

# Axioms in Voting Theory and Kenneth May's life and theorem

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Slides available on [timhua.me/slides.pdf](http://timhua.me/slides.pdf)

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  - For example, we can look at whether or not voting rules fulfills composition consistency.
- Axioms are restrictive. Sometimes, only one voting rule fulfills a set of axioms.
- They’re fun and neat mathematically.

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# Notation

- $N$  is a finite set of  $n$  voters.
- $A$  is a finite set of  $m$  alternatives (e.g. candidates in an election).
- Each voter  $i$  casts a ballot that lists their complete, transitive, and antireflexive preferences  $\succ_i$  over  $A$ . We denote the  $m!$  possible orderings by  $\mathcal{L}(A)$ .

The source is Moulin 2016 unless otherwise stated

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  - In class, we looked at three different information structures: knowing who wins the pairwise contests, knowing who wins a pairwise contest and by how much, and knowing the preferences of every voter.
  - However since we can always have a voting rule that only looks at, say, who wins pairwise contests when full information is available, we're just going to assume that we have full information to begin with.
- A voting profile  $P = (\succ_1, \succ_2, \dots, \succ_n)$  is the set of all ballots by all voters. We denote the set of all possible ballots by  $\mathcal{L}(A)^n$ .

# Definition

## Definition

A social choice function, voting rule, or SCF, is a function  $f : \mathcal{L}(A)^n \rightarrow 2^A$  that returns some subset of  $A$ , the alternatives. If  $|f(P)| = 1$ , we say that  $f$  is single-valued and write  $f(P) = a$ .

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A social welfare function  $g : \mathcal{L}(A)^n \rightarrow \mathcal{R}(A)$  returns a ranking over the alternatives.

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# Different versions of Unanimity

## Definition

An SCF  $f$  is *unanimous* if, whenever there exists an alternative  $a$  such that for all voters  $i$  and all alternatives  $b \in A \setminus \{a\}$ ,  $a \succ_i b$ , then  $f(P) = a$ .

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In other words, if  $a$  is the top choice for every voter, then the social choice function selects it. Before introducing the next axiom, we first define what we mean by Pareto dominated: An alternative  $x$  is Pareto dominated if there exists some  $y$  such that  $y \succ_i x$  for all voters  $i$ .

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An SCF  $f$  is *Pareto* if  $f(P)$  never contains a Pareto dominated alternative.

# Anonymity

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An SCF  $f$  is *anonymous* if each voter plays the same role. That is, for a given  $P$ , if  $P'$  is obtained by swapping  $i$  and  $j$ 's ballots (i.e.  $\succ'_i = \succ_j$  and  $\succ'_j = \succ_i$ ), then  $f(P) = f(P')$ . A voting rule is *dictatorial* if  $f(P)$  is the top choice of some voter  $i$ .

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## Lemma

*The U.S. presidential election is not anonymous.*

# Profiles Under Anonymity

If every voter is identical, then we can express their preferences using these profile tables:

Number of voters	10	8	3	1
First place	$a$	$b$	$d$	$c$
Second place	$b$	$a$	$b$	$d$
Third place	$c$	$c$	$a$	$b$
Fourth place	$d$	$d$	$c$	$a$

# Neutrality and Nonimposition

## Definition

An SCF  $f$  is *neutral* if alternatives are interchangeable. That is, if  $f(P) = a_1$ , and  $P'$  is obtained by swapping  $a_1$  and  $a_j$  in every voters' preferences, then  $f(P') = a_j$ .  $f$  is *imposed* if there exists some  $a \in A$  such that  $f(P) \neq a$  for all  $P \in \mathcal{L}(A)^n$ .

# Monotonicity

There are many different ways to think about Monotonicity. The general idea is that if the winning candidate gains more/do not lose any support as we move from profile  $P$  to  $P'$ , that candidate should still win.

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## Definition (Monotonicity/ Positive Responsiveness)

If  $a \in f(P)$ , and when some voter  $n$  for whom  $a$  is not their top choice changes their preferences such that  $a$  is their top choice, then under the new preference  $P'$ ,  $f(P') = a$

# Unrestricted Domain/ Resolute

## Definition

We say that an SCF  $f$  has the unrestricted domain quality or is resolute if it is single valued for all  $P \in \mathcal{L}(A)^n$ .

# Strategyproofness

## Definition

When a voter  $i$  changes their preferences from  $\succeq_i$  to  $\succeq'_i$ , and the resulting profile changes from  $P$  to  $P'$  as a result, we say an SCF  $f$  is single-voter strategy-proof if  $f(P) \succeq_i f(P')$ .

# Strategyproofness

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In this case,  $\succeq_i$  is thought of as  $i$ 's sincere preferences. When  $i$  changes their preferences to  $\succeq'_i$ , the voting rule should not pick a candidate that results in a better outcome under the original, sincere preferences by acting on misrepresented information.









# Summary

- Anonymity: Voters are equal
- Neutrality: Candidates are equal
- Monotonicity: More support = good
- Resolute: Always picks a winner
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- Anonymity: Voters are equal
- Neutrality: Candidates are equal
- Monotonicity: More support = good
- Resolute: Always picks a winner
- Strategyproofness: Can't lie and get a better outcome
- There are a ton more axioms: We covered composition consistency and clone invariance in class. I could spend all of thirty minutes talking about axioms and never stop.

# A quick preview of axiomatic analysis of voting schemes

System	Monotonic	Condorcet winner	Majority	Condorcet loser	Majority loser	Mutual majority	Smith	ISDA	LIIA	Independence of clones	Reversal symmetry	Participation, consistency	Later-no-harm	Later-no-help	Polynomial time	Resolvability
Schulze	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes
Ranked pairs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes
<b>Split Cycle</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	No
Tideman's Alternative	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes	Yes
Kemeny–Young	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes
Copeland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	No
Nanson	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes
Black	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	No	No	No	Yes	Yes
Instant-runoff voting	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes
SmithIRV	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes	Yes
Borda	Yes	No	No	Yes	Yes	No	No	No	No	No	Yes	Yes	No	Yes	Yes	Yes
Geller-IRV	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes	Yes
Baldwin	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes
Bucklin	Yes	No	Yes	No	Yes	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Plurality	Yes	No	Yes	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Contingent voting	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Coombs <sup>[3]</sup>	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes	Yes
Minimax	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes
Anti-plurality <sup>[3]</sup>	Yes	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	Yes
Sri Lankan contingent voting	No	No	Yes	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Supplementary voting	No	No	Yes	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Dodgson <sup>[3]</sup>	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes

Figure: (Wikipedia contributors 2021)

# Two quick theorems

## Theorem (Campbell-Kelly)

*If there exists a Condorcet winner—some candidate that beats every other candidate in all pairwise contests—then picking that winner is the unique resolute, anonymous, neutral, and strategyproof SCF (given three or more candidates and an odd number of voters)*

## Theorem (Gibbard-Satterthwaite)

*Any resolute, nonimposed, and strategyproof SCF for three or more alternatives must be a dictatorship.*

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It's easy to see that simple majority rule is resolute, neutral, anonymous, and positively responsive (again, ignoring ties for now).

We see that anonymity implies that we can use profile tables to express everyone's preferences and that the SCF is dependent only on total number of votes for either candidate. If a voting rule is not simple majority, then there must be some case where  $a$  gets more votes than  $b$ , but  $b$  wins. Now we add votes to  $b$  until it has exactly as many votes as  $a$  does in the beginning.



# May's Theorem Proof continued

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In this case, positive responsiveness states that  $b$  still wins since it got more votes. However, neutrality states that  $a$  must win, since this is the exact same condition as before, but  $a$  and  $b$  swapped places. Thus we see that a non-simple majority rule SCF cannot satisfy all four axioms. □

Source : (K. O. May 1952)

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- It verifies that simple majority rule makes sense in the axiomatic framework.
- It shows us that we can use axioms to think about voting rules.
- It provides an argument for why we may want to reduce a multicandidate election down to pairwise contests.

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# Kenneth O May (1915-1977)



JULY 8, 1915–DECEMBER 1, 1977

Source: (Tropp 1979)

# Kenneth O May (1915-1977)

- His dad fought in WWI, came back and got a master's from Columbia, and taught at Dartmouth and then UC Berkeley in the Political Science department. He taught Earl Warren, who later became Chief Justice.

Source on May's life unless otherwise stated is (Jones, Enros, and Tropp 1984)

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- May was a mathematics major at U.C. Berkeley and "had an interest in the mathematical basis of statistics and the use of statistics as an element in national planning"
- Yep. Kenneth is a communist and joined the communist party in college.
- He also pushed for racial integration at a barbershop that refused to serve Black students.

# Kenneth O May's Life, continued

- After graduating from Berkeley with an A.B. in Mathematics, May set sail for London on September 18, 1937, and visited Moscow as a tourist while studying at University College (Now more often known as UCL) and took classes at LSE.

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- He got married in London in 1938. His dad tried to stop him and his fellowship forbids fellows from marrying but he did it anyway.
- So he lost his fellowship and went to Paris, where he studied at the University of Sorbonne and took classes at the l'Université Ouvrière (Worker's University) at night.

# l'Université Ouvrière



## 4. PLANISME ET SOCIALISME

Le développement du système de production capitaliste engendre des crises économiques périodiques. Depuis 1825 éclate, environ tous les dix ans, une de ces crises dont les manifestations ont été résumées en ces termes par Engels :

*Le commerce s'arrête ; les marchés s'encombrent, les produits sont là, aussi abondants qu'in vendables ; la monnaie se cache ; le crédit s'évanouit ; les fabriques se ferment ; les masses ouvrières manquent de moyens d'existence ; les faillites succèdent aux faillites, les ventes forcées aux ventes forcées<sup>1</sup>.*

En 1929, le monde capitaliste est entré dans une crise économique sans précédent aussi bien par sa longueur, par sa profondeur, que par l'étendue des dévastations qu'elle a provoquées.

*Si bien que le problème des crises constitue un des problèmes essentiels de la politique contemporaine. Comment mettre fin aux crises ? Que faire pour qu'il n'y ait plus de crises ?*

A ces questions, le marxisme répond dans les termes suivants : les crises étant nées avec le capitalisme lui-même, les crises étant engendrées par le développement du système capitaliste, le seul moyen d'en finir pour toujours avec les crises, c'est la suppression du système capitaliste lui-même, l'instauration d'une économie socialiste.

D'autres, par contre, prétendent qu'il est possible d'en finir pour toujours avec les crises par d'autres moyens, sans supprimer le capitalisme qui engendre les crises, sans instaurer le socialisme.

<sup>1.</sup> Friedrich ENGELS : *Socialisme utopique et socialisme scientifique*, p. 68, au Bureau d'Éditions, 1936.



# Reminds me of Abolish/Defund the police



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# Source of pictures

The book above is (Fajon 1938). The entire collection below can be found here.



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- He traveled back to the U.S., and then back to Berkeley to finish his degree.
- Again, he was a part of the Communist party and conducted some official businesses on behalf of the organization

# (Professor May Disowns Communist Son; 'Only Honorable Course,' Says Californian 1940)

The New York Times

FRIDAY, SEPTEMBER 27, 1940

## Professor May Disowns Communist Son; 'Only Honorable Course,' Says Californian

Special to THE NEW YORK TIMES.

BERKELEY, Calif., Sept. 26.—The disowning of the cause of communism by Samuel Chester May, veteran University of California professor and a leader in State affairs, "disowned and disinherited" his son, Kenneth, today because he is an avowed Communist.

The youth, who is a teaching assistant at the university, is campaign manager for the Communist party in Alameda County. He made his views public last night at a meeting of the Berkeley Board of Education, when he appeared to speak in behalf of a petition for permitting the use of Berkeley school buildings for Communist meetings.

"I have been dreading this break for weeks," said Professor May. "I have been expecting it for a long time. The break came privately some time ago, but now it must come publicly."

Every one he knows me knows that my views are contrary to those of Kenneth. So decided are my views that I have completely disowned and disinherited Kenneth."

In addition to his post as head of the university's Bureau of Public Administration, Professor May is vice chairman of the State Defense Council. He went to Sacramento today and after a conference with Governor Olson explained his attitude toward his son and asserted he had taken the only honorable course in repudiating him "for his

espousal of the cause of communism."

"It is just one of those things that may happen to any father," he said. "Any one who has children can understand."

"For twenty years I've been fighting communism. I have students around all over the country who know how I stand on radicalism and communism, so I don't believe any one will question my position."

"When I became convinced my son had become an irreconcilable Communist I took the only honorable course consistent with my personal views and the position I hold as an executive of the defense council."

Kenneth May was graduated from the University of California in 1936 after a brilliant campus record. He was a Phi Beta Kappa student and a member of the Golden Bear Honor Society and the Student Judicial Council. In competition with students throughout the United States he won a scholarship under the Institute of World Affairs and studied in Russia for two and a half years, for five months in Russia.

Following his return he was made a teaching assistant in mathematics at the university. His wife, the former Miss Ruth McGovney, daughter of Professor Dudley O. McGovney of the university, is a teacher in Oakland High School.

After the board of education meeting he said:

"Some one had to take the action I did, and what happens cannot be helped."

# Based May

- In response, May said that he believes that “the Communist party is the greatest force for good in the world and that only through Socialism can the people of the United States solve the problem of unemployment, poverty, oppression and war”

# His full statement

<p>is- nly rs. er- as- ed us te on irc an in at ed ns his he ich is- an om arc nts to ac- ry, ng</p>	<p>fists.</p> <p><b>Statement Issued</b></p> <h2>Kenneth May Defends Membership in Party</h2> <p>Kenneth May, in a statement defending his membership in the Communist party, last night made no specific comment on the action of his father, Professor Samuel Chester May, in disowning him for his beliefs.</p> <p>He took occasion to deny that his wife, who is the former Ruth McGovney, daughter of Professor Dudley O. McGovney of the university and a teacher in Oakland high schools, is a Communist.</p> <p>May said:</p> <p>"I first joined the Communist party as an undergraduate at the University of California because I found by actual experience in student activities that the Communists were consistent and uncompromising fighters for the interests of the students and against reaction within and without the university."</p> <p>"I became convinced that the Communists were correct in their analysis of the university adminis-</p>	<p>tion manager.</p> <p>w a x B d o n I oi ti</p> <p>tration and the social system of which the university is a part.</p> <p>"As a member of the Communist party I have seen how the party works everywhere to preserve and extend democracy, protect the living standards of the people, build the trade unions and keep this country out of war.</p> <p>"During a stay of two years in Europe I observed the Communist parties in France and England in action and visited a number of other countries, including the Soviet Union. All these experiences convinced me that the Communist party is the greatest force for good in the world and that only through Socialism can the people of the United States solve the problem of unemployment, poverty, oppression and war.</p> <p>"As a patriotic American I have no other choice but to work for what I consider to be the best interests of my country and the world."</p> <p>o S I E F si A M cl ci C H H ci w W</p>
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Figure: (K. May 1940)

# War with U.S.S.R. June 22, 1941

**"All the News That's Fit to Print."**

NEWS INDEX, PAGE 36, THIS SECTION  
YOL. XC, No. 20,465. Mailed at Second-class Postage Station, Department, New York, N. Y.

Copyright, 1941, by The New York Times Company.  
NEW YORK, SUNDAY, JUNE 22, 1941.

LATE CITY EDITION  
Partly cloudy and coolish; warm today and tomorrow.  
Temperature Tuesday—High 71; Low 58.  
1

# HITLER BEGINS WAR ON RUSSIA, WITH ARMIES ON MARCH FROM ARCTIC TO THE BLACK SEA; DAMASCUS FALLS; U.S. OUSTS ROME CONSULS

MUST GO BY JULY 15

**Hope Dims for Submarine; Diver Balked at 370 Feet**

Ban on Italians Like Order to German Representatives

U. S. DENIES SPYING

Envys Told to Protest Axis Charges—Nazis Get 'Moor' Text

My MISTAKE D. MURKIN  
Says He Has None That  
Wouldn't Be Good—That  
Russia Enclosed with Direction by State Department is a Note from  
State Department is a note from  
the State Department to the Italian  
ambassador and other agencies that  
the country having connection with  
the Nazis, was to be sent to the  
Nazis by July 15. This we say to the  
Nazis demand for the sending of  
all Americans to Germany.

At the same time Senator Wayne, Wisconsin, who had been sent to the  
Nazis, was told he had to go to Dr.  
Hans Thomsen, the Cleverly Charged  
Führer of the Nazi Party. Roosevelt's message to Congress  
particularly the Senate, was read by  
the American Foreign Relation  
Committee on the Senate on  
May 21. The note was to the  
Nazis, which was strengthened this after-  
noon, making it clear that the note  
was not from the State Department.

This morning, which came out  
now, engaging in a speech at  
Washington, the Foreign Minister of  
the United States and to drive  
home his point, said that he had  
received notice that the country  
would be sent to the Nazis by July 15  
and stated that consequences  
would be sought for the statement.

ARMY ASKS GUARD  
BE KEPT IN SERVICE

Recommends Congress Act to Hold State Troops, Reserve

NAVY MAY REPLACE  
SHIPYARD STRIKERS

Weights Pulling Down Machines  
to Work to End Long Tie-Up

R. A. F. BLASTS FOE SYRIAN CITY TAKEN

Bags 26 Nazi Planes in Record Day Raids on Invasion Coast

GERMANY IS BOMBED

British on 11th Straight Night Offensive Into Western Reich

TADMUR PUSH IS ON

French Withdraw After a Hard Fight—British Closer to Beirut

Allied Planes Harassing French Troops, Whose Defense Falters

Twice Daily Dark Planes over  
Western Front Hit French Troops

Attack Gets On Big Scale and  
French Troops, Fighting on  
Confined Four Pages

Weight Pulling Down Machines  
to Work to End Long Tie-Up

BAD FAITH CHARGED

Goebbels Reads Attack  
on Soviet—Ribbentrop Announces War

BALTIC MADE ISSUE

Finns and Rumanians  
Are Called Allies in Plan of Assault



WHERE GERMAN ARMIES MARCH ON RUSSIA

Shows on the map is the western frontier of the Soviet Union, which is about 2,000 miles. Cities indicated on map from Norway to Rumania.

Established by us. Ribbentrop  
is printed on page 6.

BY C. BRIDGES PETERS  
To the Associated Press  
BERLIN, Friday, June 22.—As  
Adolf Hitler's war on Russia began, he  
launched a new blitzkrieg against  
Croatia, which he has long regarded as  
a bulwark against the Soviet Union. The non-aggression pact and anti-  
comintern pact, which Hitler signed in August, 1936, against the  
Soviet Union, began along with the  
attack on the Arctic region to the Black  
Sea. The British, who have been  
Germany are also the troops of  
Prussia.

Adolf Hitler is a pseudonym  
in the German people used over a  
period of years by the Nazi propaganda  
Minister Dr. Joseph Goebbels to  
justify the war against the Soviet Union.  
The author begins this reading the  
beginning in the history of the  
Soviet Union, which is the reason  
because in spite of its increasing  
power, the Soviet Union has not  
area it had definitely been  
that was destined because Britain was still hoping to  
bring about European conflict.

New Standards to be  
Used Hitler in the proclamation

The text of Adolf Hitler's proclamation, as recorded here by  
Cobhams Broadcast System, follows:

It was a difficult step for me to send my Minister to Moscow to negotiate a peace, but the situation requires that we  
work together to work against the policy of encirclement  
of Britain.

I hoped that at last it would be possible to put away  
these terrible differences.

Germany never intended to occupy Lithuania. The defeat  
of Poland induced me to again address a peace offer to the  
Allies. This was declined because Britain was still hoping to  
bring about European conflict.

# Bombing of Pearl Harbor Dec 7, 1941

**"All the News That's Fit to Print."**

**The New York Times.**

Copyright, 1941, by The New York Times Company.

VOL. XCI No. 30,654. Entered as Second-Class Matter, Post Office Department, at New York, N.Y., January 1, 1904.

Copyright, 1941, by The New York Times Company.

NEW YORK, MONDAY, DECEMBER 8, 1941.

LATE CITY EDITION  
Increasing cloudiness with rising temperature today. Tomorrow cloudy, somewhat cool.  
Temperature Saturday—Max., 34; Min., 25.

THREE CENTS NEW YORK CITY and Vicinity

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# JAPAN WARS ON U. S. AND BRITAIN; MAKES SUDDEN ATTACK ON HAWAII; HEAVY FIGHTING AT SEA REPORTED

---

**CONGRESS DECIDED** TOKYO ACTS FIRST

Roosevelt Will Address It Today and Find It Ready to Vote War

CONFERENCE IS HELD

Legislative Leaders and Cabinet in Sober White House Talk

TOGO CALLS ENVOYS

Declaration Follows Air and Sea Attacks on U. S. and Britain

After Fighting Is On, Grew Gets Japan's Reply to Hull Note of Nov. 26

By C. P. TRUMBOE, Special to The New York Times.

TOKYO, Monday, Dec. 8.—Japan went to war against the United States and Britain today, after air and naval attacks on Pearl Harbor, followed by a formal declaration of hostilities.

Japanese Imperial war ministers announced at 6 A. M. (4 P. M. Sunday, Eastern standard time) that a state of war existed among these nations in the Pacific area.

The President will appear personally at 12:30 P. M. Whether he would call for a flat declaration of

In the Associated Press.

PACIFIC OCEAN: THEATRE OF WAR INVOLVING UNITED STATES, AND ITS ALLIES

**GUAM BOMBED; ARMY SHIP IS SUNK**

U. S. Fliers Head North From Manila—Battleship Oklahoma Set Afire by Torpedo Planes at Honolulu

104 SOLDIERS KILLED AT FIELD IN HAWAII

President Fears 'Very Heavy Losses' on Oahu—Churchill Notifies Japan That a State of War Exists

By FRANK L. KLUCKHOFF, Special to The New York Times.

WASHINGTON, Monday, Dec. 8.—Sudden and unexpected attacks on Pearl Harbor, Honolulu, and other United States possessions in the Pacific early yesterday by the Japanese air force and navy plunged the United States and Japan into active war.

The initial attack in Hawaii, apparently launched by torpedo-carrying bombers and submarines, caused widespread damage and

# May joins the Army

- Now that the Soviets are allied with the U.S., even the American Communist party is pro-war, and at its urging May thought to enlist in the Army

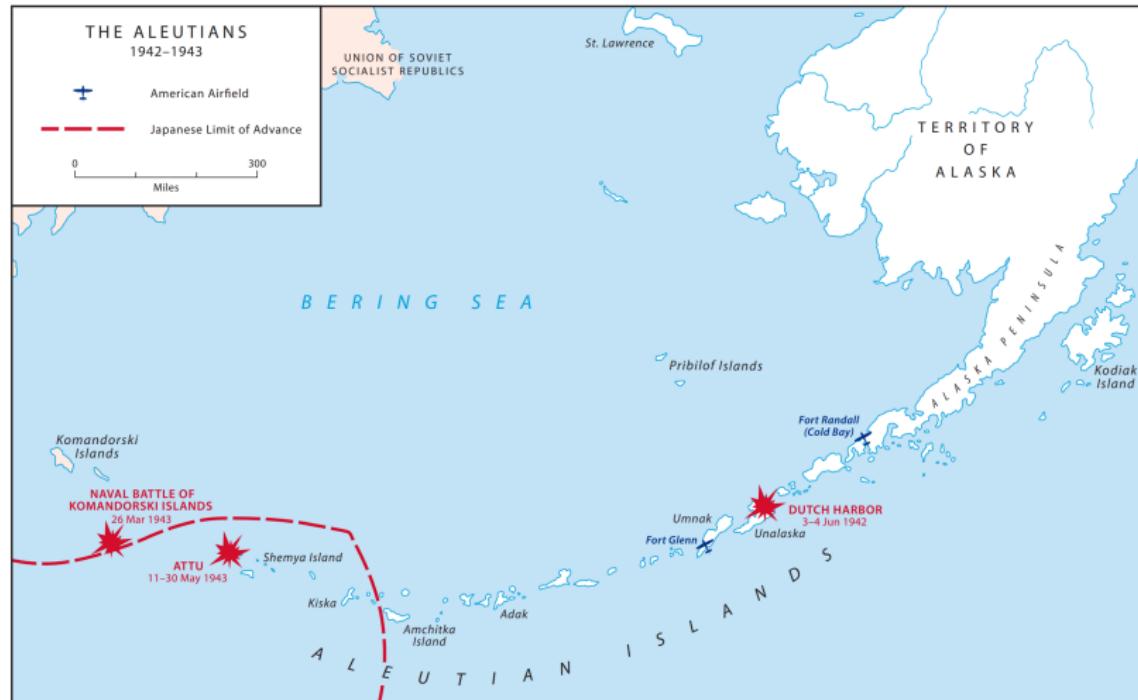
# May joins the Army

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- He finally got into the army in November 1942, joining the 87th Mountain Infantry.
- His first deployment is at Kiska.

# Aleutian Campaign



Source: (MacGarrigle 2019)

# Sgt. May in the News

Mediterranean Rome Stars And Stripes Newspaper Archives March 3, 1945 Page 1

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**THE STARS AND STRIPES**  
MEDITERRANEAN

Vol. 2, No. 65, Saturday, March 3, 1945
Printed In Italy
TWO LINE

# U. S. 9th Army Reaches Rhine

## Alexander Meets With Tolbukhin; 3-Way Assault Plan Coordinated

**Historic Military Events Hinted By Conference Of Two Marshals**

By Sgt. STAN SWINTON  
*Staff Correspondent*

ADVANCED ALLIED FORCE HEADQUARTERS, March 3—Field Marshal Sir Henry H. L. G. Alexander has moved to coordinate the three-pointed assault upon Ger-

## HANDS ACROSS THE ADRIATIC



## Yanks Capture Krefeld, Enter Neuss, Shell Ruhr

SHAFF, March 2—The watch on the Rhine was taken over by the U. S. 9th Army today.

Krefeld, great German industrial center of 165,000 inhabitants, three miles west of the Rhine and 12 miles northwest of Dusseldorf, fell tonight while U. S. 9th Army troops smashed through the crumbling enemy defenses all the way to the Rhine River somewhere in the vicinity of Neuss.

Neuss, across the river from Dusseldorf, was unofficially reported tonight to have been completely occupied.

A 9th Army spokesman announced that the German withdrawal west of the Rhine had actually turned into a "rout," while the Associated Press, in a dispatch from Field Marshal Bernard L. Montgomery's headquarters, stated tonight that "Germany's

Ec 1080: Axiomatic Voting Theory

# Sgt. May in the News

## Sgt. Ken May's Politics Were Stumbling Block

By. Sgt. JACK FOISIE  
Staff Correspondent

What makes his Army career so interesting is that back in the days before Pearl Harbor, when Stalin and the Red Army were not in such high repute, May was a bona fide member of the Communist party in the state of California. His beliefs cost him his job as teaching assistant in mathematics at the University of California, with his dismissal being instigated by his father, Samuel May, professor of public administration at the same school.

The whole dramatic, unhappy episode made May a local cause celebre. The young educator—his-

May's application for various officer candidate schools appear to have ended up in the same blind alley. No one questioned his technical or educational qualifications, his appearance before the boards was always well received, and yet the papers came back unapproved or didn't come back at all. Once

May served as an assistant squad leader throughout the brief, Japanless Kiska campaign, with the rank of Pfc. In fact it was on the direct recommendation of a three-star general that he made his stripes. It happened last November when Lt. Gen. Ben Lear visited Company A's Information and Education display. He asked May in typical general to soldier tone where he thought MacArthur would land in the Philippines.

May launched into a canny discussion of Pacific strategy in which the general soon joined. After some minutes the one-stripe and the three-star agreed on how the campaign should be won. General Lear went away highly pleased, leaving behind a recommendation that Pfc. May was deserving of at least corporal stripes.

### REASON TO WONDER

"I wonder if he would have recommended me if he had known my background" May ruefully mused.

One specific act of courage attributed to May in the Mount Belvedere fight is that he dashed into a minefield to rescue a man injured in a knocked out bulldozer. May was still smiling as he debunked the feat:

"I was pretty sure the mines were all tellers (anti-tank explosives which require much pressure to set them off) and so it wasn't as heroic as it looked."

As if for further explanation he added:

"I guess I don't have to tell you how I feel about this war."

What makes this review of May's Army career timely is that the War Department has just relaxed restrictions against Communist party members holding Army commissions.

"Yes," said May scratching his beard, "I would like to be an officer if the opportunity comes along."

Source: (Foisie 1945)

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- His interests eventually shifted towards mathematical pedagogy, undergraduate research, and the history of mathematics (Tropp 1979).
- He founded *Historia Mathematica* in 1974, a journal still in circulation today.

# Summary

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  - ③ May: the only resolute, neutral, anonymous, and positively responsive two-candidate SCF is simple majority rule

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  - ③ May: the only resolute, neutral, anonymous, and positively responsive two-candidate SCF is simple majority rule
- ③ Kenneth May—the patriot, Communist, mathematician, and historian.

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4 May's theorem

5 The Life of Kenneth May

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# Bibliography I

- Fajon, Etienne. 1938. *Les grands problèmes de la politique contemporaine : 4. Planisme et Socialisme*. Pari: Bureau D'Editions.  
[https://pandor.u-bourgogne.fr/archives-en-ligne/ead.html?id=FRMSH021\\_00009&c=FRMSH021\\_00009\\_brb362\\_04](https://pandor.u-bourgogne.fr/archives-en-ligne/ead.html?id=FRMSH021_00009&c=FRMSH021_00009_brb362_04).
- Foisie, Jack. 1945. Sgt. Ken May's Politics Were Stumbling Block. *The Stars and Stripes Mediterranean Rome* (Italy) (March): 4.  
<https://access-newspaperarchive-com.ezp-prod1.hul.harvard.edu/it/lazio/rome/mediterranean-rome-stars-and-stripes/1945/03-03/page-4/>.
- International Commission on the History of Mathematics. *Historia Mathematica*.  
<https://www.mathunion.org/ichm/historia-mathematica>.

## Bibliography II

- Jones, Charles V, Philip C Enros, and Henry S Tropp. 1984. Kenneth o. may, 1915–1977: his early life to 1946. *Historia Mathematica* 11 (4): 359–379. ISSN: 0315-0860.  
[https://doi.org/https://doi.org/10.1016/0315-0860\(84\)90022-3](https://doi.org/https://doi.org/10.1016/0315-0860(84)90022-3).
- MacGarrigle, George L. 2019. *Aleutian Islands: The U.S. Army Campaigns of World War II*. Center of Military History. [https://history.army.mil/html/books/072/72-6/CMH\\_Pub\\_72-6.pdf](https://history.army.mil/html/books/072/72-6/CMH_Pub_72-6.pdf).
- May, Kenneth. 1940. Kenneth May Defends Membership in Party. *San Francisco Chronicle* (September): 5.
- May, Kenneth O. 1952. A set of independent necessary and sufficient conditions for simple majority decision. *Econometrica* 20 (4): 680–684. ISSN: 00129682, 14680262. <http://www.jstor.org/stable/1907651>.

## Bibliography III

- Moulin, Hervé. 2016. *Handbook of computational social choice*. Edited by Felix Brandt, Vincent Conitzer, Ulle Endriss, Jérôme Lang, and Ariel D. Editors Procaccia. Cambridge University Press.  
<https://doi.org/10.1017/CBO9781107446984>.
- Professor May Disowns Communist Son; 'Only Honorable Course,' Says Californian. 1940 [in en]. *New York Times* (September): 25.  
<https://nyti.ms/3nXADBm>.
- Tropp, Henry S. 1979. Eloge: kenneth o. may, july 8, 1915-december 1, 1977. *Isis* 70 (3): 419–422. <https://doi.org/10.1086/352284>.
- Wikipedia contributors. 2021. *Borda count — Wikipedia, the free encyclopedia*. [Online; accessed 5-December-2021].  
[https://en.wikipedia.org/w/index.php?title=Borda\\_count&oldid=1058279645](https://en.wikipedia.org/w/index.php?title=Borda_count&oldid=1058279645).