

**KERNFORSCHUNGSZENTRUM
KARLSRUHE**

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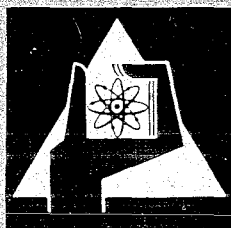
KFK 1090

Literaturabteilung

A Guide to Chinese Technical Translation for Scientists

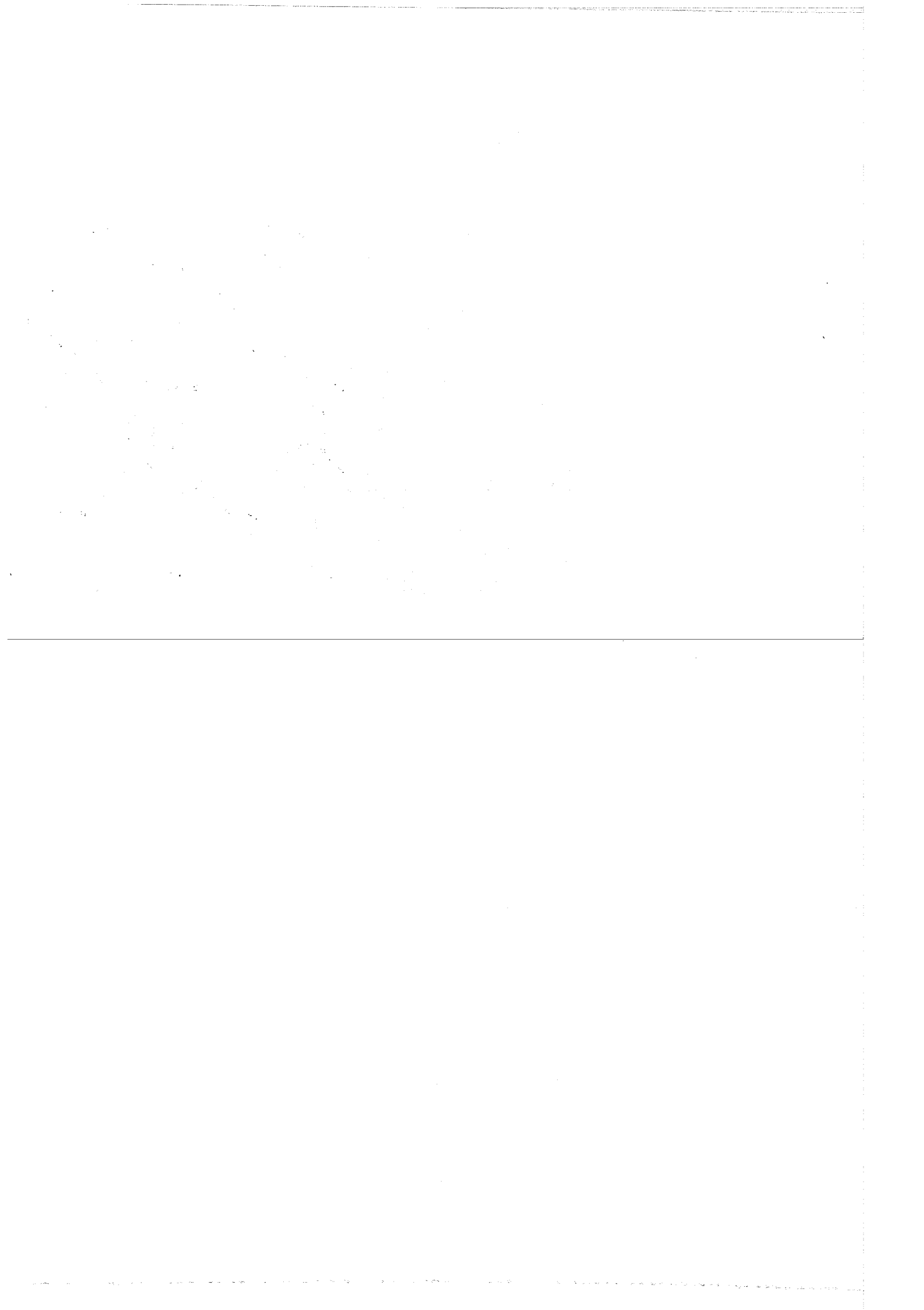
Part II

Peter Buriks



GESELLSCHAFT FÜR KERNFORSCHUNG M. B. H.

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F O R E W O R D

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

Translation Exercise I

Szilard-Chalmers 效 应 及 其 应 用
hsiaò yìng chí ch'í yìng yòng

一, Szilard-Chalmers 效 应 基 本 原 理
ī hsiào yìng chī pěn yuán lǐ

大 家 知 道, 凡 有 一 作 用
tà - chiā chīh - taò , fán - yǔ í tsò - yòng -

力, 必 有 一 大 小 相 等 方 向
lì , pì - yǔ í tà - hsiào hsiāng - tǎng fāng - hsiàng

相 反 的 反 作 用 力, 这 就 是
hsiāng-fǎn ti fǎn - tsò - yòng - lì , ch'è ch'iu shìh

著 名 的 牛 頓 第 三 定 律。这
chù - míng ti niú - tùn tì - sān tǐng - lǜ . ch'è

种 作 用 也 存 在 于 核 反 应
chǔng tsò yòng yěh ts'un tsai yú hó fǎn yìng

中, 例 如, 在 核 转 变 时, 原 子
chūng, lì jú, tsai hó chuǎn pièn shíh, yuán tzǔ

核 放 出 不 同 的 粒 子 (α-

hó fàng ch'ū pù t'úng ti lì tzǔ

或 β- 粒 子 等), 使 这 个 原

huò lì tzǔ těng shǐh chè kò yuán

子 核 受 到 一 反 作 用, 因

tzǔ hó shòu taò ì fǎn tsò yùng, yīn

而 产 生 "反 冲", 受 反 冲 的

érh ch'ǎn shēng fǎn ch'úng shòu fǎn ch'úng ti

原 子 称 为 反 冲 原 子。理

yuán tzǔ ch'ēng wei fǎn ch'úng yuán tzǔ. lǐ

论 计 算 表 明^[1], 反 冲 原 子

lùn chì suàn piao míng^[1], fǎn ch'úng yuán tzǔ

所 具 有 的 反 冲 能 量, 一

sǒ chù yǔ ti fǎn ch'úng néng liàng, ì

般 至 少 为 几 百 电 子 伏

pān chih shao wei chí pǎi tièn tzǔ fú

特 而 原 子 在 分 子 中 的

t'è, érh yuán tzǔ tsai fēn tzǔ chūng ti

结 合 能 只 不 过³⁻⁵ 电 子 伏

chiéh hó néng chǐh pú kuò tièn tzǔ fú

特 左 右。 这 里， 可 用 气， 溴，

t'è tsǒ yù chè lí, k'ò yùng lù, hsiù,

碘 在 (n, γ) 反 应 中 所 获 得

tiēn tsai fǎn yìng chūng sǒ huò té

的 反 冲 能 量 为 例 来 说

ti fǎn ch'úng néng liàng wéi lì lái shuō

明 (表 7)。 因 此， 反 冲 能 量 足

míng piǎo yīn t'z'ǔ fǎn ch'úng néng liàng tsú

以 使 分 子 中 化 学 键 断

ǐ shǐh fēn t'z'ǔ chūng huà hsiéh chièn tuàn

裂， 致 使 生 成 的 反 冲 原

lièh, chìh shǐh shēng ch'éng ti fǎn ch'úng yuán

子 处 于 游 离 态。 由 于 这

tzǔ ch'ǔ yú yú lí t'ai. yú yú chè

种 现 象 在 1934 年 被 Szilard-

chūng hsièn hsiàng tsai nién pèi

Chalmers^[2]

发现，因而称为 Szi-
fā hsièn, yīn érh ch'ēng wei

lard-Chalmers

效应。直到1947年后，
hsiaò yìng. chíh taò nién hòu,

才对这个方面的工作开
ts'ai tuì ché fāng miàn ti kūng tsò k'ai

始了系统的，大量的研
shǐ la hsi t'üng ti tà liàng ti yén

究。

chiù

表7 反冲能 E_M 与 C-X 键能的比较

piào 7 fǎn ch'úng néng E_M yǔ C-X chièn néng ti pǐ chiào

元素 yuán sù	E_C 最大 tsuì tà (百万电子伏特) pǎi wàn	E_M 最大 tsuì tà (电子伏特)	E_{C-X} 键能 chièn néng (电子伏特)
Cl	6,2	543	2,9
Br	5,1	174	2,3
J	4,8	96	2,0

近 十 几 年 来, 由 于 加

chìn shíh chī nién lái, yú yú chiā

速 器 和 反 应 堆 的 建 立,

sù ch'ì hó fǎn yìng tuī ti chièn lì,

以 及 近 代 分 析 分 离 方

ǐ chí chìn tai fēn hsi fēn lí fāng

面 新 技 术 的 出 现, 诸 如

mièn hsin chì shù ti ch'ü hsièn, chü jú

气 体 色 谱, 质 谱, 磁 分 析

ch'ì t'ì sè p'ü chíh p'ü tz'ü fēn hsi

等, 使 得 对 Szilard-Chalmers 效 应

těng, shǐh té tuì hsiào yìng

的 研 究 更 为 广 泛 和 深

ti yén chiù kèng wéi kuǎng fàn hó shēn

入。¹⁾

jù

¹⁾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'ü-lò, 庫 侖 k'ù-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 hsiào or the binome 效应 hsiào-yìng 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 hsiào in our Index; these are the serial numbers under which the character concerned appears in the dictionaries of Mathews, Rüdénberg and Stange, and Oshanin (see Part I, p. 14, Note 8). Under the multicharacter combinations given we look for a binome "hsiào-yìng", 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 chí and 其 ch'í mean "and" and "its" respectively, it seems likely that 应用 yìng-yùng 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 應 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 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-yùng" 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 by L. Szilard and T. Chalmers in the journal Nature 134, 462 (1934). 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 应用核物理学研究所. Translated literally: "to apply (yìng-yùng) - nucleus (hó) - physics (wù-lǐ-hsüeh) - 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-pě'n 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 yuán-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 yú are commonly combined with a character such as "middle", which then goes at the end of the sentence. Thus, 于 is associated with

中 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 ts'ún-tsaì 存在 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; Rüdénberg 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 lì - jú 例如 must signify "for example". A dictionary check confirms this. Once we realize that 在 and 时 go together - as 于 and 中 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 (Rüdénberg 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'ū" 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 lì-tzǔ 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 出 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	pǎ "handle"; one chair = ì pǎ ĭ-tzu 一把椅子 one "handle" chair
張	chāng "extent"; one table = 一張桌子 ì chāng chō-tzu = one extent table
本	pěn "root"; that book = 那本書 nà pěn shū
架	chià "frame"; three aircraft = 三架飞机 sān chià feī - chī
枝	chīh "branch"; one brush = ì chīh pǐ 一枝筆
封	fēng "to seal"; this letter = ché fēng hsìn 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 一反作用.

"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-tàò 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: lǐ-lùn means "theory".⁶⁾ The reader should then look up the third character 計, again in the hope of finding a binome. All our dictionaries serve him well, chì-suàn means "calculation".⁷⁾ We are also lucky with the fifth character 表 piǎo. Mathews renders the binome piǎo-míng as "to make clear", Rüdénberg and Stange give the meaning "anzeigen", while Oshanin mentions делать очевидным.

6) 理論物理学 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 實驗 shíh-yèn. Thus, experimental physics must be 實驗物理学 and Institute for

Experimental Nuclear Physics must be shíh-yèn yüán-tzǔ-hó wù-lǐ-hsüeh yén-chiù-sǒ 實驗原子核物理学研究所.

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 lǐ is veining of precious stones, skin, and wood, etc. Hence the secondary meanings: outlines, principles. Thus, lǐ-lùn has the meaning, say, "basic discussion" = theory.

7) 计算机 chì-suàn-chī means computer.

计算尺 chì-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 **羣力, 放射化学 (下册), 人民教育出版社** p. 298 (1961).

The first two characters are the name of the author of the book (Ch'ún Lì). 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** Wáng ("king"), **李** Lǐ ("plum") and **張** Chāng ("to extend": we met this character as a classifier in Note 5).

The book title following the name Ch'ún Lì, fàng-shè huà-hsüéh is known already to the reader as "radiochemistry", from Part I, pp. 33 and 34.

下 册 hsià-ts'è 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** shàng-ts'è ("top" volume), and the second volume **下 册** hsià-ts'è ("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** jén-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" **人民日報** jén-mín jìh-pào; **日** jìh means "sun" and thus also "day", while the character pào was one of the first Chinese characters we met in Part I, p. 17. Jìh-pào means simply a daily newspaper.

教育 chiaò-yü means "instruction, education", and the last three characters **出版社** ch'ū-pǎn-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 *sǒ* 所 with the participial suffix *ti* 的 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 Rüdénberg and Stange, however, we might have doubts, since the binome 具有 *chù-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 *ì-pān* is listed (binome No. 217) in Mathews as "common, general". In Rüdénberg 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, *ì-pān* signifies "usually, in general"⁹⁾. Both Rüdénberg and Stange and Oshanin give the meaning "at least" for *chìh-shaǒ*. Thus, on taking *weí* 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 (*weí*) at least several (*chī*) hundred (*paǐ*) electrons (*tièn-tzǔ*)..... We naturally press on, running straight into the trap: on the basis of individual meanings of the characters *fú* 伏 (to prostrate oneself) and *t'è* 特 (specially) we seek to

9) The way in which *ì-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, tièn-tzǔ-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 chiéh-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 的 ti 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 (在 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, tsǒ-yù 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 過 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 chè-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 sǒ 的 ti. This means that the characters lù, hsiù, tiē (Cl, Br, I) belong to 所 sǒ, while the object belonging to the verb "to use" must be another noun; only the "recoil energy" (fǎn-ch'úng néng-liàng) 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 (laí) clarification (shuō-míng) (Table I.)".

来 laí 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" ¹¹⁾. We have already met 表 piǎo as a verb in the expression piǎo-míng (see p. 12). Here it appears with the meaning "table". Since k'ě 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 pǐ-chiào 比較 mean

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 说 (說) is such an exception. The commonest reading is shuō. Then the character means to speak; to explain. Other readings are shuì and yüeh - 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 yüeh "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 antipenultimate 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** tsuì-tà meaning "maximum".

最 is the superlative character, while **大** tà means "large". We are familiar with this character from the expressions **大学** tà-hsüéh ("large study" = university) and **大家** tà-chiā ("large family" = all). Since **与** yǔ means "and", the next two characters **键能** chièn-néng 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 chièn-néng 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 "chiéh-hó-néng". 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** yüán-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 (tièn-tzǔ fú-t'è) is preceded by the two characters **百** pǎi (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 ¹²⁾;
3. for numbers exceeding ten thousand or exceeding one hundred millions the numbers 万 wàn (10^4) and 億 ì (10^8) are used.

Examples:

12	十二	shih-èrh
22	二十二	èrh-shih-èrh
98	九十八	chiŭ-shih-pā
357	三百五十七	sān-pai wŭ-shih-ch'ī
5846	五千八百四十六	wŭ-ch'iēn pā-pai szù-shih liù
13684	一万三千六百八十四	í-wàn sān-ch'iēn liù-pai pā-shih-szù
673124533	六億七千三百一十二万四千五百三十三	liù-ì ch'ī-ch'iēn-sān-pai-ì-shih-èrh-wàn szù-ch'iēn wŭ-pai sān-shih-sān

Table I

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

Element	$E_{\gamma\max}$ (MeV)	E_{\max} (eV)	E_{c-x} (eV)
Cl	6,2	543	2,9
Br	5,1	174	2,3
I	4,8	96	2,0

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 pú-shih szù-shih.

The fifth sentence starts with 因此 yīn-tz'ǐ, "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 fǎn-ch'úng néng-liàng of course mean recoil energy, which however, was denoted in the Table heading by fǎn-ch'úng-néng. Here, suddenly, a liàng ("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 足从 tsú-í is given in all our dictionaries; tsú-í means sufficient to. We thus translate (without bothering yet about style): as the Table shows, the recoil energies are sufficient to cause (shǐh) the chemical bond (huà-hsüéh-chièn) in the molecule (fēn-tzǔ-chūng) to be broken. We realize of course that the expression tuàn-lièh 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-lièh 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 lièh 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.

Chìh-shǐh 致使 can be translated as one wishes. Since chǐh means say, "to bring about" and shǐh 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, chìh-shǐh means to effect, to cause. All that is being said here is what the effect is of breaking of the chemical bond. The binome shēng-ch'éng has the meaning "to become" in all three dictionaries ("shēng" here therefore does not mean either "to live" or "to bring to life, to bear" - as in the expression "ch'ǎn-shēng" considered earlier (p. 10) - instead it means "to be born, to arise"). The verbal significance of shēng-ch'éng indicates that 的 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 yú-lí-t'ai ("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 yú 游 and "to leave" for lí 离 are not the clearest signposts to the translator, especially since 态 t'ai ("state") normally means "behaviour". On the other hand, once one knows that yú-lí-t'ai means "free state", one realizes that the expression is well-chosen. The free state of an atom is the behaviour (t'ai) of moving around (yú) to its heart's content and of leaving (lí) its fixed site. If there were good specialist dictionaries, then one would soon find the true meaning of yú-lí-t'ai, and immediately recognize the sense of ch'ǔ-yú "to be placed in", a meaning of ch'ǔ which is given by Oshanin only (помещаться), and which comes at the top of his list of meanings.

In the next sentence fā-hsièn 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 (k'aī-shǐh) systematic (hsì-t'üng ti) comprehensive (tà-liàng ti) investigations (yén-chiù)". 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 来 laí 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 laí is "since (the time that)". For this, however, laí (often the form ǐ-laí 以来 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" (chìn) to us, i. e. the last 10 years up to the present moment. The passage thus reads: over the last decade. Here yú-yú - just like yú-yú fā-hsièn - is dependent on the last binome in the second part of the sentence: yú-yú chièn-lì: through (proceeding from) the construction of accelerators and reactors. In the third part of the sentence yú-yú still governs the last binome ch'ū-hsièn, which means, "to appear, to arise". The binome ǐ-chí is given by Rūdenberg 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 (chìn-tai) analysis and separation.

Chū-jú is not given by our dictionaries, but it is obvious (already the character 等 tǐng = etc. indicates listing of the modern separating methods) that the binome must mean "e. g." 13).

Ch'ì-t'í is the normal expression for gas. The three multi-character combinations are then easy to understand. Naturally, gas chromatography (ch'ì-t'í sè-p'ǔ), mass spectroscopy (ch'íh-p'ǔ) and magnetic analysis (tz'ú-fēn-hsī) 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 (kuǎng-fàn) and depth (shēn-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 chū, which appears in certain expressions (such as chū-hóu 諸侯 the feudal princes), indicates that several examples are mentioned.

效应 hsiàò-yìng = effect

应用 yìng-yòng = application

应用核物理学研究所 yìng-yòng hó-wù-

lǐ-hsüeh yén-chiù-sǒ = Institute of Applied Nuclear Physics

基本原理 chī-pěn yüán-lǐ = principles

大家 tà-chiā = all

知道 chīh-tào = to know

必有 pì-yǔ = to be certainly present

方向 fāng-hsiàng = direction

定律 tìng-lǜ = law

核反应 hó-fǎn-yìng = nuclear reaction

核转变 hó-chuǎn-piàn = nuclear transformation

原子核 yüán-tzǔ-hó = atomic nucleus

放出 fàng-ch'ū = to emit (particles)

粒子 lì-tzǔ = particle

反冲 fǎn-ch'úng = recoil

反冲原子 fǎn-ch'úng yüán-tzǔ = recoil atom

理论 lǐ-lùn = theory

实验 shíh-yèn = experiment

实验物理学 shíh-yèn wù-lǐ-hsüeh = experimental
physics

计算 chì-suàn = calculation

具有 chü-yǔ = to have, to possess

反冲能量 fǎn-ch'úng néng-liàng = recoil energy

电子伏特 tièn-tzǔ fú-t'è = eV

百万电子伏特 pǎi-wàn tièn-tzǔ fú-t'è = MeV

结合能 chiéh-hó-néng = binding energy

键能 chièn-néng = binding energy

原子能 yüán-tzǔ-néng = atomic energy

反应 fǎn-yìng = reaction

反应堆 fǎn-yìng-tuī = reactor

加速器 chiā-sù-ch'ì = accelerator

获得 huò-té = to absorb (energy)

表 piǎo = table

化学键 huà-hsüeh-chièn = chemical bond

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

游离态 yú-lí-t'ai = free state

- 現象 hsièn-hsiàng = phenomenon
- 发现 fā-hsièn = to discover (land, effect)
- 工作 kūng-tsò = work, to work
- 开始 k'aī-shǐh = to begin (research)
- 系统的研究 hsi-t'ǔng ti yén-chiù = systematic investigations
- 大量的研究 tà-liàng ti yén-chiù = extensive investigations
- 比較 pǐ-chiào = comparison
- 最大 tsuì-tà = maximum
- 最小 tsuì-hsiaǒ = minimum
- 元素 yüán-sù = element
- 分析 fēn-hsī = analysis
- 分析化学 fēn-hsī huà-hsüéh = analytical chemistry
- 分离 fēn-lí = separation
- 技术 chì-shù = technique
- 气体 ch'ì-t'ǐ = gas
- 气体色谱 ch'ì-t'ǐ sè-p'ǔ = gas chromatography
- 质谱 chíh-p'ǔ = mass spectroscopy
- 磁分析 tz'ú-fēn-hsī = magnetic analysis

Translation Exercise II

迴 huí	前 ch'ién	南 nán		
旋 hsüán	西 hsī	部 pù	卡 k'ǎ	
加 chiā	德 té	巴 pā	爾 ěrh	西 hsī
速 sù	主 chǔ	登 tēng	斯 szū	德 té
器 ch'ì	要 yào	維 weí	魯 lǔ	卡 k'ǎ
又 yù	的 ti	爾 ěrh	艾 ài	爾 ěrh
是 shìh	原 yüán	登 tēng	原 yüán	斯 szū
在 tsai	子 tzǔ	堡 paǒ	子 tzǔ	魯 lǔ
歐 ōu	能 néng	邦 pāng	核 hó	艾 ài
洲 chōu	研 yén	首 shǒu	研 yén	原 yüán
最 tsuì	究 chiù	都 tū	究 chiù	子 tzǔ
大 tà	機 chī	卡 k'ǎ	中 chūng	核 hó
的 ti	構 kou	爾 ěrh	心 hsīn	研 yén
由 yú	最 tsuì	斯 szū	設 shè	究 chiù
于 yü	近 chìn	魯 lǔ	在 tsai	中 chūng
它 t'ā	造 tsaò	艾 ài	西 hsī	心 hsīn
和 hó	成 ch'éng	為 weí	德 té	
歐 ōu	的 ti	目 mù	西 hsī	

研 yén	際 chī	作 tsò	洲 chōu
究 chiù	間 chiēn	又 yù	原 yüán
基 chī	的 ti	成 ch'éng	子 tzǔ
地 tì	重 chùng	為 weí	組 tsǔ
之 chīh	要 yào	而 hsī	織 chīh
一 ī	原 yüán	區 ōu	的 ti
。	子 tzǔ	國 kuó	合 hó

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: hsī té k'ǎ ěrh 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'ǎ ěrh) to bottom (té hsī). Then comes nán pù. The last characters of the last sentence are chīh ī.

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 為 weí (line 3, penultimate character). Going on, we find 機 chī (line 4, 12th character), 器 ch'ì (line 5, 5th character), 為 weí (page 27, line 2, 4th character), and finally 國 kuó (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:

为 , here 爲 ; 机 , here 機 ;
器 , here 器 (only one additional dot); 国 ,
here 國 . 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'ǎ, 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 Rüdénberg 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 ěrh should either form a binome with k'ǎ 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'ǎ-ěrh". 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'ǎ-ěrh" 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 lǔ-ài, 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 lǔ-ài or szū-lǔ-ài, 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 "yüán-tzǔ-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 "chūng-hsīn". All three dictionaries give one, in the meaning "centre". Thus, "yüán-tzǔ-hó yén-chiù chūng-hsīn" 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 *hsī-té*. The name of the nuclear research centre is thus: *k'ǎ-ěrh-szū-lǔ-àì*.

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 *hsī-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 *té* (virtue) is used to mean Germany¹⁴⁾. He would also have realized that the characters *k'ǎ*, *ěrh* 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-té* 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 tsai*, 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 *shoŭ-tū* means "capital (city)", and have no difficulty recognizing "Baden" in "*pā-tēng*" and Württemberg in "*wei-ěrh-tēng-paŏ*". 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 邦 *pāng* means "state" while *kuó* 國 "country" means the higher unit (*chūng-kuó* = China, *té-kuó*, *yīng-kuó*, etc.). We now come to the exact details of the geographic location of Baden-Württemberg: *hsī-nán-pù* = 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-té*, 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-té* = West Germany;

14) In Chinese, Germany is *té-kuó* 德国, England *yīng-kuó* 英国 and France *fà-kuó* 法国. Since *té*, *yīng* and *fǎ* (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 coining. However, not too much weight should be attached to this thesis, since - as we shall see very shortly - Europe is *oū-choū* in Chinese (*choū* means continent). The basic meaning of *oū* 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 *wei* 為 is here the copula "to be" or the verb "to make" until we have found some binomes in the dictionary. We first find *mù-ch'ién* 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 "*chū-yaò*" in all our dictionaries, and thus conclude that *wei* 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 "*chī-koù*" here. The translation must read "nuclear research establishment or centre". We realize, however, that on the basis of its components *chī* ("machine") - *koù* (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* 的 preceding the by now familiar five-character combination *huí-hsüán-*

(English pronunciation), France (French pronunciation) and Europe (English pronunciation), the Chinese heard *té*, *yīng*, *fà* and *ōū*, and thus adopted for these words characters which they just happened to hit upon or which were already in common use for the rendering of foreign sounds. The idea of the Chinese slyly smirking when speaking the sound *ōū* for Europe is in any case pure twaddle. This very character *ōū* is in fact the first component of the family surname *Ōū-yáng*, that is to say one of the oldest and most distinguished families in China.

chiā-sù-ch'ì = cyclotron (see Part I, p. 12) is again a participial suffix. The character ch'éng 成 "to become" very often has the meaning of "to become finished". This meaning is suitable here: "the recently completed cyclotron also (yù) is (shìh) in the European continent (oū-chou) 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 shìh 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) 這本書新 ch'è p'ên shū hsīn, or this piece book is one which new (i. e. with copula, but also with ti) 這本書是新的.

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 chièn-lì and ch'ū-hsièn) coming some distance from yú yú. These nouns were preceded by the genitive sign 的 . We find this construction occurring here again: yú yú ti hó-tsò.

We now immediately concentrate our attention on the characters hó-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 hó (and). The first institution is t'ā = he, i. e. in this connection the Karlsruhe Nuclear Research Centre. The character hó is followed immediately by the familiar binomes oū-choū (Europe) and yüán-tzǔ (atom). Since atoms cannot be "European", this oū-choū 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.

Yù 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'éng-weí 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. Chùng-yaò is everywhere "important, significant" (we met the expression in Part I, page 33). Chī-tì, 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 的 , we naturally assume that the story will concern the important Karlsruhe Nuclear Research Centre in Western Europe. This means that the character 的 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 的, 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 問 chiēn 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 chī-chièn being impossible, simply because chī belongs to kuó: the expression kuó-chī 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".

Chīh 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 chīh 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, chīh 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 Rüdénberg and Stange gives at the end of a list of combinations containing this character a very fine example in which chīh appears twice, once in each of its two meanings: 無處不可用之之燈 wú-ch'ù p'ù-k'ǒ - yùng-chīh chīh tēng: not to be (wú) a place (ch'ù) (where) not (pù) can (k'ǒ) 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 chameleonlike nature of the Chinese characters.

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

西德 hsī-té = West Germany

西歐 hsī-oū = West Europe

歐洲 oū-chōu = Europe

原子核研究中心 yüán-tzǔ-hó yén-chiù chūng-hsīn =

nuclear research centre

首都 shōu-tū = capital (city)

目前 mù-ch'ién = now

主要 chǔ-yaò = most important

機構 chī-koù = mechanism

回旋加速器 huí-hsüán chiā-sù-ch'ì = cyclotron

歐洲原子組織 oū-chōu yuán-tzǔ tsǔ-chīh =

Euratom

合作 hó-tsò = cooperation

重要 chùng-yaò = significant

基地 chī-tì = basis

Translation Exercise III

磁 鏡 系 統 內 高 能
tz'ú ching hsi t'üng nei kaō néng

粒 子 的 注 入 和 積 聚
lì tzǔ ti chù jù hó chī chü

本 文 提 出 一 個 在 磁
pěn wén t'í ch'ü í kò tzai tz'ü

鏡 系 統 中 同 時 注 入 H_2^+
ching hsi t'üng chüng t'üng shíh chù jù

束 和 H^0 束 的 方 法 通 過
shù hó shù ti fāng fǎ t'üng kuò

系 統 內 中 性 剩 余 氣 體
hsi t'üng nei chüng hsing shèng yú ch'i t'í

流 動 過 程 的 分 析 得 到
liú t'ung kuò ch'éng ti fēn hsi té taò

了 質 子 積 聚 率 的 基 本
la chíh tzǔ chī chü lü ti chī pěn

方 程 和 質 子 密 度 作 指
fāng ch'éng hó chíh tzǔ mì tù tsò chíh

数 增 长 的 条 件 . 对 系 统

shù tsēng chǎng ti t'iao' chièn tuì hsi t'üng

工 作 参 量 的 分 析 表 明

kūng tsò ts'ān liàng ti fēn hsi piao' ming

了 在 10-100 千 电 子 伏 范 围

la tsai ch'iēn tiēn tzu' fú fàn wei'

内, 高 磁 场 对 于 研 究 粒

nei kao' tz'u' ch'āng tuì yü' yēn chiū' lì

子 的 积 聚 是 有 利 的, 但

tzü' ti ch'i' chü' shih' yü' lì ti t'ān

最 佳 能 量 的 选 择 则 远

tsuì chiā' néng liàng ti hsiān' tsé' tsé' yüān

较 Post 等 以 低 为 宜 的 说

chiaò' tēng' i' t'i' wei' í' ti' shuō

法 来 得 复 杂, 需 依 照 试

fā' lai' té' fù' tsá' hsi' i' chao' shih'

验 的 目 的 确 定, 在 几 种

yēn' ti' mù' t'i' ch'üeh' t'ing' tsai' ch'i' chüng

情 况 下 较 高 的 能 量 是

ch'ing' k'uang' hsiā' chiaò' kao' ti' néng liàng shih'

有 利 的 .

yǒu lì ti

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 "lì-tzǔ" = particle.

From his knowledge that this binome is a noun, conclusions can be drawn concerning the nature of the versatile ti 的.

Thus, lì-tzǔ 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 hó "and" into the two binomes chù-jù and chī-chù. 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 lì-tzǔ ti chù-jù must mean: "the introduction of particles". This immediately suggests the term "particle injection".

The binome chī-chù 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 chī-chù 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 kaō-néng lì-tzǔ "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 hsi-t'ǔng ti yén-chiù = systematic investigations. The character ti 的 is again a suffix here which turns the noun hsi-t'ǔng into an adjective. Hsi-t'ǔng thus means a system, into which (nèi) high-energy particles are injected. The characters tz'ú-chìng 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-fǎ and t'ūng-kuò ... t'iaó-chièn) is so typically Chinese that we will consider it in detail. In the first sentence fāng-fǎ, the meaning of which "method, procedure", is given in all three dictionaries, is the object of the verb t'í-ch'ū (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 的. The second sentence appears to have exactly the same structure. Here, however, further information is given of the "subject" fēn-hsī (analysis), again in the form of an adjectival modification terminating in 的; but fēn-hsī 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'ì-t'í) and to take "the system interior" (hsi-t'ǔng-nèi) as the object of t'ūng-kuò. In fact, however, t'ūng-kuò goes with fēn-hsī: "through" = by means of a (specific) analysis. The subject ("we", "the authors") of the verb té-taò (to obtain, only given in Oshanin: приобрести) is not mentioned. Té-taò here governs not one but two objects, which are separated by hó (and). These objects are fāng-ch'éng (equation) ¹⁶⁾ and t'iaó-chièn (conditions). Further details

are also given of both objects, each time terminating in ti 的. It would seem that 的 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-wén 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 本 "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 fāng-ch'éng - shìh 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 (pěn-wén) presents (t'í-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 fāng - ch'éng - shìh is also used for this important word. Einstein's equation ($E = mc^2$) should not cause the translator to rack his brain in Chinese at least: 愛因斯
坦方程 ài-yīn-szū-t'ān fāng-ch'éng.

(í-kò fāng-fǎ) of the simultaneous (t'úng-shíh) injection (chù-jù) of an H_2^+ - and an H^0 -beam (shù) in a (tsai . . . chūng) mirror machine (tz'ú-chìng hsi-t'ǔng)". The only other thing to be noted here is that in the title chù-jù is used as a noun (lì-tzǔ ti chù-jù: particle injection), whereas in the first sentence it functions as a verb with an object, namely "beam" (shù). Even though many nouns can be used as verbs, this is by no means a matter of course. Such a twin personality is likely with binomes made up of two characters, which can usually be interpreted as verbs.

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 (kuò-ch'éng) of flow (liú-tùng) of the neutral (chūng-hsìng) residual gases (shèng-yú ch'ì-t'í) in the system (hsi-t'ǔng-neì) have (la) (the authors) obtained (té-taò) the basic (chī-pěn) equation (fāng-ch'éng) for the proton accumulation rate (chíh-tzǔ chī-chù-lù) and the conditions (tiaó-chièn) that the proton density (chíh-tzǔ-mì-tù) makes (tsò) an exponential (chǐh-shù) increase (tsēng-chǎng). 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 的 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 "piaǒ-míng" associated with the subject: the analysis has (la) shown that . . .

It is necessary to realize here that tsai and nei are a combination. In Part I, pp. 31 and 32 we saw that tsai can be coupled with shàng: to study nuclear reactions on the cyclotron. We met shíh ("time") coupled with tsai in the first Translation Exercise above: tsai hó-chuǎn-pièn shíh: "during a nuclear transformation", "in nuclear transformations". We have also encountered the combination tsai..... chūng several times above, e.g. on pp. 3 and 16, in the expression

在 (n,γ) 反应中 tsai (n, γ) fǎn-yìng chūng: in a (n,γ) reaction.

In the last sentence of this Exercise we shall also come across the combination tsai..... hsià = under (some circumstances = certain conditions). Here tsai is combined with nei and means "within". We are already familiar with the binome néng-liàng in the meaning "energy". The binome fàn-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" (kaō-tz'ú-ch'áng). The copula shìh 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 (tuè-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'ǔng (system) and kūng-tsò (work, to work), but are let down by our dictionaries in the case of the expression "ts'ān-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'ān - liàng" means "parameter" ("ts'ān-shù" 参数 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 **的** : "but (tàn) the choice (hsüǎn-tsé) of the optimum (tsuì-chiā) 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-fǎ, 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-fǎ 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 ǐ tī weí í. The combination ǐ X weí 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-fǎ" as "on comparison with the theory of Post et al., according to which the lowest possible energy is the best".

Laí-té (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 fù-tsá¹⁷⁾. Now on assigning a causative significance to laí (to get to arrive = to give rise to), the binome laí-té would become a transitive verb with the meaning say: to introduce, to give rise to (complications). And once we realize that yǎn (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)

Fù-tsá means "complex, e. g. in the sentence: this physical problem is extremely complex: **这个物理问题很复杂** ché kò wù-lǐ wèn-tí hěn fù-tsá.

(it) must (hsū) according (ī-chaò) the test's (shih-yèn) purpose (mù-tì) be accurately determined (ch'üeh-tìng). In mù-tì, the character 的 which has occupied us in nearly all our Chinese sentences, is in its original meaning "target". The same character 的, coming before mu-ti, 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'uàng) a relatively (chiaò) high (kaō) energy can be advantageous.

Translation Exercise IV

无 机 反 相 分 配

wú chī fǎn hsiàng fēn p'ei

色 层 法

sè ts'éng fǎ

最 近， 出 现 了 一 种 新

tsui chìn ch'ū hsièn la ì chūng hsīn

的 分 离 方 法， 这 就 是 无

ti fēn lí fāng fǎ ché chüè shìh wú

机 反 相 分 配 色 层 法。 这

chī fǎn hsiàng fēn p'ei sè ts'éng fǎ ché

方 面 的 工 作， 引 起 了 许

fāng mièn ti kung tsò yǐn ch'ǐ la hsü

多 化 学 家 们 的 注 意， 得

tō huà hsüeh chiā men ti chü ì té

出 了 满 意 的 研 究 结 果。

ch'ū la mǎn ì ti yén chüè chieh kuò

但 迄 今 为 止， 尚 没 有 一

tàn ch'ì chīn wei chǐh shàng meí yü ì

篇 评 述 性 的 文 章。 本 文

p'ien p'ing shü hsing ti wén chāng pěn wén

的 目 的， 就 在 于 介 紹 這
ti mù tì chiù tsai yú chiè shaò chè
方 面 的 工 作。
fāng miàn ti kūng tsò

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 (ts'éng)", i. e. "chromatography". Since fēn-p'eì means "distribution" - Nernst's distribution law would be in Chinese néng-szū-t'ō fēn-p'eì tìng-lù 能斯脫分配定律¹⁸⁾ - 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 kù-tìng-hsiàng 固定相 and liú-tòng-hsiàng 流動相. The apparently insoluble puzzle presented by fǎn-hsiàng 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-chī appears in the meaning "inorganic" in all our dictionaries¹⁹⁾.

18) The reader will be disturbed to note the use here of such a common character as néng (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'ü (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 néng, 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 yǐn-ch'ǐ, which we have met in the expression "to initiate (reactions)" (see Part I, p. 29, Note 30), here has as its object the attention (chù-ì) of many (hsǔ-tō) chemists (huà-hsüeh-chiā)²⁰. The subject of the verb té-ch'ū ("to obtain - to cause to go out (= to produce)") is still the research (kūng-tsò = works) in the field (fāng-mièn) of partition chromatography, the object being the satisfactory (mǎn-ì ti) research data (yén-chiù chiéh-kuǒ). P'iēn is a classifier for papers (wén-chāng), again indicated in our dictionaries (Mathews: N. A. = numerary adjunct = classifier; Rūdenberg and Stange: Zählwort für Aufsätze usw.; Oshanin: счѐтное слово для списков, сочинений).

P'íng-shù-hsìng ti is an adjective meaning "critically reporting". "Chièh-shaò" 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)

无机化学	wú-chī huà-hsüeh	= inorganic chemistry
无机溶液	wú-chī júng-yèh	= inorganic solution
有机化学	yǔ-chī huà-hsüeh	= organic chemistry
有机溶剂	yǔ-chī júng-chì	= organic solvent
有机酸	yǔ-chī-suān	= organic acid
有机相	yǔ-chī-hsiàng	= organic phase

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-hsüeh-chiā. He terms himself hsüeh-huà-hsüeh ti.

Recently (tsuì-chìn) has (la) appeared (ch'ū-hsièn)²¹⁾ a²²⁾ new (hsīn-ti) separation method (fēn-lí-fāng-fǎ) this thereupon is (shìh) reversed phase partition chromatography in inorganic chemistry. The works in this field have (la) caught (yǐn-ch'í) the attention (chù-ì) of many chemists (and) have (la) resulted in (té-ch'ū) satisfactory research data. But "until-today-to make-stop" (= as yet) still (shàng) not (meí) present (yǔ) one piece (p'iēn) critically reporting paper (wén-chāng). The purpose (mù-tì) of the present work (pěn-wén) thereupon (chiù) to be (tsai) in (yú) to introduce (chièh-shaò) the works (kūng-tsò) 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'ū-hsièn is an intransitive verb which often has a following subject, here: the new separation method.

22) Chǔng is here simply a classifier belonging to fāng-fǎ (method, procedure).

Translation Exercise V

偶 偶 核 的 自 裂 变
ǒu ǒu hó ti tzù liè pièn

势 垒 厚 度
shìh leǐ hòu tù

核 素 的 自 裂 变 半 衰
hó sù ti tzù liè pièn pàn shuāi

期 ($T_{1/2}$) 和 它 们 的 原 子 序
ch'í hó t'ā men ti yüán tzǔ hsü

数 λ 与 质 量 数 A 之 间
shù yǔ chih liàng shù chih chiēn

的 关 系 问 题 已 有 许 多
ti kuān hsi wèn t'í i yǔ hsü tō

人 进 行 过 研 究。 一 般 将
jén chìn hsing kuò yén chiù i pān chiāng

核 素 的 $T_{1/2}$ 的 对 数 值 对
hó sù ti ti sù tuì shù chih tuì

它 们 的 λ^2/A 值 作 图。 发 现
t'ā men ti chih tsò t'ú fā hsièn

偶 偶 核 的 实 驗 点 并 不

ǒu ǒu hó ti shíh yèn tiēn pìng pù

都 落 在 一 条 直 綫 上, 而

tōu lò tsai ì t'iaó chíh hsièn shàng érh

奇 A 核 的 $T_{1/2}^f$ 則 远 比 偶

chī A hó ti tsé yüán pǐ ǒu

偶 核 的 为 大。

ǒu hó ti weí tà

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 chiēn ti ("between": see Part I, p. 33); wèn-t'í (question, problem, see page 45, Note 17); hsǔ-tō (many); yén-chiù (investigation, to investigate); ì-pān (usual, cf. p. 14, Note 9); fā-hsièn (to discover, see p. 25); shíh-yèn (test); chíh-hsièn (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 chiēn ti" and "wèn-t'í". We search for the binome "kuān-hsì", 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 $T_{1/2}^f$ 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 ch'ih-liàng-shù, atomic number is yüán-tzǔ hsù-shù, and half-life of spontaneous fission is tzù-lièh-pièn pàn-shuaī-ch'í. Our "booty" here is in fact considerable, since - if spontaneous fission is tzù-lièh-pièn - we can assume that lièh-pièn means fission (it does!). It is remarkable to find, however, that the binome lièh-pièn for fission, a discovery of our time with virtually inconceivable consequences, does not appear in any of our three dictionaries.

Since $T_{1/2}^f$ can only be a characteristic of nuclei or nuclides, to all appearances hó-sù must mean nuclide, because we have always found so far that nucleus is represented by the expression yüán-tzǔ-hó or hó 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 yén-chiù (investigation) is the object of the verb chìn-hs'ing, 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 chìn-hs'ing (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 (yén-chiù), calculations (chì-suàn), tests (sh'ih-yèn), etc.

The first lines of the text can now be translated say as follows:

The problem of the relationship between the half-lives ($T_{1/2}^f$) 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 hòu-tù. We recall the expression

密度 mì-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. hòu-tù (thickness), wēn-tù 溫度 (temperature), sù-tù 速度 (velocity), ch'íáng-tù 強度 (light intensity). Our Character Index gives the meanings "pair" and "even" for the character 偶. We fare

well on taking the latter meaning: even-even nuclei (oǔ-oǔ-hó) ²³⁾.

And with a bit of luck we complete the title: The thickness of the potential wall (shǐh-leǐ) on spontaneous fission of even-even nuclei.

The last sentence of our text is understandable from a literal translation, once we found the binome tuì-shù in the meaning "logarithm" in all our dictionaries, and t'iaó as a classifier (for long objects and thus also for straight lines): this second meaning of t'iaó, which is new to us, is also quoted in all our dictionaries. We discussed the construction yǔǎn chiaò fù-tsá in detail in the third Translation Exercise. The construction "yǔǎn pǐ weí tà" in this sentence is very similar; pǐ and chiaò have the same meaning "to compare".

Our literal translation reads: usually to take (chiāng) the logarithmic values (tuì-shù-chíh) of the (half-lives) $T_{1/2}^f$ (of spontaneous fission) of nuclides (h ó-sù) (and) relative to (tuì) their Z^2/A values to make (tsò) a diagram (t'ú) ²⁴⁾; to appear (fā-hsièn) that the experimental points (tiěh) of the even-even nuclei completely (píng) not (pù) all (toū) fall (lò) on (tsaì-shàng) one piece (t'iaó) straight line (chíh-hsièn) and (érh) that the $T_{1/2}^f$ (values) of nuclei with odd A then (tsé) far (yǔǎn) 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)

oǔ is also used in the meaning "pair" in physics and chemistry:
偶极子 oǔ-chí-tzǔ = dipole; 偶极分子 oǔ-chí-fēn-tzǔ = dipole molecule. The meanings "even number" oǔ-shù 偶数 and "pair" are to some extent interrelated. Division of an even number by two gives a "pair" of numbers. The "odd number" chī-shù 奇数 appears in the next sentence.

24) This character features in the usual expression t'ú-shū-kuǎn
图书馆 = building for sketches and books = library

Character Index

- ài 艾 19, 12, 6519
 一 十 卅 卌 艾 艾
- ch'ǎn 产 産 163, 6694, 396 to produce
 一 十 卅 卌 立 产 产 产 产 産
- chāng 张 張 195, 6744, 5798 to extend; common surname
 一 二 弓 弓 弓 弓 张 张 张
 弓 弓 弓 弓 张 张 张
- chāng 章 182, 6724, 2278 chapter
 一 卅 立 音 音 章 章
- ch'áng 长 長 213, 6752, 5793 long; chǎng: to grow
 一 丨 丨 长 长
 一 長 長 長 長
- ch'áng 场 場 218, 6770, 4486 an open space
 一 十 土 坦 坦 坦 坦 場 場
- chāo 照 238, 6786, 8771 to illumine, to reflect
 日 日 日 照 照 照
- chè 这 這 265, 6826, 6611 this (see Part I, p. 25)
- ch'ēng 称 稱 383, 6962, 4128 to call
 一 二 子 禾 禾 禾 禾 禾 禾 禾
 禾 禾 禾 禾 禾 禾 禾

ch'éng 成 379, 6943, 7016 to become (finished)
 一 了 万 成 成 成

ch'éng 程 375, 6950, 305 road
 一 二 千 禾 和 程 程 程

chī 基 399, 1702, 211 basis
 一 廿 廿 廿 其 基 基 基

chī 机機 411, 1668, 7044 machine
 一 才 才 才 机
 才 才 机 机 机 机 机 机 机 机
 机 机 机

chī 积積 500, 7602, 8116 to amass
 一 二 千 禾 和 和 积
 禾 禾 禾 积 积 积

chī 奇 514, 1783, 3063 odd (number)
 一 大 大 奇 奇

chī 几幾 409, 1666, 7038 several
 一 几
 二 二 二 二 二 二 二 二 二 二

chī 及 468, 1687, 6496 to reach, and
 一 了 乃 及

chī 极極 484, 1713, 73 the utmost point
 机 机 机 极
 机 打 机 机 极 极

chì 計 計 456, 1737, 2268 to calculate
、 讠 讠 讠
、 讠 讠 讠 讠 讠 讠

chì 技 442, 1735, 6219 skill
一 扌 扌 扌 扌 扌 扌 技

chì 劑 劑 457, 7606, 2888 agent
、 一 一 一 一 一 一 一 劑
一 一 一 一 一 一 一 劑 劑 劑 劑 劑 劑
劑 劑 劑 劑

chì 际 際 467, 7635, 8391 border
了 阝 阝 阝 阝 阝 际
阝 阝 阝 阝 阝 阝 际 際

ch'í 其 525, 1769, 8046 possessive pronoun: his, her, its, their
一 十 廿 其 其 其

ch'í 期 526, 1770, 3579 period
一 廿 廿 其 其 其 期 期

ch'í 起 548, 1794, 5968 to rise, to raise (see Part I, p. 29, Note 30)

ch'ì 器 器 549, 1801, 1077 utensil (see Part I, p. 31)

口 凵 哭 哭 哭 器

ch'ì 迄 568, 1820, 6774 to reach to
、 一 一 乞 乞 迄

ch'ì 气 氣 554, 1767, 7812 air
ㄣ ㄣ 气 气 气 气 气 氣 氣

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

chiā 佳 593, 1869, 166 good
ノ 亻 亻 亻 亻 佳 佳 佳 佳

chiā 加 580, 1849, 1083 to increase (see Part I, p. 31)
ㄩ 力 加 加 加

chià 架 583, 1852, 5319 frame; classifier
力 加 加 架 架

chiāng 将 將 656, 7664, 3273 to take
、 丩 丩 丩 丩 丩 丩 将 将
ㄥ 丩 丩 丩 丩 丩 将

ch'iang 强 強 668, 1922, 8922 strong
ㄩ ㄩ ㄩ ㄩ ㄩ 强 强 强
ㄩ ㄩ ㄩ 强

chiào 較 713, 1939, 6531 to compare
一 一 一 亘 車 車' 車 車
車 車 較

chiào 教 719, 1947, 6337 teaching
一 十 土 丩 孝 孝 孝 教
教

chiéh 結 結 782, 2015, 1214

to tie

ノ 纟 纟 纟 纟 結
纟 纟 纟 纟 纟 結

chiéh 介 629, 2050, 2742

"to lie between" (see Part I, p. 21, Note 21)

chiēn 間 835, 2106, 3460

interspace (see Part I, p. 34)

chièn 鍵 859, 2093, 6813

bolt (lock)

ノ 人 亼 亼 亼 余 余 金 金 金 釵
釵 釵 釵 釵 釵 釵

chièn 件 862, 2120, 2514

piece

ノ イ 亻 亻 件 件

chièn 建 853, 2085, 6812

to establish

ㄋ 彡 彡 彡 彡 建 建

ch'ién 前 919, 7772, 2901

before

ノ 丷 丷 丷 前 前 前 前

chīh 知 932, 7031, 1091

to know (see Part I, p. 23)

chīh 枝 938, 7027, 6221

branch; classifier

木 扌 扌 扌 枝

chīh 織 989, 7015, 6912

to weave

纟 纟 纟 纟 纟 纟 纟 纟 織
織 織

chīh 之 935, 6978, 6589 genitive character of the written language
' 之

chíh 质 質 1009, 7077, 8176 disposition; matter (see Part I, p. 20, Note 19)

chíh 直 1006, 6980, 749 straight; direct
- 十 方 直 直

chíh 值 975, 6981, 752 value
1 十 值 值

chǐh 只 946, 7066, 8093 only
口 只 只

chǐh 止 939, 7056, 472 to stop
1 十 止 止

chǐh 指 959, 6989, 1606 finger, to point
- 十 才 才 批 指

chìh 至 982, 6995, 255 to reach
- 工 云 至 至 至

chìh 致 984, 7010, 6307 to bring about
云 至 至 至 致 致

ch'íh 尺 1045, 7115, 4968 foot(rule)
丿 一 尸 尺

chìn 近 1061, 2169, 6640 near to
丿 一 斤 斤 近 近

chìn 进 進 1091, 7798, 6605 to enter; to advance
二 井 进 一 一 佳 佳 佳 進

chìng 鏡 1137, 2213, 7577 mirror
 人 今 年 余 余 金 金 鑄 鏡

ch'íng 情 1170, 7844, 3688 feelings; circumstances
 ' 卍 卍 卍 卍 情 情

chiù 就 1210, 7857, 7718 thereupon (see Part I, p. 25)

chiù 究 1199, 2257, 7911 to examine into (see Part I, p. 28 Note 29)

chō 桌 掉 1262, 7167, 2305 table (see Part I, p. 32, Note 33)

choū 洲 1290, 7193, 2840 continent
 ' ' ' ' ' 洲

chū 诸 諸 1362, 7277, 1629 pluralizing character
 ' 言 言 言 言 言 諸
 諸

chǔ 主 1336, 7236, 357 master; main
 ' 主 主 主 主

chù 注 1340, 7240, 366 to pour into
 ' ' ' ' 注 注

chù 著 著 1361, 7272, 1648 to make known (see Part I, p. 25)

ch'ū 出 1409, 7297, 1020 to go out
 / 4 4 出

ch'ü 处 處 1407, 7300, 6491 to dwell; ch'ü: place
 ㄉㄨˋ ㄉㄨˋ 處 處
 ㄉㄨˋ ㄉㄨˋ 處 處 處 處 處

chü 具 1556, 2799, 8065 tool; to possess
 ㄉㄨˋ 具 具 具 具 具

chü 聚 1581, 8057, 5705 to assemble
 ㄉㄨˋ 聚 聚 聚 聚 聚 聚 聚

chuǎn 转 轉 1431, 7351, 3293 to turn
 ㄉㄨㄢˇ 转 转 转 转 转 转 转
 ㄉㄨㄢˇ 转 转 转 转 转 转 转 转

ch'üeh 确 確 1181, 2972, 964 certainly
 ㄉㄨㄟˊ 确 确 确 确 确 确
 确 确 确 确 确 确 确 确

ch'ün 羣 羣 1737, 2991, 2559 herd
 ㄉㄨㄢˊ 羣 羣 羣 羣 羣 羣

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

chūng 种 種 1511, 7445, 468 sort
 ㄉㄨㄥ 种 种 种 种 种 种
 种 种 种 种 种 种 种

chùng 重 1509, 7443, 462 heavy
 ㄉㄨㄥˋ 重 重 重 重

ch'úng 冲 1523, 7465, 2673 to dash against
 ㄉㄨㄥˊ 冲 冲 冲

érh 而 1756, 4257, 3750 and yet

一 丿 丂 而

ěrh 爾 1754, 4264, 4028

一 丿 丂 丂 丂 丂 丂 爾 爾 爾 爾

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

fǎ 法 1762, 77, 8841 law

丨 丨 丨 丨 丨 丨 法 法 法

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

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

fàn 泛 1773, 97, 6595 overflowing

丨 丨 丨 丨 泛

fàn 范範 1780, 115, 7193 pattern

丨 丨 丨 丨 丨 范 范 范

丨 丨 丨 丨 丨 丨 范 范 范 范

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

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

feī 飞飛 1850, 165, 7850 to fly

丿 丿 飞 飞 飞 飞

飞 飞

fēn 分 1851, 179, 4289 to divide (see Part I, p. 21, Note 23)

- fēng 封 1887, 217, 3163 to seal; classifier
- 十 土 圭 丰 圭 - 封 封
- fú 伏 1964, 349, 5074 to prostrate oneself
ノ 亻 亻 伏 伏
- fù 复 復 1996, 310, 6417 to repeat
' 夕 才 丰 丰 丰 丰 复 復
- hěn 很 2094, 455, 5906 very (see Part I, p. 34)
- hó 核 2089, 755, 7997 nucleus (see Part I, p. 31, Note 32)
- hó 和 2115, 738, 1095 harmony; and
ノ 二 于 才 禾 和
- hó 合 2117, 740, 1188 to unite
ノ 人 亼 合
- hóu 侯 2135, 783, 5165 marquis
ノ 亻 亻 亻 侯 侯 侯 侯
- hòu 后 後 2143, 778, 6489 afterwards
ノ 厂 尸 后
ノ 亻 亻 亻 後 後 後 後
- hòu 厚 2147, 779, 3125 thick
- 厂 后 厚 厚 厚
- hsī 析 2488, 5384, 2033 to distinguish
- 扌 才 木 析 析 析
- hsī 西 2460, 5377, 1953 the west
- 一 冂 而 西 西

- hsi 系 2423, 477, 8484 related; used for 係 hsi
 丿 亠 丩 丩 系 系 系
- hsi 係 2424, 478, 8486 to belong to
 丿 亠 亠 係
- hsià 下 2520, 537, 2005 under
 一 丅 下
- hsiāng 相 2562, 5432, 1695 mutual (see Part I, p. 24)
- hsiàng 象 2568, 5441, 5757 resemblance
 丿 ㄣ 宀 宀 豕 豕 象 象
 象 象
- hsiàng 向 2549, 571, 3926 in the direction of (see Part I, p. 24)
- hsiaǎo 小 2605, 5454, 8346 small (see Part I, p. 24)
- hsiaò 效 2599, 588, 6391 efficacious
 丿 亠 六 交 交 交 交 效 效
- hsiēh 歇 2642, 617, 4943 to rest
 日 月 弓 弓 弓 弓 歇 歇
- hsièn 現 2684, 641, 7586 to manifest
 二 干 王 王 王 王 現 現
- hsièn 线 纜 2723, 5520, 5647 line, ray (see Part I, p. 12)
 纜
 纜
 纜
 纜 纜 纜 纜 纜 纜 纜 纜 纜 纜
 纜 纜 纜 纜 纜 纜 纜 纜 纜 纜

hsīn 新 2737, 5540, 2037 new
 , 一 六 古 立 亨 亲 新 新
 新 新

hsīn 心 2735, 5535, 8526 heart
 / 心 心 心

hsìn 信 2748, 5536, 1156 letter
 / 一 一' 信 信

hsíng 行 2754, 699, 3020 to do
 / 彳 彳 行 行

hsìng 性 2771, 5550, 391 nature, disposition (see Part I, p. 34)

hsiù 溴 溴 not given, 7221, bromine
 5096
 / 彳 彳 彳 彳 彳 彳 彳 彳 彳 彳

hsū 需 2844, 5759, 3762 to require
 - 一 二 平 平 需 需 需
 需 需 需

hsü 許 2825, 1108, 2429 very
 , 彳 言 言 言 許 許

hsü 序 2851, 5753, 3087 order
 , 一 广 广 广 序 序

hsüán 旋 2894, 5786, 6025 to revolve (see Part I, p. 12)
 , 一 方 方 方 方 方 方
 方 方 方

- í 宜 2993, 1236, 629 proper
, 宀 宀 宀 宜
- ǐ 从 2932, 1170, 7984 to take
厶 厶 厶 厶
- ǐ 椅 2954, 1278, 3077 chair
一 十 木 扌 扌 扌 椅 椅 椅
- ǐ 已 2930, 1172, 7243 already (sign of the past)
冫 冫 已
- ì 意 2960, 1182, 8565 a thought
, 一 一 一 音 音 意 意 意
- jén 人 3097, 1388, 4891 man
ノ 人
- jú 如 3137, 1442, 1096 like
ノ 女 女 如
- jù 入 3152, 1460, 6517 to enter
ノ 入
- júng 溶 7562, 1494, 1393 to dissolve
氵 氵 氵 溶 溶 溶
- k'ǎ 卡 616, 1892, 2007
丨 丨 上 卡 卡
- k'ai 开 開 3204, 1523, 3485 to open
二 丌 开
冫 冫 冫 冫 冫 冫 冫 冫

kaō 高 3290, 1604, 3827 high (see Part I, p. 34)

kèng 更 3346, 1646, 6573 more

一 日 更 更

kò 个 個 3366, 2347, 1870 most commonly used classifier, "piece"

一 个 个
一 个 个 个 个 个 个

k'ò 可 3381, 2353, 3037 can

一 日 可

kòu 構 3428, 2407, 4121 roofing

一 十 木 木 木 木 構 構 構
構

kù 固 3450, 2449, 1868 firm

一 日 固 固 固

k'ù 庫 3496, 2490, 2650 treasury

一 日 庫 庫

kuān 关 關 3571, 2550, 3484 frontier pass; to close; to connect

一 日 关 关
一 日 关 关 关 关
一 日 关 关 关 关

kuǎn 馆 館 3559, 2566, 1483 a building

一 日 舍 舍 舍 舍 舍 舍
一 日 舍 舍 舍 舍
一 日 舍 舍 舍 舍

- lǐ 李 3852, 3140, 3145 plum; common surname
 一 十 木 李 李 李
- lǐ 里裏 3865, 3134, 5840 within
 冂 旦 里 里
 一 一 重 裏 裏 裏 裏
- lì 立 3921, 3212, 544 to stand (up)
 一 一 一 立 立
- lì 力 3920, 3217, 4782 force (see Part I, p. 24)
- lì 例 3890, 3144, 2923 example
 一 一 一 一 例 例 例 例
- lì 利 3867, 3189, 2945 sharp; profit
 一 二 一 一 利 利 利
- lì 粒 3923, 3214, 554 grain (see Part I, p. 21, Note 25)
- liáng 量 3943, 3233, 446 to measure; liàng: a measure
 冂 旦 量 量 量 量
- liè 裂 3990, 3294, 5821 to split
 一 一 一 一 裂 裂 裂 裂 裂
- liú 流 4080, 3421, 7786 to flow
 一 一 一 一 流 流 流 流
- lè 勒 3841, 3464, 4806 to bridle
 一 一 一 一 勒 勒 勒 勒

lò 落 4122, 3453, 1425 to fall

ㄌㄛˋ ㄌㄛˋ ㄌㄛˋ ㄌㄛˋ ㄌㄛˋ ㄌㄛˋ ㄌㄛˋ ㄌㄛˋ

lǚ 魯 4176, 3548, 1622

ㄌㄨˇ ㄌㄨˇ ㄌㄨˇ ㄌㄨˇ ㄌㄨˇ ㄌㄨˇ ㄌㄨˇ ㄌㄨˇ

lǜ 律 4297, 3624, 2620 law (see Part I, p. 25)

lǜ 率 5910, 5324, 2359 rate (e.g. counting rate)

ㄌㄨˋ ㄌㄨˋ ㄌㄨˋ ㄌㄨˋ ㄌㄨˋ ㄌㄨˋ ㄌㄨˋ ㄌㄨˋ

lì 氣 4194¹/₂, 3604, 7818 chlorine

ㄌㄧˋ ㄌㄧˋ ㄌㄧˋ ㄌㄧˋ ㄌㄧˋ ㄌㄧˋ ㄌㄧˋ ㄌㄧˋ
ㄌㄧˋ ㄌㄧˋ

lún 侖 4246, 3568, 3792 to arrange

ㄌㄨㄣˊ ㄌㄨㄣˊ ㄌㄨㄣˊ ㄌㄨㄣˊ ㄌㄨㄣˊ ㄌㄨㄣˊ

lùn 論 4253, 3575, 3794 to discuss

ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ
ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ ㄌㄨㄣˋ

mǎn 滿 4326, 3658, 4027 to fill

ㄇㄢˇ ㄇㄢˇ ㄇㄢˇ ㄇㄢˇ ㄇㄢˇ ㄇㄢˇ ㄇㄢˇ ㄇㄢˇ
ㄇㄢˇ ㄇㄢˇ

meí 沒 4555, 3984, 6256 not

ㄇㄟˊ ㄇㄟˊ ㄇㄟˊ ㄇㄟˊ ㄇㄟˊ ㄇㄟˊ ㄇㄟˊ ㄇㄟˊ

men 們 4419, 3768, 3436 toneless sign of the plural (in a few cases; see Part I, p. 28, Note 29)

- | | | | | |
|------|---|------------------|-----------------------------|-------------------|
| mì | 密 | 4464, 3827, 1003 | dense | 丿 山 宀 宀 宀 宀 宀 宀 宀 |
| miàn | 面 | 4497, 3863, 1943 | (sur) face | 一 丿 丿 而 而 面 |
| mín | 民 | 4508, 3872, 6865 | people | 丿 丿 尸 尸 民 |
| míng | 名 | 4524, 3893, 1358 | name (see Part I, p. 25) | |
| míng | 明 | 4534, 3898, 3554 | bright | 日 日 日 明 明 |
| mù | 目 | 4596, 3981, 1693 | eye | 目 目 |
| nà | 那 | 4604, 3999, 2227 | that | 丿 刀 那 那 那 |
| nán | 南 | 4620, 4012, 3917 | south | 一 十 尗 尗 尗 南 南 |
| neì | 内 | 4766, 4042, 4045 | within | 丨 冂 内 内 |
| néng | 能 | 4648, 4046, 7186 | able to (see Part I, p. 19) | |
| nián | 年 | 4711, 4113, 2590 | year | 丿 一 一 年 年 |
| niú | 牛 | 4737, 4141, 2512 | ox | 丿 一 一 牛 |
| ō | 俄 | 4779, 4191, 6928 | suddenly | 丿 丨 丨 仵 仵 俄 俄 俄 |

- ōu 欧 歐 4817, 4235, 4910 Europe
 一 丿 又 区 区' 区" 区" 欧 欧
 一 百 百 區 區 歐
- ǒu 偶 4801, 4229, 4089 pair; even (number)
 丿 丨 但 偶 偶 偶
- pā 巴 4826, 4266, 7280
 丿 丿 丿 巴
- pǎ 把 4829, 4269, 7286 classifier ("handle")
 一 扌 扌 扌 扌 扌 把
- pǎi 百 4976, 4311, 1682 a hundred
 一 丿 丿 百
- pān 般 4881, 4333, 6282 sort
 一 丨 丨 丨 丨 丨 每 每 每 般 般
- pǎn 版 4886, 4324, 6108 block for printing
 丨 丨 丨 片 片 片 版
- pàn 半 4875, 4338, 2504 half
 丶 一 三 半
- pāng 邦 4910, 4370, 2216 state
 一 丨 丨 邦 邦
- pǎo 堡 4947, 4396, 219 walled village
 丨 丨 丨 但 保 保 保 堡
- pèi 被 4999, 4457, 6237 sign of the passive
 ' 丨 丨 丨 丨 丨 初 初 被 被
- p'èi 配 5019, 4478, 7249 to match
 一 丨 丨 而 而 而 配 配
- pěn 本 5025, 4496, 5420 root
 一 丨 丨 本 本

- pǐ 比 5077, 4541, 7081 to compare
 丨 卜 上 上 比
- pǐ 筆 5130, 4575, 2627 writing-brush
 丨 丿 ㇇ ㇇ ㇇ 筆 筆 筆
- pì 必 5109, 4553, 8705 necessarily (see Part I, p. 24)
- piǎo 表 5187, 4668, 5835 to make known
 - = 丰 丰 丰 丰 丰 丰 丰
- piēn 編編 5231, 4726, 3787 to compile
 纟 纟 纟 纟 纟 纟 纟 纟 纟 纟
 編 編
- pièn 變 變 5245, 4715, 6475 to change
 丨 一 十 卅 卅 卅 卅 卅 卅 卅 卅
 纟 纟 纟 纟 纟 纟 纟 纟 纟 纟
- p'īēn 篇 5248, 4751, 3791 leaf of a book; classifier
 丨 丿 ㇇ ㇇ ㇇ ㇇ ㇇ ㇇ ㇇ ㇇
 篇 篇 篇
- pìng 并 並 5292, 4790, 510 intensive particle before a negative
 丷 丷 丷 并
 丷 丷 丷 丷 丷 丷 丷 並
- p'íng 評 5306, 4811, 2420 to comment on
 言 言 言 言 言 言 評
- pù 不 5379, 4906, 7977 no(t) (when pù 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).
 - 丿 丿 不

pù 部 5376, 4922, 2174 section
, 亠 ㄩ ㄩ 喜 喜 了 部

p'ǔ 譜 5386, 4931, 1505 register

言 言 言 言 言 言 言 譜

p'ǔ 普 5384, 4928, 1504 everywhere

丷 丷 丷 并 并 并 普

sān 三 5415, 4977, 8 three

一 = 三

sè 色 5445, 5368, 7310 colour

丿 ㄣ ㄣ ㄣ ㄣ 色

shàng 上 5669, 5065, 81 above (see Part I, p. 31, Note 32)

shàng 尚 5670, 5073, 3855 still

丨 丨 小 尚 尚

shǎo 少 5675, 5076, 4148 few

丨 小 小 少

shào 紹 5689, 5086, 1372 to connect

丿 丿 丿 丿 糸 糸 糸 紹 紹 紹

shè 社 5701, 5100, 152 a company

一 = 亠 示 示 示 社 社

shè 設 5711, 5099, 6267 to establish

言 言 言 設 設

shēn 深 5719, 5130, 5393 deep

丨 丨 丨 丨 丨 深 深

shēng 生 5738, 5154, 389 to live

丨 丨 二 牛 生

shèng 剩 5750, 5162, 2951 residue

ノ 二 千 千 千 千 千 千 千
乘 剩

shíh 时 時 5780, 5225, 3229 time

1 日 日 日 日 日 日 日 時 時

shíh 十 5807, 5237, 2264 ten

- 十

shǐh 使 5770, 5188, 6572 to cause

ノ 1 1 1 使 使 使

shǐh 始 5772, 5187, 1461 the beginning

ノ 女 女 女 始

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

shìh 势 勢 5799, 5195, 4869 power

- 十 十 十 十 十 十 十 十
- 十 十 十 十 十 十 十 十

shìh 试 5798, 5213, 6881 to try

言 言 言 言 言 言 言 言

shǒu 首 5839, 5256, 1739 head

ノ 二 二 二 二 二 二 二

shòu 受 5840, 5261, 6194 to suffer

ノ 1 1 1 1 1 1 1

shū 书 5857, 5266, 1502 book

ノ 子 子 子 子 子 子 子 子

shù 術 5889, 5310, 3031 method
一 十 才 木
夕 夕 行 行 行 休 休 術

shù 述 5890, 5311, 6759 to state
一 十 才 木 术 述

shù 数 數 5865, 5267, 6406 number
、 〃 二 半 米 粳 粳 粳 粳 粳
數 数
口 巾 昌 婁 婁 婁 數

shù 束 5891, 5297, 5519 to bind
一 日 巾 束 束

shuāi 衰 5908, 5327, 5861 to decrease
、 一 宀 衣 衣 衰 衰 衰

shuō 說 說 5939, 5361, 7567 to speak
言 言 言 言 說 說 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)
一 日 巾 束 速

suān 酸 5514, 5689, 6464 sour, acid
一 行 而 而 西 西 酸 酸 酸

suàn 算 5516, 5685, 2804 to calculate
、 丷 丷 丷 算 算 算

szū 斯 5574, 5623, 2039 一 廿 其 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
, 山 山 它

taì 代 5996, 5875, 6874 a generation
ノ イ 代 代

t'ai 态 態 6024, 5920, 8682 behaviour
- ナ 大 太 太 态 态 态
ノ 台 台 能 能 態

tàn 但 6038, 5934, 15 but
ノ イ 伯 但

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

taò 到 6133, 6056, 2864 to arrive
一 丕 丕 丕 丕 至 到

té 得 6161, 6095, 3225 to obtain
ノ 夕 夕 但 但 得 得

té 德 6162, 6094, 8531 virtue
ノ 夕 夕 夕 夕 德 德 德

t'è 特 6165, 6096, 3237 specially
ノ 夕 夕 夕 特 特

tēng 登 6167, 6103, 590 to mount
フ マ マ' マ'' マ''' 登 登 登
登

- těng 等 6178, 6102, 3240 to wait; equal to; et cetera (see Part I, p. 24)
- tī 低 6188, 6127, 6852 low
 一 亻 亻 亻 亻 低 低
- ti 的 6213, 6163, 4361 genitive sign (see Part I, p. 25 and p. 27 ff)
- tì 第 6203, 6150, 4769 ordinal numeral prefix (see Part I, p. 25)
- tì 地 6198, 6125, 7419 the earth
 - 十 土 土 土 地
- t'í 提 6233, 6193, 6008 to lift in the hand
 - 扌 扌 扌 扌 扌 提
- t'í 題 6238, 6198, 6015 a theme
 旦 早 早 是 是 是 是 題 題
- t'í 體 體 6246, 6180, 579 body
 一 亻 亻 亻 休 休
 冎 冎 冎 骨 骨 骨 骨 骨 骨
 骨 骨 骨
- t'iaó 条 條 6300, 6232, 5383 condition
 一 亻 亻 亻 亻 條 條
- tiǎn 石 典 6348, 6289, 8073 iodine
 - 丿 石 石 石 石 石 石 石 石
 石 典
- tiǎn 点 點 6346, 6295, 1275 dot
 一 卜 占 占 点
 一 冎 冎 冎 冎 冎 冎 冎 冎

tièn 电 電 6358, 6305, 7441 electricity (see Part I, p. 21, Note 20)

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

tō 多 6416, 6383, 4255 many
ノ 夕 夕 夕 夕 夕

t'ō 脱 6468, 6406 to strip
ノ 月 月 月 月 月 月 月 月 月 月

tsá 杂 雜 6646, 6466, 903 mixed (see Part I, p. 18)

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

ts'ai 才 纔 6672, 6496, 7769 only then
一 寸 寸 (last stroke from top to bottom)
纔 纔 纔 纔 纔 纔 纔 纔 纔
纔 纔 纔 纔

ts'an 参 參 6685, 6515, 4219 to take part in
厶 厶 厶 厶 厶 厶 厶 厶 厶 厶
厶 厶 厶 厶 厶 厶 厶 厶 厶 厶

tsaò 造 6730, 6548, 6612 to build
ノ 一 牛 生 告 造

tsé 则 則 6746, 7551, 2968 consequently
几 目 目 目 目 目

tsé 择 擇 276, 7561, 2484 to select
扌 扌 扌 扌 扌 扌 扌
扌 扌 扌 扌 扌 扌 扌
扌 扌 扌 扌

ts'è 册 6756, 7567, 4101 volume

ノ 月 册 册

tsēng 增 6763, 7577, 1550 to increase

一 十 土 土 土 土 土 土 土
增 增

ts'éng 层層 6772, 7587, 1559 layer

一 一 尸 尸 层 层
尸 尸 层 层 层 层 层 层

tsǒ 左 6774, 7877, 106 left

一 十 土 左 左

tsò 作 6780, 7871, 2065 to do (see Part I, p. 24)

tsú 足 6824, 7917, 5977 foot; sufficient

口 一 一 尸 足

tsǔ 组 6817, 7925, 617 to organize

一 一 一 一 一 一 一 一

tsui 最 6858, 7964, 6070 most

一 旦 昇 昇 昇 昇 最 最

ts'un 存 6891, 8006, 3110 to be in existence

一 一 一 存 存

tū 都 6500, 8109, 2181 metropolis; toū: all

一 十 土 尹 者 者 者 都

tù 度 6504, 8101, 6168 measure, degree

一 广 广 度 度 度

t'ú 圖 圖 6531, 8150, 1874 sketch, map

冂 冂 冂 冂 冂 冂 冂
冂 冂 冂 冂 冂 冂

tuàn 斷 斷 6547, 8166, 2013 to interrupt

、 〃 二 米 迷 迷 斷 斷
夕 夕 夕 夕 夕 夕 斷 斷

tuī 土 堆 6557, 8179, 867 pile

一 十 土 土 土 土 土 土 土 土

tuì 对 對 6562, 8181, 3165 opposite to

丿 又 又 对 对
、 〃 〃 〃 〃 〃 〃 〃 對

tùn 屯 頓 6584, 8200, 8301 to bow (see Part I, p. 25)

tùng 动 動 6611, 8234, 4787 to move

二 云 云 云 云 云
、 亻 車 重 重 動 動

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

t'úng 同 6615, 8239, 3862 equal

丨 冂 冂 同

t'ūng 统 統 6641, 8257, 7687 to unite

夕 夕 夕 夕 夕 夕 夕 夕 夕 夕

tzǔ 子 6939, 7476, 3098 son (see Part I, p. 19 f)

tzù 自 6960, 7475, 1736 self

一 一 自 自

tz'ú 磁 6966, 7549, 8896 magnetic

一 一 石 石 磁 磁

tz'ü 止 6972, 7528, 7131 this

一 一 止 止 止 止

wàn 万 萬 7030, 8287, 4095 ten thousand

一 一 万

一 一 一 一 萬 萬 萬

wáng 王 7037, 8323, 314 king; common surname

一 一 王 王

weí 为 爲 7059, 8371, 4523 to be; to make

一 一 为 为
一 一 一 一 一 一 一 一 一 一

weí 维 維 7067, 8386, 911 to hold together

一 一 一 一 一 一 一 一 一 一

weí 围 圍 7082, 8345, 1878 to surround

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wēn 温 溫 7125, 8436, 684 warm

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- wén 文 7129, 8441, 6545 literature (see Part I, p. 15)
- wèn 問 7141, 8430, 3450 to ask
 ㄨㄣˋ ㄇㄨˋ ㄇㄨˋ ㄇㄨˋ 門 問
- wú 无 無 7180, 8509, 8742 to have not
 ㄨˊ ㄨˊ 无 无 无 无 无 无
- wù 物 7209, 8503, 4482 matter; object (see Part I, p. 18)
- yaò 要 7300, 8612, 9032 important; to want
 ㄩㄠˋ ㄩㄠˋ ㄩㄠˋ 西 要 要 要
- yě 也 7312, 8666, 7418 also
 ㄩㄝˇ 也
- yè 液 3033, 1260, 6495 fluid
 ㄩㄝˋ 液 液 液 液 液 液
- yán 研 7341, 8692, 2390 to grind, to study (see Part I, p. 28
 Note 29)
- yèn 驗 7367, 8717, 8010 to study (see Part I, p. 29. Note 29)
- yīn 因 7407, 8797, 1891 to rely upon
 ㄩㄣ 因 因 因 因 因
- yǐn 引 7429, 8788, 1979 to lead (see Part I, p. 29, Note 30)
- yīng 英 7489, 8839, 5224 brave
 ㄩㄥ 英 英 英 英 英
- yìng 应 應 7477, 8826, 8555 to correspond (see Part I, p. 29, Note 30)
- yú 游 7522, 8908, 3115 to wander
 ㄩˊ 游 游 游 游 游 游

- yú 由 7513, 8872, 1830 from
𠂇 𠂆 由 由
- yǔ 有 7533, 8916, 3582 to be present, to have (see Part I, p. 24)
- yù 右 7541, 8904, 1122 right hand side
一 ナ 右
- yù 又 7539, 8879, 6557 again
又
- yú 于於 7643, 8980, 8956 in, on (see Part I, p. 30, Note 31)
- yú 余餘 7608, 9066, 8502 overplus
人 人 今 會 食 食 食 餘 餘
餘 餘
- yǔ 与與 7615, 8992, 8059 and (see Part I, p. 34)
- yù 育 7687, 9077, 3679 to bring up
' 一 去 育 育
- yüán 原 7725, 9113, 8428 source (see Part I, p. 19 and 20)
- yüán 元 7707, 9123, 7463 originally (see Part I, p. 33 f)
- yüǎn 远遠 7734, 9112, 6747 distant
一 二 元 远
一 十 士 亨 亨 亨 袁 遠
- yòng 用 7567, 8929, 3707 to use (see Part I, p. 24 and p. 27, Note 26)