

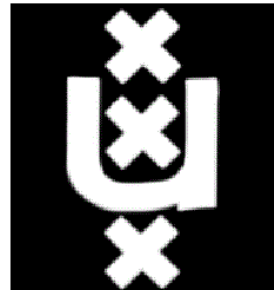
Analyzing the Logic in Sun Tzu, "The Art of War" Using Mind Maps

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<https://suntzu.squaringthecircles.com/>

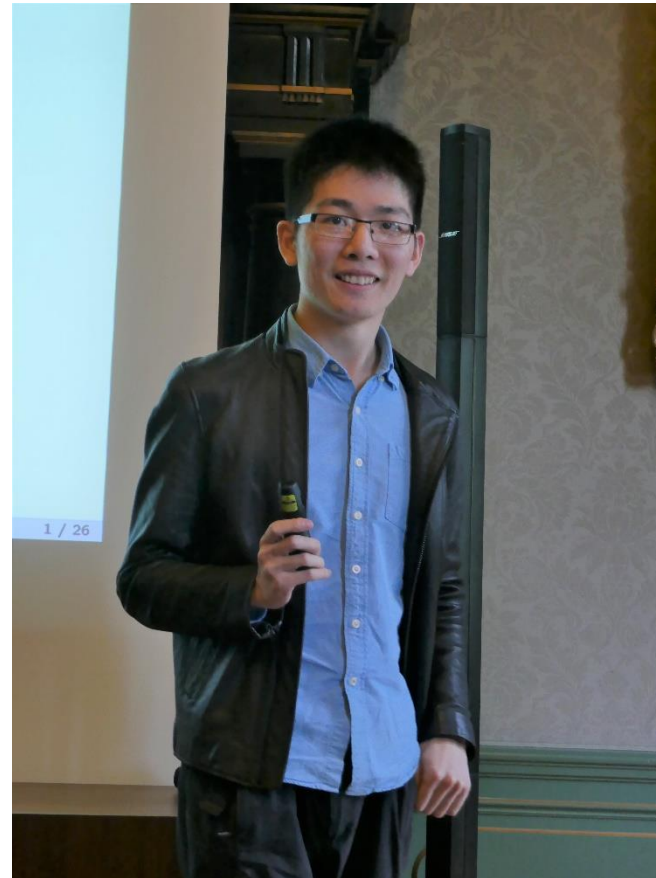


The presentation title is also the title of a book, in the Logic in Asia series of Springer.
(<https://doi.org/10.1007/978-981-19-6250-9>)

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Sun Tzu, the Art of War

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- An ancient Chinese work on strategy and warfare.
- About 500 BC
- 13 chapters
- Translated into English by Lionel Giles in 1910,
 - *The only translation that is freely available without copyright.*
- The first 6 chapters are considered more theoretical:
 - Planning, Waging War, Strategic Attack, Positioning, Use of Energy, Weaknesses and Strengths.
- The last 7 chapters are more practical
 - Military Maneuvers, Variation of Tactics, The Army on the March, Terrain, The Nine Situations, Attacking with Fire, Use of Spies.
- Especially in business circles Sun Tzu became popular.

Logic

- ➔ **Logic** in Sun Tzu's time was very informal, and rather abstract.
- ➔ By making *mind maps* we were able to see patterns more easily.
- ➔ By uncovering logical *patterns* in Sun Tzu's text, of which *enumerations* and *pairs of opposites* are the most prominent ones, we were able to highlight his reasoning better.

Perspective

From the chapter Guangze (广泽) of the Shizi (尸子):

If you looked at the stars from inside a well, no more than a few stars would be visible to you.

If you look from a hilltop, then you can see when they first appear and when they fade away.

It's not that they're any brighter, but the setting makes it this way.

自井中视星，所视不过数星；自丘上以视，则见其始出，又见其入。

非明益也，势使然也。

Mind maps, or formally, **text tree mind maps**, allow us to widen our perspective on the text of Sun Tzu's book.



Van Gogh,
Starry Night over
the Rhone

Medieval Representation of Text

Sun Tzu, the Art of War Ch. V, par. 6:

*indirect tactic efficiently applied
are inexhaustible as heaven and earth
thundering as the flow of rivers and
streams like the sun and moon they
end but to begin anew like the four seasons
as they pass away to return once
more*

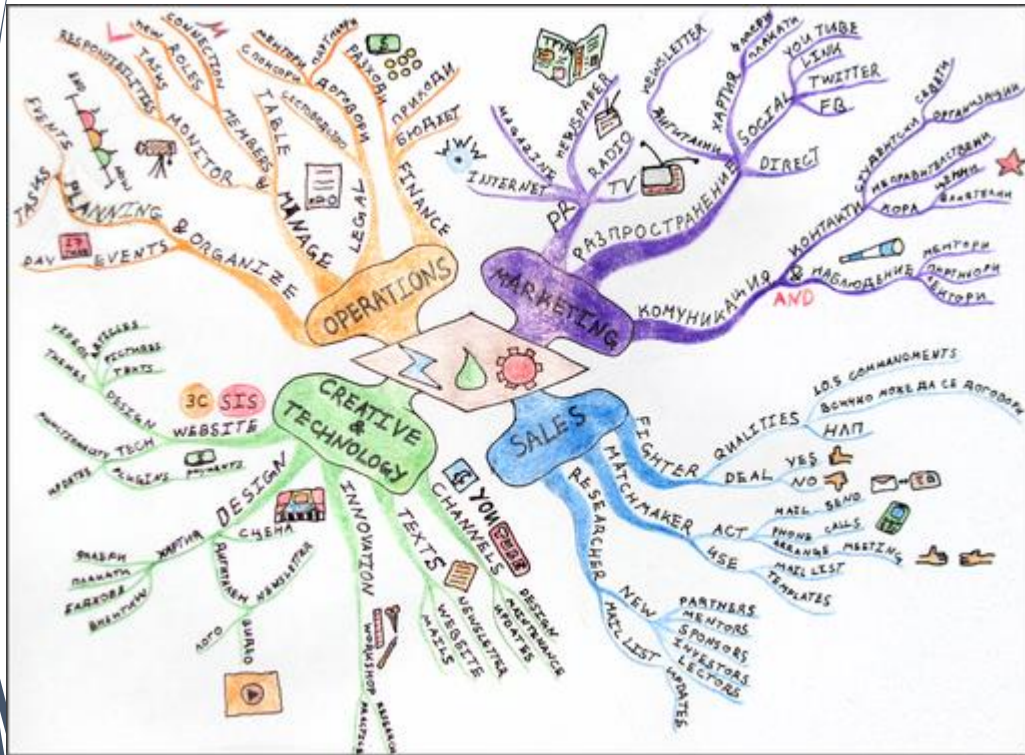
Contemporary Representation of the Same Text

6. Indirect tactics, efficiently applied, are inexhaustible as Heaven and Earth, unending as the flow of rivers and streams; like the sun and moon, they end but to begin anew; like the four seasons, they pass away to return once more.

故善出奇者，无穷如天地，不竭如江河。
终而复始，日月是也。
死而复生，四时是也。

What is a Mind Map?

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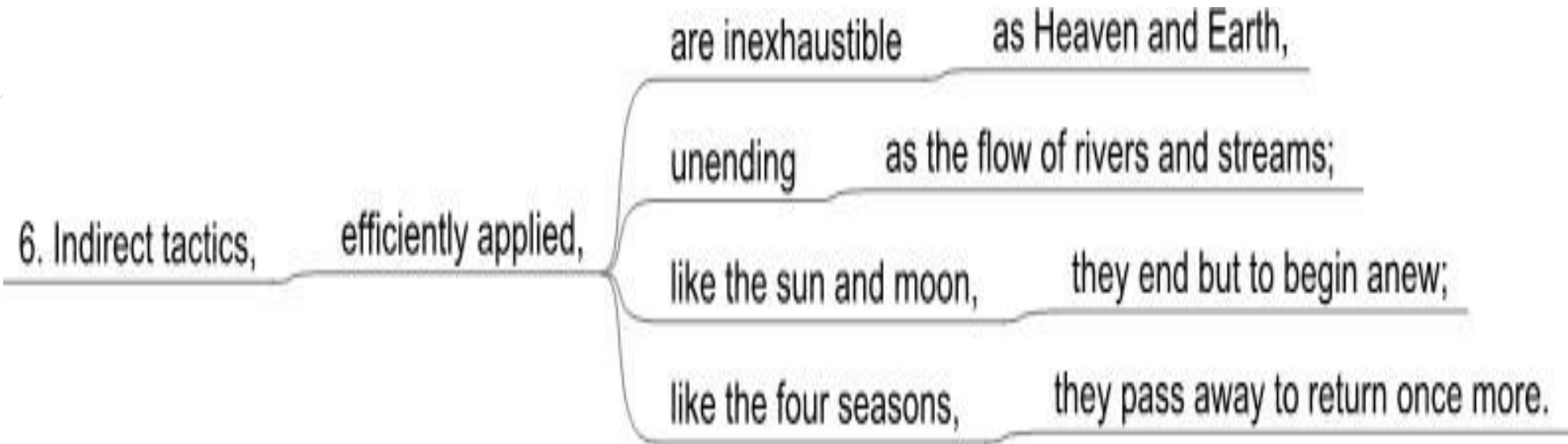


By <http://mindmapping.bg> [CC BY-SA 2.5 (<https://creativecommons.org/licenses/by-sa/2.5>)], via Wikimedia Commons

- ▶ A **mind map** is a diagram used to visually organize information.
- ▶ A mind map is hierarchical and shows relationships among pieces of the whole.
- ▶ It is often created around a **single concept**, drawn as an image in the center of a blank page, to which associated representations of ideas such as images, words and parts of words are added.
- ▶ Major ideas, **topics**, are connected directly to the central concept, and **other ideas** branch out from those major ideas.
- ▶ https://en.wikipedia.org/wiki/Mind_map
- ▶ Mind maps are made popular by Tony Buzan around 1970.

The Same English Text as a Text Tree Mind Map

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It should be clear that Sun Tzu uses an informal **enumeration** of four elements to describe his *indirect tactics*:

1. heaven and earth,
2. rivers and streams,
3. sun and moon,
4. four seasons.

Comparing English and Chinese versions of the Mind Maps

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6. Indirect tactics, efficiently applied, are inexhaustible as Heaven and Earth, unending as the flow of rivers and streams; like the sun and moon, they end but to begin anew; like the four seasons, they pass away to return once more.

Uncovering a translation problem!

We corrected this here.

In the English fragment the last two sentences were in reverse order with respect to the Chinese ones.

Definition of a Text Tree

- ▶ A **Text Tree** is an oriented (or rooted) tree structure consisting of arcs (lines or associations), and
- ▶ Vertices (nodes), where each vertex is the end of exactly one arc,
 - ▶ except the root that has no arc pointing to it.
 - ▶ The arcs starting at a specific vertex are ordered
- ▶ See Knuth, page 373 ¹

Text Tree Mind Map Definition

- ▶ A combination of **Text Tree** and **Mind Map**, where:
- ▶ The mind map is shown as a tree, in a left-right orientation.
- ▶ The *AoW chapter title* represents the Central Theme.
- ▶ To the chapter title, only *topic-nodes* can be attached.
- ▶ Other topic-nodes or *text-nodes*, can be attached to topic nodes.
- ▶ Other text-nodes or topic-nodes, can be attached to text-nodes.
- ▶ The text-nodes contain the text in the chapter, split into parts as follows:
 - ▶ Each paragraph is split into sentences.
 - ▶ A sentence is split into sentence parts.
- ▶ **The tree is strictly unidirectional, left-right and top down.**

Are TTMM's Really Mind Maps?

You could question whether TTMM's are mind maps.

It is certainly true that TTMM's contain a **central theme**, the chapter title, to which **topics** are attached, which is the *primary requirement* for a mind map.

Therefore, we think that enough of the essence of a mind map is preserved to call a TTMM a **mind map**.

Advantages of analyzing a text with a TTMM

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- The **use of mind mapping software!** (e.g. Freemind)
- – Text can easily be imported.
- – Manipulation of nodes.
- Software could be developed to assist in sentence splitting, importing and exporting text.
- The initial splitting of the text into text nodes can be done manually quite easily, or with help of some text scripts.
- The transformation of text to a text tree mind map (TTMM) is a lossless operation.
 - When the mind map is traversed from left to right and top to bottom, the **original text** will reappear.
- If desired, the topic titles can be used as section titles.
- It is possible to give nodes additional attributes, like coloring, to show meaning.

The Patterns

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- Pairs of Opposites
- Enumerations
- Preference Order
- Definitions
- Metaphors

and: **Conditional Sentences**

Pairs of Opposites

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- ▶ Opposite pairs are groups of two items which have meaning that is opposite. This is related to the yin-yang principle of ancient China.
- ▶ For example, in chapter 5 (paragraph 6):
 - ▶ weak and strong
 - ▶ direct and indirect
 - ▶ heaven and earth
 - ▶ sun and moon
 - ▶ strength and weakness
- ▶ Some of these examples are also used as **metaphor**.

Enumerations

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- ▶ In almost every chapter Sun Tzu used some form of enumeration of things or concepts, in several chapters even two. For example,
 - ▶ the seven military considerations in chapter 1,

12. When seeking to determine the military conditions, let them be made the basis of a comparison, in this wise:--

- (1) Which of the two sovereigns is ingrained with the Moral law?
- (2) Which of the two commanders has most ability?
- (3) With whom lie the advantages derived from Heaven and Earth?
- (4) On which side is discipline most rigorously enforced?
- (5) Which army is stronger?
- (6) On which side are officers and men more highly trained?
- (7) In which army is there the greater constancy both in reward and punishment?

- ▶ the five essentials for victory in chapter 3,
- ▶ the nine varieties of ground in chapter 11,

Preference Order

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1. 孫子曰：凡用兵之法，

全國為上，破國次之；

全軍為上，破軍次之；

全旅為上，破旅次之；

全卒為上，破卒次之；

全伍為上，破伍次之。

- Preferences are conditional statements which assume a certain order in their execution.
- Sun Tzu uses this construct at several occasions, indicating good and not-so-good ways of performing warfare.

Chapter 03, sentence 1.

[Art of War] It is better to capture a country intact, than to destroy a country;
It is better to capture an army intact, than to destroy an army;
It is better to capture a regiment intact, than to destroy a regiment;
It is better to capture a unit intact, than to destroy a unit.
It is better to capture a squad than to destroy a squad;

Original text (Giles):

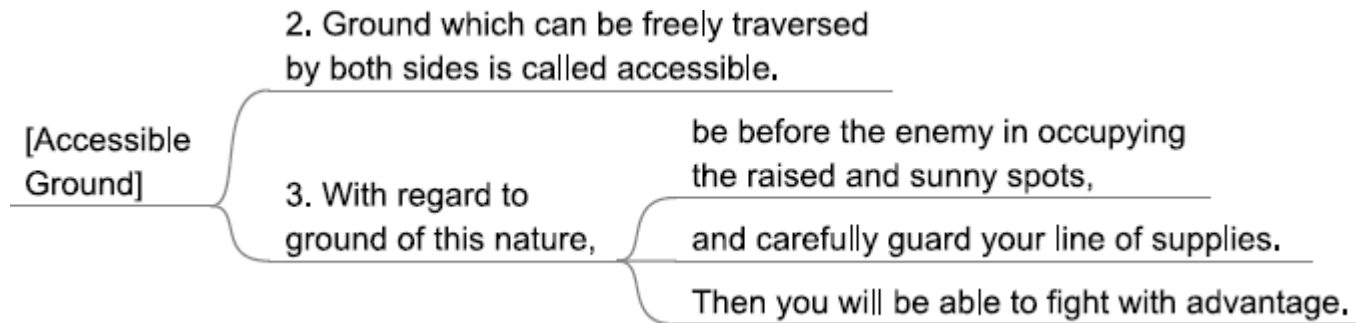
1. Sun Tzu said: In the practical art of war, the best thing of all is to take the enemy's country whole and intact; to shatter and destroy it is not so good. So, too, it is better to recapture an army entire than to destroy it, to capture a regiment, a detachment or a company entire than to destroy them.

Definition

- ▶ A hybrid construction of enumerations and conditional statements, clearly meant to be a definition of a concept.

For example, **Terrain** in chapter X paragraph 1:

We may distinguish six kinds of terrain, to wit: (1) Accessible ground; ...



Conditional Sentences

- ▶ A conditional sentence can be thought of as a sentence with an ***if-then*** construct.
- ▶ An example of a conditional statement in AoW Ch. II, par 2. is:
 - ▶ » if victory is long in coming,
 - then men's weapons will grow dull and their ardor will be damped.
- ▶ Strictly speaking there is not **one** conditional sentence pattern.
 - ▶ It can be considered as a set of patterns, where each pattern shows a particular type of reasoning.

Sentences of the form A 者, B也

27. When there is much running about and the soldiers fall into rank, it means that the critical moment has come.

28. When some are seen advancing and some retreating, it is a lure.

29. When the soldiers stand leaning on their spears, they are faint from want of food.

30. When those who are sent to draw water begin by drinking themselves, the army is suffering from thirst.

汲而先饮者，渴也

The situation that “those who are sent to draw water begin by drinking themselves” is a situation that “the army is suffering from thirst”. (Ch. IX, par. 30).

Translation: When those who are sent to draw water begin by drinking themselves, the army is suffering from thirst.

Sentences of the form A 者, B也

鸟集者，虚也
汲而先饮者，渴也
数赏者，窘也

Wang Li: 者 is a resumptive pronoun

The interpretation of “A者, B也” from a logic point of view :

For any X that is a case of A, X is a case of B.

Other themes in the book

- Historical background & comparison with other strategy studies
- Argumentation beyond reasoning patterns?
- Game theory and theory of mind in Sun Tzu?
- Other translated editions
- Terminology for terrain types
- Classification of conditional sentences

Theory of Mind in Sun Tzu

- The very concept of deception involves reasoning about the opponent's perception
- Sun Tzu never makes this explicit
- Compare this with the explicit use of ToM in the story of the Huarong Pass ambush (a probably fictitious event 7 centuries later described in the Romance of the three Kingdoms book, written in the 13th century)

The Huarong Pass story

- Being defeated at Red Cliff CaoCao has two options of retiring: the valley or a mountain pass
- Kongming sets an ambush at the mountain pass and exposes his position by setting up a bonfire
- CaoCao still chooses the pass, arguing that the bonfire is a ruse making him to believe that the ambush is in the valley (3rd order ToM reasoning)
- In the story, both opponents refer to the teachings of Sun Tzu about deception.

Game Theory in Sun Tzu?

- ▶ Other authors (Niou and Ordeshook) have found indications of the use of mixed strategies, and dominated strategies in the ideas of Sun Tzu
- ▶ This is however as vague and informal as the use of logic in Sun Tzu
- ▶ More in our chapter in the forthcoming handbook on the history of logical thought in China


Sun Tzu and the Rules of Victorious Warriors

Home | The Art of War, Chapters | Patterns and Results | About our Work | Help | the Paper | the Presentation

The Art of War, Chapters


Click on a chapter title to see its details.

01 I. START PLANNING	始計
02 II. WAGING WAR	作戰
03 III. ATTACK BY STRATAGEM	謀攻
04 IV. TACTICAL DISPOSITIONS	軍勢
05 V. ENERGY	兵勢
06 VI. WEAK POINTS AND STRONG	虛實
07 VII. CONTENDING	軍爭
08 VIII. NINE VARIATIONS	九變
09 IX. THE ARMY ON THE MARCH	行軍
10 X. TERRAIN	地形
11-1 XI. THE NINE SITUATIONS - 1	九地
11-2 XI. THE NINE SITUATIONS - 2	九地
12 XII. THE ATTACK BY FIRE	火攻
13 XIII. THE USE OF SPIES	用間





On this website we publish a study about an ancient Chinese work on strategy and warfare: *Sun Tzu, The Art of War*. This study is done from the perspective of logic, mathematics, and computer science. To show the results, we make use of contemporary mind mapping methods. This website shows the mind maps that resulted from this study, for all chapters of "the Art of War", both in English and in Chinese. For a more detailed introduction see here ...

Our work about the first 6 chapters has been presented at the conference *The Making of the Humanities VII*, University of Amsterdam, November 15-17, 2018.



A monograph with the title: *Analyzing the Logic of Sun Tzu in "the Art of War", Using Mind Maps* has been written by the authors listed here ... This book has been published in October 2022, [see here...](#)



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The original translation to English of "The Art of War" can be found [here](#) and is provided under the Gutenberg licence, to be found [here](#).
The pictures are from the Long Corridor in the Summer Palace in Beijing, China, the photos are made by Peter van Emde Boas.

- The mind maps are current, and the same as in the book.
- The text is **out-of-date!**
- Short overview text for each chapter.
- Mindmap in English and Chinese for each chapter (Dutch in preparation).
- Interactive mindmap for the first six chapters.
- Text, the Chinese, the original and modified Giles translation.
- Description of the patterns.
- Complete overview of all patterns for the first six chapters.
- Agglomerated text, formatted as a paper.
- Pictures from the Long Corridor in Beijing.

Useful links

- ▶ Chinese Text Project

- ▶ <https://ctext.org/art-of-war>

- ▶ Yellow Bridge

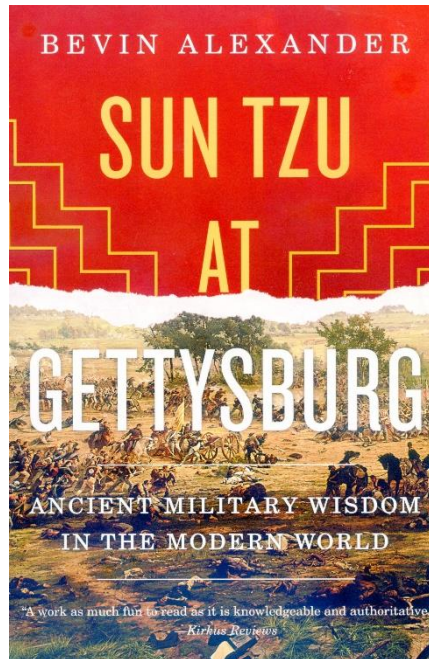
- ▶ <https://www.yellowbridge.com/onlinelit/artofwar.php>

- ▶ Freemind

- ▶ <http://freemind.sourceforge.net/>

The relevance of the teaching of Sun Tzu

Examples from the American Civil War



How Robert E. Lee lost his chance to win the Civil war by violating the rules of Sun Tzu

Strategic Targets during the Civil War 1861-65

- ▶ Two party war within the young state of the USA; Union (northern states) vs. Confederation (Southern states), triggered by the secession of the southern states in 1861
- ▶ Union: Crush the rebellion, i.e., defeat the confederate army and occupy the seceded states
- ▶ Confederates: Survive, preferably with some minor victory on Union territory, in order to obtain recognition from the European powers
- ▶ These targets were not understood when the war broke out.

Sun Tzu on planning a war

15. Thus it is that in war the victorious strategist

only seeks battle after the victory has been won,

whereas he who is destined to defeat first fights and afterwards looks for victory.

AoW IV, 15

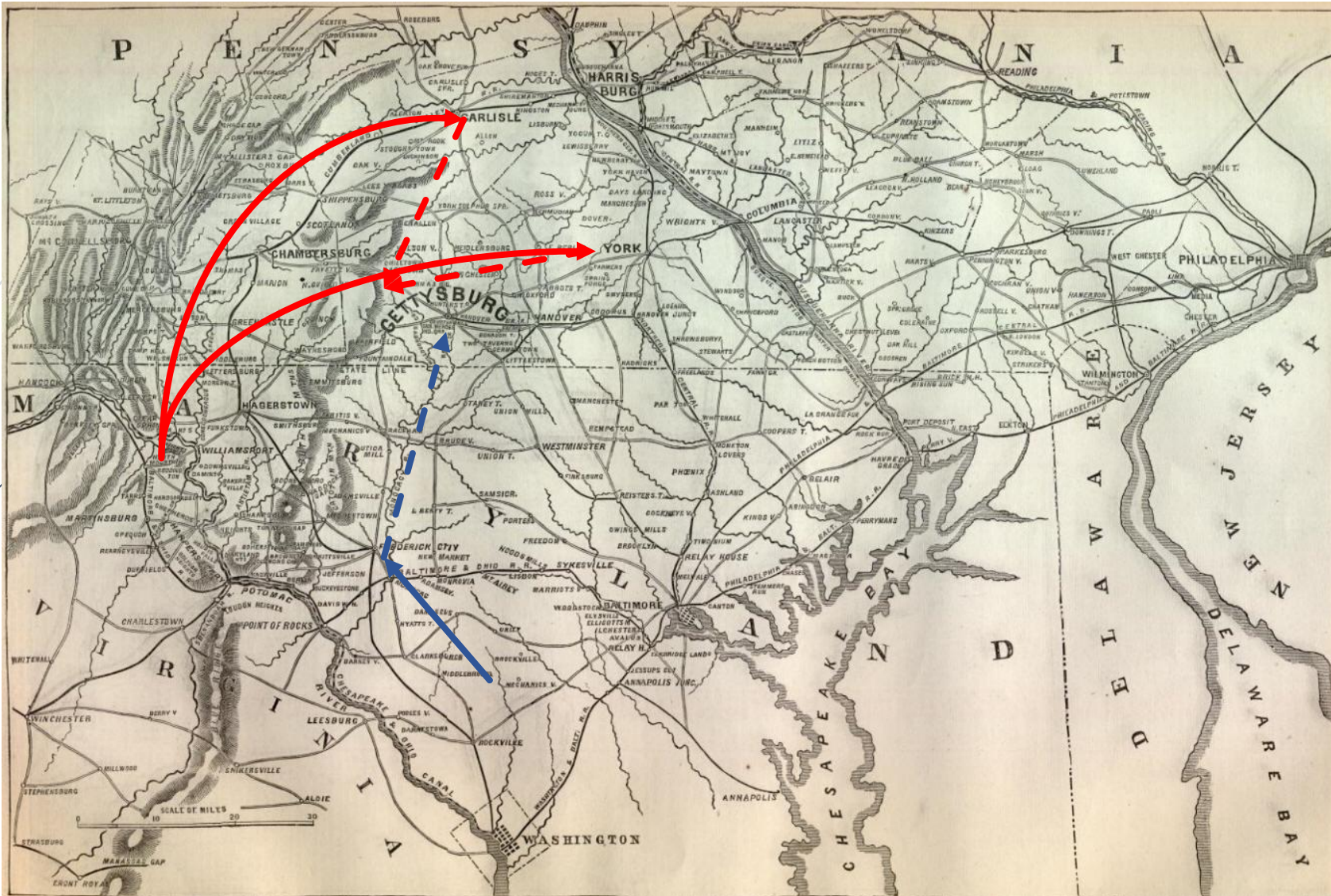
A rare occasion where Sun Tzu agrees with von Clausewitz

No one starts a war – or rather, no one in his senses ought to do so without first being clear in his mind what he intends to achieve by that war and how he intends to conduct it

On War, Book 8, Ch. 2.

The Gettysburg campaign

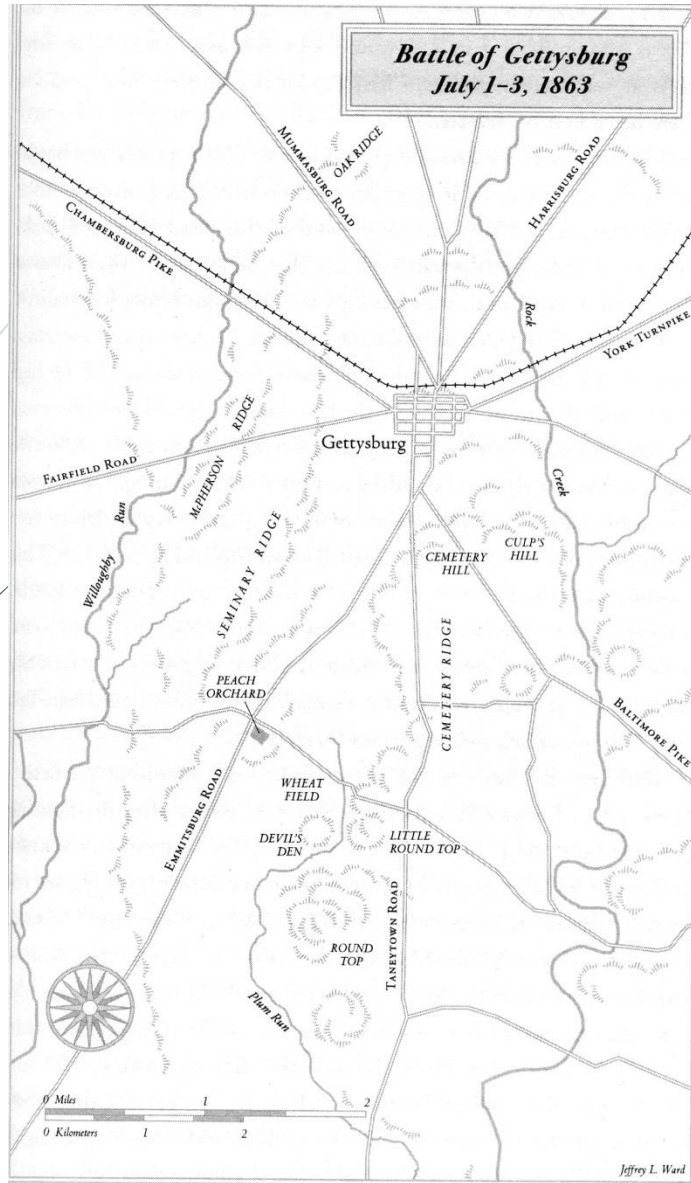
- ▶ Jun 10 1863 Lee (Confederates) invaded into Pennsylvania
- ▶ The Union commander Meade was primarily protecting Washington. He maneuvered to keep his army in between Lee's position and Washington
- ▶ Lee had in principle a free road towards Union targets like Harrisburg, Baltimore or Philadelphia
- ▶ Instead of advancing he moved backwards to engage Meade
- ▶ Lee had been advised to restrain himself to defensive battles only; that was what his army was good at (and what Sun Tzu would have recommended in his situation)



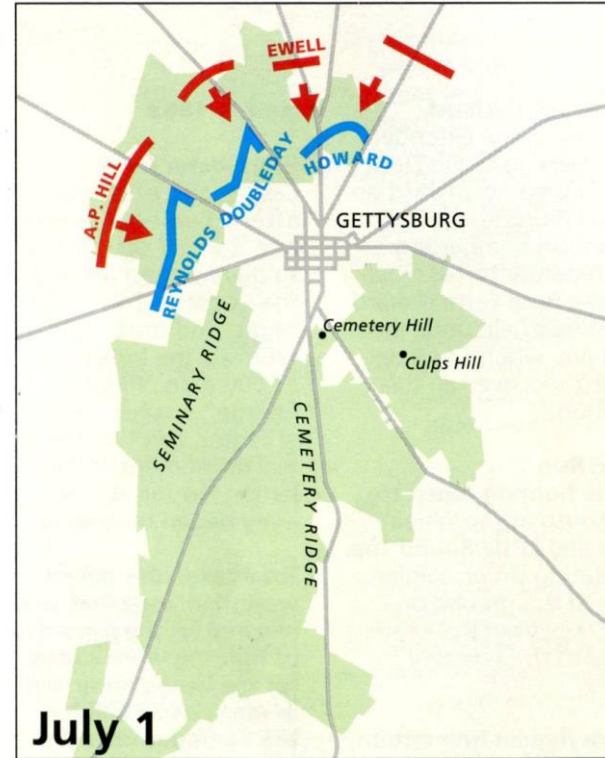
Lee's troops reach Carlisle and York, but on learning that **Mead** has reached Frederick he retires towards Cashtown 8 miles west of Gettysburg; **Mead** pursues him

Events on July 1st, 1863

- ▶ Elements of the two armies accidentally stumble onto each other north-west of Gettysburg
- ▶ Instead of retiring to a strong position in the hills the Confederates send in more and more troops
- ▶ By the evening with great losses for the Confederates, the Union has been driven out of Gettysburg towards a strong position on Cemetery hill, southwest of the city.



The Battle at a Glance



Confederates
Union

[Terrain]

12. We cannot enter into alliances until we are acquainted with the designs of our neighbors.

13. We are not fit to lead an army on the march unless we are familiar with the face of the country--

14. We shall be unable to turn natural advantage to account unless we make use of local guides.

its mountains and forests,
its pitfalls and precipices,
its marshes and swamps.

AoW Ch.VII, 12-14

[Halfway Towards Victory]

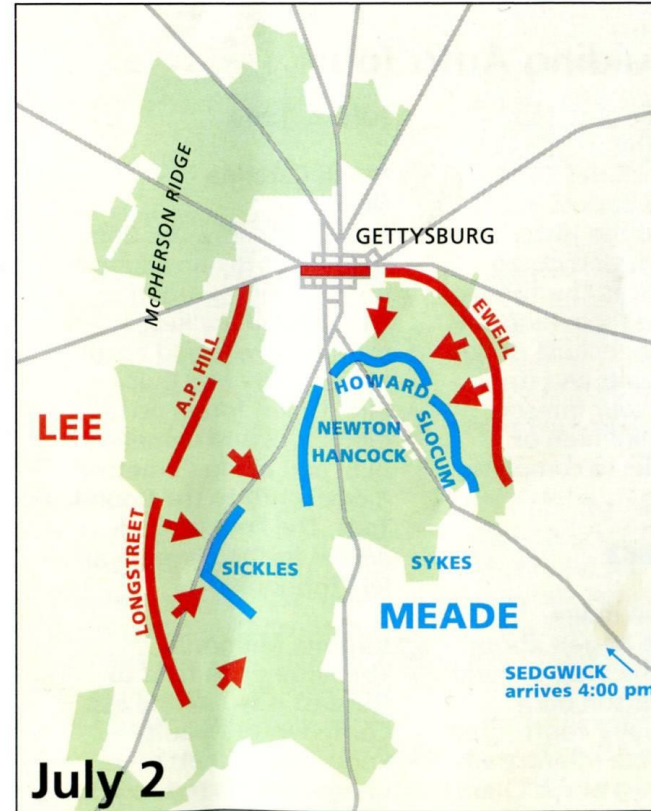
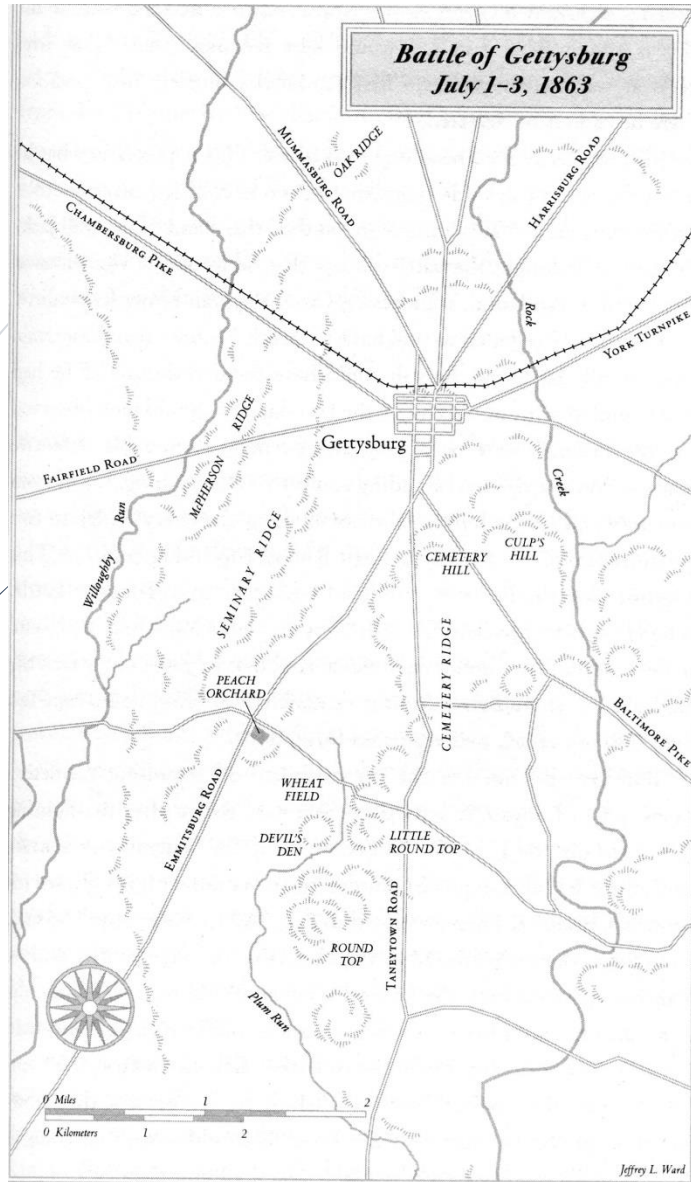
- » 27. If we know that our own men are in a condition to attack,
 - ° but are unaware that the enemy is not open to attack,
- » 28. If we know that the enemy is open to attack,
 - ° but are unaware that our own men are not in a condition to attack,
- » 29. If we know that the enemy is open to attack,
 - ° and also know that our men are in a condition to attack,
 - but are unaware that the nature of the ground makes fighting impracticable.

AoW Ch. X, 27-29



July 2nd, 1863

- ▶ Longstreet (a Confederate Commander) recommends to move south of the union in order to occupy the strong positions on the hills and interrupt Meade's connection to Washington
- ▶ Lee (the boss of Longstreet) insists on a direct attack



Confederates
Union

Little Round Top

- ▶ The strategic position of “Little Round Top” was central in blunders from both sides
- ▶ The Confederates missed the opportunity of taking this position while undefended
- ▶ A Union commander actually withdrew from this position without being ordered to do so. A colleague just arrived by accident in time to save the position losing his life in the action.
- ▶ The Confederates actually occupied “Round Top” to the south of “Little Round Top”, but were ordered to leave....



Little Round Top and Round Top



The Union position

View from little round top

21. The natural formation of the country is the soldier's best ally;

[Test of a Great Commander]

but a power of estimating the adversary, of controlling the forces of victory, and of shrewdly calculating difficulties, dangers and distances, this constitutes the test of a great Commander.

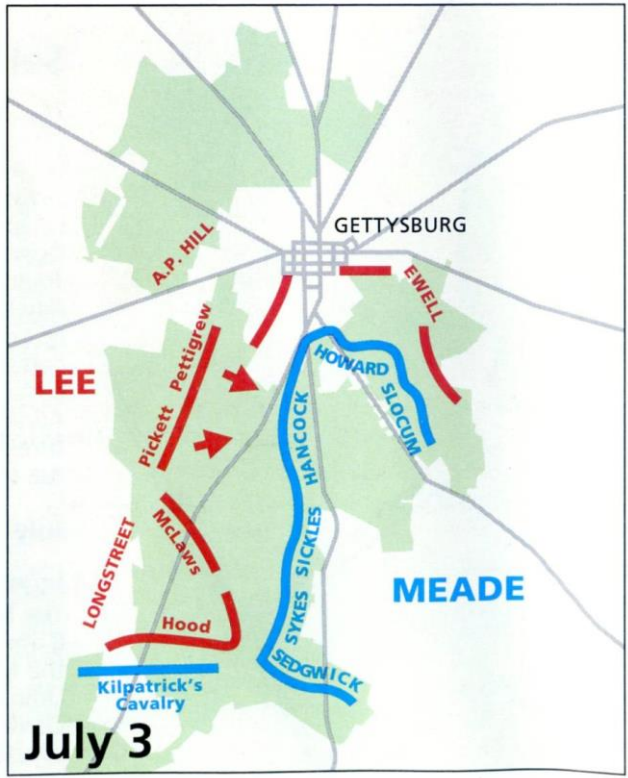
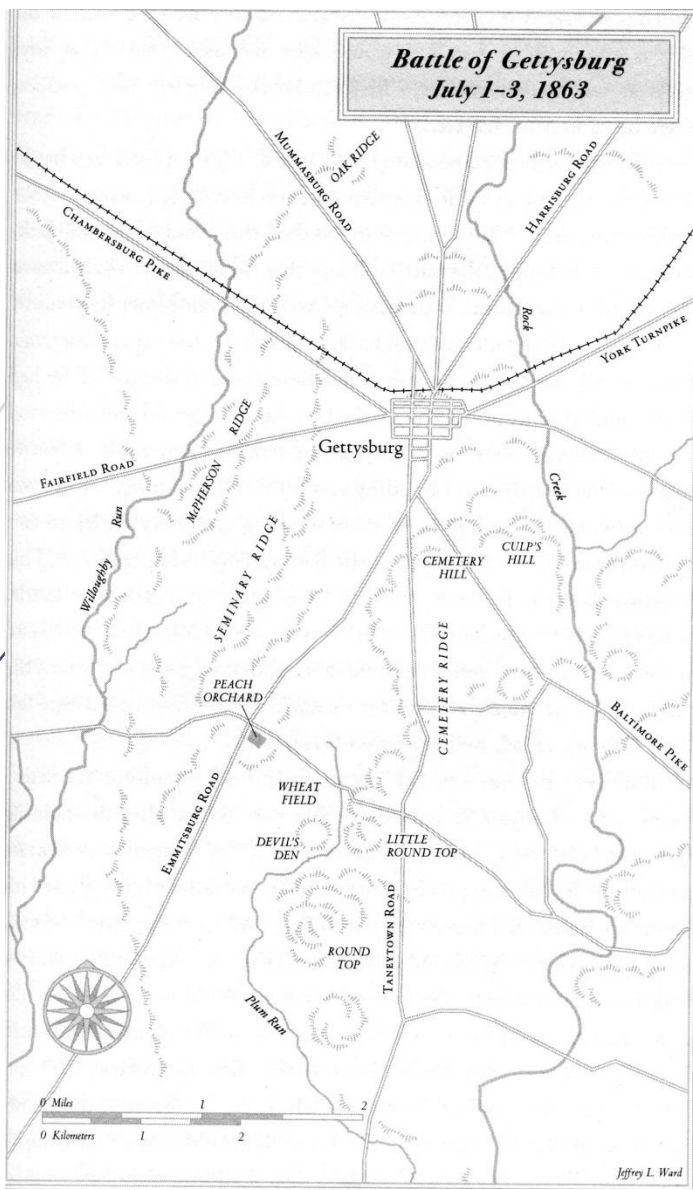
[Knowing]

22. He who knows these things, _____ and in fighting puts his knowledge into practice, _____ will win his battles.
He who knows them not, _____ nor practices them, _____ will surely be defeated.

AoW X, 21-22

July 3rd, 1863

- ▶ Lee (Confederated) orders attacks both from the north and the west
- ▶ Again Lee disregards Longstreets advice to move south
- ▶ Final suicidal attack by Pickett and Pettigrew (Confederates)
- ▶ Lee must withdraw to Virginia; Meade doesn't try to pursue the retiring Confederates



Confederates
Union



Confederate view at Cemetery Ridge



Confederate view at Cemetery Ridge – details
The Union army is protected both by the hill and the wall

17. Thus we may know that there are five essentials for victory:

- (1) He will win who knows when to fight and when not to fight.
- (2) He will win who knows how to handle both superior and inferior forces.
- (3) He will win whose army is animated by the same spirit throughout all its ranks.
- (4) He will win who, prepared himself, waits to take the enemy unprepared.
- (5) He will win who has military capacity and is not interfered with by the sovereign.

AoW III, 17

10. With regard to precipitous ground,

if you are beforehand with your adversary,

you should occupy the raised and sunny spots,
and there wait for him to come up.

11. If the enemy has occupied them before you,

do not follow him,

but retreat

and try to entice him away.

AoW X, 10-11

3. There are:

roads which must not be followed,

armies which must be not attacked,

towns which must not be besieged,

positions which must not be contested,

commands of the sovereign which must not be obeyed.

AoW VIII, 3



This point is called: The angle – a Union defence position; a small number of confederates reached this point, but couldn't achieve anything having arrived there

QUESTIONS ?