present work.

\(^{21}\) Ch'u-hsièn is an intransitive verb which often has a following subject, here: the new separation method.

\(^{22}\) Chu-hsièn is here simply a classifier belonging to fang-fa (method, procedure).
Translation Exercise V

偶偶核的自裂变
ou ou ho ti tzù lièh pien

势垒厚度
shih leí hoù tu

核素的自裂变半衰
ho su ti tzù lièh pien pàn shuaì

期(T₁/₂)和它们的原子序
ch'i ho ts'a men ti yuán tzù hsù

数Z与质量数A之间
shù yǔ chîh liáng shù chîh chîen

的关系问题已有许多
ti kuān hsì wèn t'i yǔ hsù tō

人进行过研究。一般将
jēn chèn hsíng kuò yēn chiù 1 pân chiăng

核素的T₁/₂的对数值对
ho su ti ti tuì shù chîh tuì

它们的Z/A值作图。发现
t'a men ti chîh tsê t'û fā hsiên
This present title and the first two lines of text might appear extremely difficult to the translator at first sight. However, first impressions should always be ignored on principle by the translator from Chinese. Coolly and collectedly, we look for familiar expressions in the lines and do in fact find some: chīh ch'iên ti ("between": see Part I, p. 33); wèn-t'i (question, problem, see page 45, Note 17); hshū-tō (many); yèn-chiù (investigation, to investigate); t-pān (usual, cf. p. 14, Note 9); fā-hsièn (to discover, see p. 25); shī-h-yèn (test); chī-h-sièn (straight line, see Part I, p. 12). We naturally try to make a start with the translation at the spot where we find the largest number of familiar points. In this case the "weak" point is that between "chīh ch'iên ti" and "wèn-t'i". We search for the binome "kuān-hsī", and find meanings such as "relationship, relation, to relate to" in all our dictionaries. This puts us on solid ground: the problem of the relationship between......

Good fortune often smiles even on the much-tormented translator. We are acquainted with the use of the symbols A, Z and $T^\text{f}_{1/2}$ for the mass number, atomic number and half-life of spontaneous fission. We surmise that the Latin letters will be preceded by the corresponding Chinese expressions,
and the meanings of the individual characters do in fact indicate — unless we are completely mistaken — that in Chinese mass number is chî-h-liàng-shù, atomic number is yûán-tzŭ hsù-shù, and half-life of spontaneous fission is tzù-lièh-piên pàn-shuai-chü. Our "booty" here is in fact considerable, since — if spontaneous fission is tzù-lièh-piên — we can assume that lièh-piên means fission (it does!). It is remarkable to find, however, that the binome lièh-piên for fission, a discovery of our time with virtually inconceivable consequences, does not appear in any of our three dictionaries.

Since \( T_{1/2}^i \) can only be a characteristic of nuclei or nuclides, to all appearances hŏ-sù must mean nuclide, because we have always found so far that nucleus is represented by the expression yûán-tzŭ-hô or hô on its own. The only difficulty still facing us in translating the first lines of the text, comes at the end of this sentence. Here it must be realized that yên-chiû (investigation) is the object of the verb chin-hsîng, kuò being simply a past-tense character (this frequently-occurring meaning of kuò should be known, cf. also p.15, Note 10). If we attribute a causative meaning to the first character of the binome chin-hsîng (to cause to advance), all our difficulties in understanding this binome disappear: ("to urge forward-to do). In practice the meaning "to carry out, to perform, to conduct" is mostly applicable. The Chinese, like the British, "perform" investigations (yên-chiû), calculations (chî-suăn), tests (shîn-yên), etc.

The first lines of the text can now be translated say as follows:
The problem of the relationship between the half-lives \( (T_{1/2}^i) \) of spontaneous fission of nuclides and their atomic number \( Z \) and mass number \( A \) has already been studied by numerous investigators.

In the title a "weak spot" is the binome hou-tù. We recall the expression 密度 mî-tù (density, see p. 43). Many terms in physics which have to be expressed in units, are formed with tù, by analogy with "density", e.g. hou-tù (thickness), wên-tù 温度 (temperature), sù-tù 速度 (velocity), ch'îang-tù 强度 (light intensity). Our Character Index gives the meanings "pair" and "even" for the character ou. We fare
well on taking the latter meaning: even-even nuclei (ou-ou-ho) 23). And with a bit of luck we complete the title: The thickness of the potential wall (shih-lei) on spontaneous fission of even-even nuclei.

The last sentence of our text is understandable from a literal translation, once we found the binome tu-l-shu in the meaning "logarithm" in all our dictionaries, and t'ia to as a classifier (for long objects and thus also for straight lines): this second meaning of t'iao, which is new to us, is also quoted in all our dictionaries. We discussed the construction yuan chiao ...... fu-tsa in detail in the third Translation Exercise. The construction "yuan pi ...... wei ta" in this sentence is very similar; pi and chiao have the same meaning "to compare".

Our literal translation reads: usually to take (chiang) the logarithmic values (tu-l-shu-chih) of the (half-lives) $T_{1/2}^f$ (of spontaneous fission) of nuclides (ho-su) (and) relative to (tu-l) their $Z^2/A$ values to make (ts’o) a diagram ($t’u$) 24) to appear ($fa-hsi’en$) that the experimental points (ti’en) of the even-even nuclei completely (ping) not (pu) all (tou) fall (lo) on (tsai-shang) one piece (t’iao) straight line (chih-hsi’en) and (erh) that the $T_{1/2}^f$ (values) of nuclei with odd A then (ts’e) far (yuan) greater than (the $T_{1/2}^f$ values) of the even-even nuclei.

Freely translated, this might read: Normally the logarithm of $T_{1/2}^f$ is plotted against $Z^2/A$, which reveals that in the case of the even-even nuclei the experimental values do not lie along a straight line, while the $T_{1/2}^f$ values of nuclei with odd A are far greater than those of even-even nuclei.

23) ou is also used in the meaning "pair" in physics and chemistry: 偶极子 ou-chi-tzu = dipole; 偶极分子 ou-chi fen-tzu = dipole molecule. The meanings "even number" ou-shu and "pair" are to some extent interrelated. Division of an even number by two gives a "pair" of numbers. The "odd number" chih-shu 奇数 appears in the next sentence.

24) This character features in the usual expression t’u-shu-kuan

図書館 = building for sketches and books = library
<table>
<thead>
<tr>
<th>Character</th>
<th>Pinyin</th>
<th>Definition</th>
<th>Glossary Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>ch’ān</td>
<td>ch’ān</td>
<td>to produce</td>
<td>163, 6694, 396</td>
</tr>
<tr>
<td>chāng</td>
<td>chāng</td>
<td>to extend; common surname</td>
<td>195, 6744, 5798</td>
</tr>
<tr>
<td>chāng</td>
<td>chāng</td>
<td>chapter</td>
<td>182, 6724, 2278</td>
</tr>
<tr>
<td>ch’āng</td>
<td>ch’āng</td>
<td>long; chăng: to grow</td>
<td>213, 6752, 5793</td>
</tr>
<tr>
<td>ch’āng</td>
<td>ch’āng</td>
<td>an open space</td>
<td>218, 6770, 4486</td>
</tr>
<tr>
<td>chāo</td>
<td>chāo</td>
<td>to illumine, to reflect</td>
<td>238, 6786, 8771</td>
</tr>
<tr>
<td>chè</td>
<td>chè</td>
<td>this (see Part I, p. 25)</td>
<td>265, 6826, 6611</td>
</tr>
<tr>
<td>ch’ēng</td>
<td>ch’ēng</td>
<td>to call</td>
<td>383, 6962, 4128</td>
</tr>
</tbody>
</table>
ch'êng 成 379, 6943, 7016  to become (finished)

ch'êng 程 375, 6950, 305  road

chê 基 399, 1702, 211  basis

chê 机机 411, 1668, 7044  machine

chê 积积 500, 7602, 8116  to amass

chê 奇 514, 1783, 3063  odd (number)

chê 几幾 409, 1666, 7038  several

chê 及 468, 1687, 6496  to reach, and

chê 极極 484, 1713, 73  the utmost point
<table>
<thead>
<tr>
<th>Character</th>
<th>Pinyin</th>
<th>Meanings</th>
</tr>
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<tbody>
<tr>
<td>计 (jì)</td>
<td>计 (jì)</td>
<td>456, 1737, 2268</td>
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<tr>
<td>技 (jì)</td>
<td>技 (jì)</td>
<td>442, 1735, 6219</td>
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<tr>
<td>剂 (jì)</td>
<td>剂 (jì)</td>
<td>457, 7606, 2888</td>
</tr>
<tr>
<td>际 (jì)</td>
<td>际 (jì)</td>
<td>467, 7635, 8391</td>
</tr>
<tr>
<td>其 (qí)</td>
<td>其 (qí)</td>
<td>525, 1769, 8046</td>
</tr>
<tr>
<td>期 (qī)</td>
<td>期 (qī)</td>
<td>526, 1770, 3579</td>
</tr>
<tr>
<td>起 (qǐ)</td>
<td>起 (qǐ)</td>
<td>548, 1794, 5968</td>
</tr>
<tr>
<td>器 (qì)</td>
<td>器 (qì)</td>
<td>549, 1801, 1077</td>
</tr>
<tr>
<td>迄 (qì)</td>
<td>迄 (qì)</td>
<td>568, 1820, 6774</td>
</tr>
</tbody>
</table>
ch'i 氣 554, 1767, 7812 air

chia 家 594, 1844, 5731 family (see Part I, p. 23)

chia 佳 593, 1869, 166 good

chia 加 580, 1849, 1083 to increase (see Part I, p. 31)

chia 架 583, 1852, 5319 frame; classifier

chiaang 将将 656, 7664, 3273 to take

ch'iang 強強 668, 1922, 8922 strong

chiao 鉴 713, 1939, 6531 to compare

chiao 教 719, 1947, 6337 teaching
chiên 结结 782, 2015, 1214 to tie

chiên 介 629, 2050, 2742 "to lie between" (see Part I, p. 21, Note 21)

chiên 間 835, 2106, 3460 interspace (see Part I, p. 34)

chiên 鍵 859, 2093, 6813 bolt (lock)

chiên 件 862, 2120, 2514 piece

chiên 建 853, 2085, 6812 to establish

ch'ien 前 919, 7772, 2901 before

chīn 知 932, 7031, 1091 to know (see Part I, p. 23)

chīn 技 938, 7027, 6221 branch; classifier

chīn 織 989, 7015, 6912 to weave
chīh 之 935, 6978, 6589 genitive character of the written language 之

chīh 質質 1009, 7077, 8176 disposition; matter (see Part I, p. 20, Note 19)

chīh 直 1006, 6980, 749 straight; direct 一直一直

chīh 值 975, 6981, 752 value 价值价值

chīh 只 946, 7066, 8093 only 只只只

chīh 止 939, 7056, 472 to stop 止止止

chīh 指 959, 6989, 1606 finger, to point 指

chīh 至 982, 6995, 255 to reach 至至至至至至

chīh 致 984, 7010, 6307 to bring about 致致致致

ch’īh 尺 1045, 7115, 4968 foot (rule) 尺尺尺

chin 近 1061, 2169, 6640 near to 近近近近

chin 进 1091, 7798, 6605 to enter; to advance 进进进进
chìng 鏡 1137, 2213, 7577 mirror
ch'ing 情 1170, 7844, 3688 feelings; circumstances
chìu 就 1210, 7857, 7718 thereupon (see Part I, p. 25)
chìu 究 1199, 2257, 7911 to examine into (see Part I, p. 28 Note 29)
chō 棋棹 1262, 7167, 2305 table (see Part I, p. 32, Note 33)
chōu 洲 1290, 7193, 2840 continent
chū 诸諸 1362, 7277, 1629 pluralizing character
chū 主 1336, 7236, 357 master; main
chù 注 1340, 7240, 366 to pour into
chù 著著 1361, 7272, 1648 to make known (see Part I, p. 25)
ch'ū 出 1409, 7297, 1020 to go out
chú 处 1407, 7300, 6491 to dwell; chú: place

chù 具 1556, 2799, 8065 tool; to possess

chǔ 聚 1581, 8057, 5705 to assemble

chuan 转转 1431, 7351, 3293 to turn

ch'ueh 确确 1181, 2972, 964 certainly

ch'un 群 1737, 2991, 2559 herd

chung 中 1504, 7438, 2669 middle (see Part I, p.13 and p. 20)

chung 种種 1511, 7445, 468 sort

chung 重 1509, 7443, 462 heavy

ch'ung 冲 1523, 7465, 2673 to dash against
而 1756, 4257, 3750 and yet

發 1768, 79, 6287 to emit (see Part I, p. 30, Note 31)

法 1762, 77, 8841 law

凡 1771, 93, 7888 all; whenever (see Part I, p. 24)

反 1781, 88, 6102 opposed (see Part I, p. 24 and p. 29, Note 30)

泛 1773, 97, 6595 overflowing

範 1780, 115, 7193 pattern

方 1802, 125, 4321 direction (see Part I, p. 24)

放 1807, 143, 6361 to let go (see Part I, p. 33 and p. 34)

飛 1850, 165, 7850 to fly

分 1851, 179, 4289 to divide (see Part I, p. 21, Note 23)
fèng 封 1887, 217, 3163 to seal; classifier
fú 伏 1964, 349, 5074 to prostrate oneself
fù 复 1996, 310, 6417 to repeat
hěn 很 2094, 455, 5906 very (see Part I, p. 34)
hé 核 2089, 755, 7997 nucleus (see Part I, p. 31, Note 32)
hé 和 2115, 738, 1095 harmony; and
hé 合 2117, 740, 1188 to unite
hou 候 2135, 783, 5165 marquis
hou 后 2143, 778, 6489 afterwards
hou 厚 2147, 779, 3125 thick
hsí 折 2488, 5384, 2033 to distinguish
hsí 西 2460, 5377, 1953 the west
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<thead>
<tr>
<th>Character</th>
<th>Stroke Count</th>
<th>Radical</th>
<th>Meaning</th>
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<tr>
<td>hsi</td>
<td>2423, 477, 8484</td>
<td>related; used for 係 hsi</td>
<td></td>
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<tr>
<td>hsi</td>
<td>2424, 478, 8486</td>
<td>to belong to 係</td>
<td></td>
</tr>
<tr>
<td>hsià</td>
<td>2520, 537, 2005</td>
<td>under 係</td>
<td></td>
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<td>hsiāng</td>
<td>2562, 5432, 1695</td>
<td>mutual (see Part I, p. 24) 係</td>
<td></td>
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<tr>
<td>hsiāng</td>
<td>2568, 5441, 5757</td>
<td>resemblance 係</td>
<td></td>
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<tr>
<td>hsiāng</td>
<td>2549, 571, 3926</td>
<td>in the direction of (see Part I, p. 24) 係</td>
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<tr>
<td>hsiaō</td>
<td>2605, 5454, 8346</td>
<td>small (see Part I, p. 24) 係</td>
<td></td>
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<tr>
<td>hsiaō</td>
<td>2599, 588, 6391</td>
<td>efficacious 係</td>
<td></td>
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<td>hsiēh</td>
<td>2642, 617, 4943</td>
<td>to rest 係</td>
<td></td>
</tr>
<tr>
<td>hsiēn</td>
<td>2684, 641, 7586</td>
<td>to manifest 係</td>
<td></td>
</tr>
<tr>
<td>hsiēn</td>
<td>2723, 5520, 5647</td>
<td>line, ray (see Part I, p. 12) 係</td>
<td></td>
</tr>
</tbody>
</table>
新 2737, 5540, 2037  new
心 2735, 5535, 8526  heart
信 2748, 5536, 1156  letter
行 2754, 699, 3020  to do
性 2771, 5550, 391  nature, disposition (see Part I, p. 34)
溴 溴 not given, 7221, bromine
5096
需 2844, 5759, 3762  to require
許 2825, 1108, 2429  very
序 2851, 5753, 3087  order
旋 2894, 5786, 6025  to revolve (see Part I, p. 12)
hsüán 选选 2898, 5792, 6775 to choose

hsüéh 学学 2780, 1153, 3140 to learn (see Part I, p. 8, 15, 18)

huà 化 2211, 865, 7142 to change (see Part I, p. 9)

huí 返返 2315, 980, 6637 to revolve (see Part I, p. 12)

huò 或 2402, 1103, 6961 or

huò 获获 2412, 1098, 6153 to seize

one (when — is used on its own —
e.g. in counting — it is read in the 1st
tone; before a character in the 1st, 2nd
or 3rd tone it is read in the 4th tone, but
before a character in the 4th tone it is read
in the 2nd tone).

yī 依 2990, 1176, 5811 to rely upon
宜
2993, 1236, 629 proper

从
2932, 1170, 7984 to take

椅
2954, 1278, 3077 chair

已
2930, 1172, 7243 already (sign of the past)

意
2960, 1182, 8565 a thought

人
3097, 1388, 4891 man

如
3137, 1442, 1096 like

入
3152, 1460, 6517 to enter

溶
7562, 1494, 1393 to dissolve

卡
616, 1892, 2007

开
3204, 1523, 3485 to open
kaō 高
ì 直
kàng 更
ì 直
kè 个
ì 直
kè 可
ì 直
kòu 构
ì 直
kù 固
ì 直
kù 廓
ì 直
kuăn 关
ì 直
kuăn 馆
ì 直

3290, 1604, 3827 high (see Part I, p. 34)
3346, 1646, 6573 more
3366, 2347, 1870 most commonly used classifier, "piece"
3381, 2353, 3037 can
3428, 2407, 4121 roofing
3450, 2449, 1868 firm
3496, 2490, 2650 treasury
3571, 2550, 3484 frontier pass; to close; to connect
3559, 2566, 1483 a building
kuǎng 广廣 3590, 2592, 8331 extensive
k'uang 况 3603, 2607, 7552 circumstances
kūng 工 3697, 2721, 83 work
kuō 国國 3738, 2761, 1917 country, state (see Part I, p. 14)
kuò 果 3732, 2755, 5492 fruit
kuò 过過 3730, 2753, 6698 to pass, to cross
la 了 3958, 3274, 3091 toneless sign of the past
lái 来来 3768, 3007, 5429 to come (see Part I, p. 27, Note 28)
lei 垒垒 4228, 3102, 193 wall
li 离離 3902, 3186, 884 to separate (see Part I, p. 21, Note 24)
li 理 3864, 3133, 429 principle (see Part I, p. 18)
李 3852, 3140, 3145  plum; common surname

里 3865, 3134, 5840  within

立 3921, 3212, 544  to stand (up)

力 3920, 3217, 4782  force (see Part I, p. 24)

例 3890, 3144, 2923  example

利 3867, 3189, 2945  sharp; profit

粒 3923, 3214, 554  grain (see Part I, p. 21, Note 25)

liàng 3943, 3233, 446  to measure; liàng: a measure

liè 3990, 3294, 5821  to split

liú 4080, 3421, 7786  to flow

勒 3841, 3464, 4806  to bridle
to fall

law (see Part I, p. 25)

rate (e.g., counting rate)

chlorine

to arrange

to discuss

to fill

not

toneless sign of the plural (in a few cases' (see Part I, p. 28, Note 29)

4122, 3453, 1425

4176, 3548, 1622

4297, 3624, 2620

5910, 5324, 2359

4194 1/2, 3604, 7818

4246, 3568, 3792

4253, 3575, 3794

4326, 3658, 4027

4555, 3984, 6256

4419, 3768, 3436
<table>
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<tr>
<th>Character</th>
<th>Pinyin</th>
<th>Stroke Count</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>mì</td>
<td>4464, 3827, 1003</td>
<td>dense</td>
<td></td>
</tr>
<tr>
<td>miàn</td>
<td>4497, 3863, 1943</td>
<td>(sur) face</td>
<td></td>
</tr>
<tr>
<td>mín</td>
<td>4508, 3872, 6865</td>
<td>people</td>
<td></td>
</tr>
<tr>
<td>míng</td>
<td>4524, 3893, 1358</td>
<td>name (see Part I, p. 25)</td>
<td></td>
</tr>
<tr>
<td>míng</td>
<td>4534, 3898, 3554</td>
<td>bright</td>
<td></td>
</tr>
<tr>
<td>mù</td>
<td>4596, 3981, 1693</td>
<td>eye</td>
<td></td>
</tr>
<tr>
<td>nà</td>
<td>4604, 3999, 2227</td>
<td>that</td>
<td></td>
</tr>
<tr>
<td>nán</td>
<td>4620, 4012, 3917</td>
<td>south</td>
<td></td>
</tr>
<tr>
<td>nei</td>
<td>4766, 4042, 4045</td>
<td>within</td>
<td></td>
</tr>
<tr>
<td>néng</td>
<td>4648, 4046, 7186</td>
<td>able to (see Part I, p. 19)</td>
<td></td>
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<tr>
<td>nián</td>
<td>4711, 4113, 2590</td>
<td>year</td>
<td></td>
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<tr>
<td>niú</td>
<td>4737, 4141, 2512</td>
<td>ox</td>
<td></td>
</tr>
<tr>
<td>sū</td>
<td>4779, 4191, 6928</td>
<td>suddenly</td>
<td></td>
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</table>
ou 欧 4817, 4235, 4910 Europe

ou 偶 4801, 4229, 4089 pair; even (number)

pā 巴 4826, 4266, 7280

pǎ 把 4829, 4269, 7286 classifier ("handle")

pāi 百 4976, 4311, 1682 a hundred

pān 般 4881, 4333, 6282 sort

pān 版 4886, 4324, 6108 block for printing

pān 半 4875, 4338, 2504 half

pāng 邦 4910, 4370, 2216 state

paō 堡 4947, 4396, 219 walled village

pèi 被 4999, 4457, 6237 sign of the passive

p'ei 配 5019, 4478, 7249 to match

pēn 本 5025, 4496, 5420 root
<table>
<thead>
<tr>
<th>Character</th>
<th>Pinyin</th>
<th>Stroke Codes</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>比</td>
<td>bǐ</td>
<td>5077, 4541, 7081</td>
<td>to compare</td>
</tr>
<tr>
<td>筆</td>
<td>bǐ</td>
<td>5130, 4575, 2627</td>
<td>writing-brush</td>
</tr>
<tr>
<td>必</td>
<td>bì</td>
<td>5109, 4553, 8705</td>
<td>necessarily (see Part I, p. 24)</td>
</tr>
<tr>
<td>表</td>
<td>biǎo</td>
<td>5187, 4668, 5835</td>
<td>to make known</td>
</tr>
<tr>
<td>編</td>
<td>biān</td>
<td>5231, 4726, 3787</td>
<td>to compile</td>
</tr>
<tr>
<td>变</td>
<td>biàn</td>
<td>5245, 4715, 6475</td>
<td>to change</td>
</tr>
<tr>
<td>篇</td>
<td>piān</td>
<td>5248, 4751, 3791</td>
<td>leaf of a book; classifier</td>
</tr>
<tr>
<td>并</td>
<td>bìng</td>
<td>5292, 4790, 510</td>
<td>intensive particle before a negative</td>
</tr>
<tr>
<td>評</td>
<td>píng</td>
<td>5306, 4811, 2420</td>
<td>to comment on</td>
</tr>
<tr>
<td>不</td>
<td>bù</td>
<td>5379, 4906, 7977</td>
<td>no(t) (when bù is used on its own or before a character read in the 1st, 2nd or 3rd tone, it is read in the 4th tone, whereas before a character in the 4th tone it is read in the 2nd tone).</td>
</tr>
<tr>
<td>Pinyin</td>
<td>Definition</td>
<td>Explanation</td>
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<tr>
<td>--------</td>
<td>------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>pù 部</td>
<td>section</td>
<td>部</td>
<td></td>
</tr>
<tr>
<td>pǔ 墟譜</td>
<td>register</td>
<td>墟譜</td>
<td></td>
</tr>
<tr>
<td>pǔ 普</td>
<td>everywhere</td>
<td>普</td>
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<td>sān 三</td>
<td>three</td>
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<td>sè 色</td>
<td>colour</td>
<td>色</td>
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<td>shàng 上</td>
<td>above (see Part I, p. 31, Note 32)</td>
<td>上</td>
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<td>shàng 尚</td>
<td>still</td>
<td>尚</td>
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<td>shāo 少</td>
<td>few</td>
<td>少</td>
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<td>shào 紹</td>
<td>to connect</td>
<td>紹</td>
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<td>shè 社</td>
<td>a company</td>
<td>社</td>
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<td>shè 设設</td>
<td>to establish</td>
<td>設設</td>
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<td>shēn 深</td>
<td>deep</td>
<td>深</td>
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<td>shēng 生</td>
<td>to live</td>
<td>生</td>
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shèng
剩余 5750, 5162, 2951 residue

shí
时间 5780, 5225, 3229 time

shí
十 5807, 5237, 2264 ten

shǐ
使 5770, 5188, 6572 to cause

shǐ
始 5772, 5187, 1461 the beginning

shǐ
是 5794, 5202, 6002 to be (see Part I, p. 25)

shǐ
势 势 5799, 5195, 4869 power

shí
史 578, 5213, 6881 to try

shǒu
首 5839, 5256, 1739 head

shǒu
受 5840, 5261, 6194 to suffer

shū
书 5857, 5266, 1502 book
shù 术术 5889, 5310, 3031 method 术术
shù 述 5890, 5311, 6759 to state 述
shù 数数 5865, 5267, 6406 number 数数 数数
shù 束 5891, 5297, 5519 to bind 束
shuāi 奚 5908, 5327, 5861 to decrease 奚奚
shuō 説說 5939, 5361, 7567 to speak 説說
sǒ 所 5465, 5569, 2032 place (see Part I, p. 28, Note 29, p. 31 and 36)
sù 素 5490, 5654, 8445 plain (see Part I, p. 33 and 34)
sù 速 5505, 5674, 6728 velocity (see Part I, p. 31)
suān 酸 5514, 5689, 6464 sour, acid 酸酸
suàn 算 5516, 5685, 2804 to calculate 算算算
szū 斯 5574, 5623, 2039 一曰其其其斯斯

tà 大 5943, 5827, 5001 great (see Part I, p. 22 and 23)

t'ā 它 6439, 6410, 7174 it

tài 代 5996, 5875, 6874 a generation

t'ai 态態 6024, 5920, 8682 behaviour

但 6038, 5934, 15 but

tào 道 6136, 6062, 6632 way (see Part I, p. 24)

tào 到 6133, 6056, 2864 to arrive

té 得 6161, 6098, 3225 to obtain

té 德 6162, 6094, 8531 virtue

t'è 特 6165, 6096, 3237 specially

tèng 登 6167, 6103, 590 to mount
tēng 等 6178, 6102, 3240 to wait; equal to; et cetera (see Part I, p. 24)
tī 低 6188, 6127, 6852 low
tī 的 6213, 6163, 4361 genitive sign (see Part I, p. 25 and p. 27 ff)
tī 第 6203, 6150, 4769 ordinal numeral prefix (see Part I, p. 25)
tī 地 6198, 6125, 7419 the earth
tī 提 6233, 6193, 6008 to lift in the hand
tī 题 6238, 6198, 6015 a theme
tī 体体 6246, 6180, 579 body
t'iao 条条 6300, 6232, 5383 condition
tiēn 石、 6348, 6289, 8073 iodine
tīn 电电 6358, 6305, 7441 electricity (see Part I, p. 21, Note 20)

tīng 定 6393, 6343, 6016 to fix (see Part I, p. 25)

tō 多 6416, 6383, 4255 many

tō 脱 6468, 6406 to strip

tsé 杂杂 6646, 6466, 903 mixed (see Part I, p. 18)

tsài 在 6657, 6473, 156 (to be) in (see Part I, p. 31, Note 32 and p. 32, Note 33)

ts'ai 才纜 6672, 6496, 7769 only then

-(last stroke from top to bottom)

ts'ān 参参 6685, 6515, 4219 to take part in

tsaō 造 6730, 6548, 6612 to build

tsē 则 6746, 7551, 2968 consequently

tse 择择 276, 7561, 2484 to select
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<th>Character</th>
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<th>Explanation</th>
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<td>ts'ê 册</td>
<td>6756, 7567, 4101</td>
<td>volume</td>
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<td>tsêng 增</td>
<td>6763, 7577, 1550</td>
<td>to increase</td>
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<td>tsêng 層層</td>
<td>6772, 7587, 1559</td>
<td>layer</td>
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<td>tsǒ 左</td>
<td>6774, 7877, 106</td>
<td>left</td>
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<td>tsǒ 作</td>
<td>6780, 7871, 2065</td>
<td>to do (see Part I, p. 24)</td>
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<td>tsú 足</td>
<td>6824, 7917, 5977</td>
<td>foot; sufficient</td>
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<td>tsû 組</td>
<td>6817, 7925, 617</td>
<td>to organize</td>
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<td>tsuí 最</td>
<td>6858, 7964, 6070</td>
<td>most</td>
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<td>ts'ûn 存</td>
<td>6891, 8006, 3110</td>
<td>to be in existence</td>
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<tr>
<td>tû 都</td>
<td>6500, 8109, 2181</td>
<td>metropolis; toû: all</td>
</tr>
<tr>
<td>tû 度</td>
<td>6504, 8101, 6168</td>
<td>measure, degree</td>
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t'u 図 6531, 8150, 1874 sketch, map

断 6547, 8166, 2013 to interrupt

tư 塚 6557, 8179, 867 pile

tui 对 對 6562, 8181, 8165 opposite to

t'un 頓 6584, 8200, 8301 to bow (see Part I, p. 25)

t'ung 动動 6611, 8234, 4787 to move

t'ung 通 6638, 8255, 6689 "to get through" (see Part I, p. 17)

t'ung 同 6615, 8239, 3862 equal

t'ung 统统 6641, 8257, 7687 to unite
tzǔ 子 6939, 7476, 3098 son (see Part I, p. 19 f)

tzǔ 自 6960, 7475, 1736 self

tz’ú 磁 6966, 7549, 8896 magnetic

tz’ú 止 6972, 7528, 7131 this

wàn 万万 7030, 8287, 4095 ten thousand

wáng 王 7037, 8323, 314 king; common surname

wei 为为 7059, 8371, 4523 to be; to make

wei 維 7067, 8386, 911 to hold together

wei 圍圍 7082, 8345, 1878 to surround

wēn 温温 7125, 8436, 684 warm
<table>
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<tr>
<th>Character</th>
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<td>文</td>
<td>wén</td>
<td>7129, 8441, 6545</td>
<td>literature (see Part I, p. 15)</td>
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<td>问</td>
<td>wèn</td>
<td>7141, 8430, 3450</td>
<td>to ask</td>
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<td>无</td>
<td>wú</td>
<td>7180, 8509, 8742</td>
<td>to have not</td>
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<td>物</td>
<td>wù</td>
<td>7209, 8503, 4482</td>
<td>matter; object (see Part I, p. 18)</td>
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<td>要</td>
<td>yào</td>
<td>7300, 8612, 9032</td>
<td>important; to want</td>
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<td>也</td>
<td>yě</td>
<td>7312, 8666, 7418</td>
<td>also</td>
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<td>yè</td>
<td>3033, 1260, 6495</td>
<td>fluid</td>
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<td>研</td>
<td>yán</td>
<td>7341, 8692, 2390</td>
<td>to grind, to study (see Part I, p. 28, Note 29)</td>
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<td>驗</td>
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<td>7367, 8717, 8010</td>
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<td>因</td>
<td>yīn</td>
<td>7407, 8797, 1891</td>
<td>to rely upon</td>
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<td>引</td>
<td>yǐn</td>
<td>7429, 8788, 1979</td>
<td>to lead (see Part I, p. 29, Note 30)</td>
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<td>英</td>
<td>yīng</td>
<td>7489, 8839, 5224</td>
<td>brave</td>
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<td>应</td>
<td>yìng</td>
<td>7477, 8826, 8555</td>
<td>to correspond (see Part I, p. 29, Note 30)</td>
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<td>游</td>
<td>yú</td>
<td>7522, 8908, 3115</td>
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yu 由 7513, 8872, 1830 from

yu 有 7533, 8916, 3582 to be present, to have (see Part I, p. 24)

yu 右 7541, 8904, 1122 right hand side

yu 又 7539, 8879, 6557 again

yu 于于 7643, 8980, 8956 in, on (see Part I, p. 30, Note 31)

yu 余餘 7608, 9066, 8502 overplus

yu 与与 7615, 8992, 8059 and (see Part I, p. 34)

yu 育 7687, 9077, 3679 to bring up

yuán 原 7725, 9113, 8428 source (see Part I, p. 19 and 20)

yuán 元 7707, 9123, 7463 originally (see Part I, p. 33 f)

yuǎn 远远 7734, 9112, 6747 distant

yòng 用 7567, 8929, 3707 to use (see Part I, p. 24 and p. 27, Note 26)