C++ONLINE

KEVIN CARPENTER

TOOLING INTUITION

2024

NOT C++

Home | Order | Logout

C++ now

Order

Select one lunch menu item for each day, or None (N) if you do not wish to have lunch delivered on that day.

4/29/24 - Monday

None (N) - No Lunch Selected

4/30/24 - Tuesday

Riviera (V) - Tomato, mozzarella, basil, organic spinach & vinaigrett

5/1/24 - Wednesday

Smoked Beef Brisket (B) - Beef brisket, fries, cole slaw and garlic to

5/2/24 - Thursday

None (N) - No Lunch Selected

5/3/24 - Friday

Smoked Beef Brisket (B) - Beef brisket, fries, cole slaw and garlic to

Order Now

lunch.cpp.events > app > routes.py > order

```python
def login():
    form = LoginForm()
    if form.validate_on_submit():
        user = db.session.scalar(
            sa.select(User).where(User.username == form.username.data))
        if user is None or not user.check_password(form.password.data):
            flash('Invalid username or password')
            return redirect(url_for('login'))
        login_user(user, remember=form.remember_me.data)
        next_page = request.args.get('next')
        if not next_page or urlsplit(next_page).netloc != '':
            next_page = url_for('index')
        return redirect(next_page)
    return render_template('login.html', title='Sign In', form=form)


@app.route('/logout')
def logout():
    logout_user()
    return redirect(url_for('index'))


@app.route('/order', methods=['GET','POST'])
@login_required
def order():
    form = OrderForm()


    if form.validate_on_submit():
        order = Order(user_id=current_user.get_id() )
        order.monday = form.select_monday.data
        order.tuesday = form.select_tuesday.data
        order.wednesday = form.select_wednesday.data
        order.thursday = form.select_thursday.data
        order.friday = form.select_friday.data
        db.session.add(order)
        db.session.commit()
        flash('Payment processing...' + order.monday + ', ' + order.wednesday + ' - ' +
        return redirect(url_for('payment'))
    return render_template('order.html', title="Order", form=form)

@app.route('/payment', methods=['GET', 'POST'])
@login_required
def payment():
    return render_template('payment.html', user=user)


@app.route('/register', methods=['GET', 'POST'])
def register():
    if current_user.is_authenticated:
        return redirect(url_for('index'))
    form = RegistrationForm()
    if form.validate_on_submit():
        user = User(username=form.username.data, email=form.email.data)
        user.set_password(form.password.data)
        db.session.add(user)
        db.session.commit()
        flash('Congratulations, you are now a registered user!')
        return redirect(url_for('login'))
    return render_template('register.html', title='Register', form=form)
```

lunch.cpp.events > app > models.py > Order > __repr__

```python

from werkzeug.security import generate_password_hash, check_password_hash
from flask_login import UserMixin
from datetime import datetime, timezone
from typing import Optional
import sqlalchemy as sa
import sqlalchemy.orm as so
from hashlib import md5
from app import db, login

class User(UserMixin, db.Model):
    id: so.Mapped[int] = so.mapped_column(primary_key=True)
    username: so.Mapped[str] = so.mapped_column(sa.String(64), index=True,
                                                unique=True)
    email: so.Mapped[str] = so.mapped_column(sa.String(256), index=True,
                                             unique=True)
    password_hash: so.Mapped[Optional[str]] = so.mapped_column(sa.String(256))

    orders: so.WriteOnlyMapped['Order'] = so.relationship( back_populates='user')

    def __repr__(self) -> str:
        return '<User {}>'.format(self.username)

    def set_password(self, password):
        self.password_hash = generate_password_hash(password)

    def check_password(self, password):
        return check_password_hash(self.password_hash, password)

    def avatar(self, size):
        digest = md5(self.email.lower().encode('utf-8')).hexdigest()
        return f'https://www.gravatar.com/avatar/{digest}?d=identicon&s={size}'


@login.user_loader
def load_user(id):
    return db.session.get(User, int(id))


class Order(db.Model):
    id: so.Mapped[int] = so.mapped_column(primary_key=True)
    timestamp: so.Mapped[datetime] = so.mapped_column(
        index=True, default=lambda: datetime.now(timezone.utc))
    monday: so.Mapped[str] = so.mapped_column(sa.String(256), index=False)
    tuesday: so.Mapped[str] = so.mapped_column(sa.String(256), index=False)
    wednesday: so.Mapped[str] = so.mapped_column(sa.String(256), index=False)
    thursday: so.Mapped[str] = so.mapped_column(sa.String(256), index=False)
    friday: so.Mapped[str] = so.mapped_column(sa.String(256), index=False)
    user_id: so.Mapped[int] = so.mapped_column(sa.ForeignKey(User.id), index=True,  uniqu
    user: so.Mapped[User] = so.relationship(back_populates='orders')

    def __repr__(self) -> str:
        return '<Order id:{} uid:{} m:{} t:{} w:{} t:{} f:{} timestamp:{}>'.format(
            self.id,self.user_id,self.monday, self.tuesday, self.wednesday, self.thursday
            )
```

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WHAT NOW?

IntegrityError

```
sqlalchemy.exc.IntegrityError: (sqlite3.IntegrityError)
UNIQUE constraint failed: order.user_id
[SQL: INSERT INTO "order" (timestamp, monday, tuesday,
wednesday, thursday, friday, user_id) VALUES (?, ?, ?, ?, ?,
?, ?)]
[parameters: ('2024-03-02 01:13:29.754904', 'None (N)',
'None (N)', 'None (N)', 'None (N)', 'None (N)', '1')]
(Background on this error at: https://sqlalche.me/e/20/gkpj)
```

Traceback (most recent call last)

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/sqlalchemy/engine/base.py", line *1960*, in `_exec_single_context`

```
self.dialect.do_execute(
^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/sqlalchemy/engine/default.py", line *924*, in `do_execute`

```
cursor.execute(statement, parameters)
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

The above exception was the direct cause of the following exception:

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *1488*, in `__call__`

```
return self.wsgi_app(environ, start_response)
       ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *1466*, in `wsgi_app`

```
response = self.handle_exception(e)
           ^^^^^^^^^^^^^^^^^^^^^^^^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *1463*, in `wsgi_app`

```
response = self.full_dispatch_request()
           ^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *872*, in `full_dispatch_request`

```
rv = self.handle_user_exception(e)
     ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *870*, in `full_dispatch_request`

Flask-W...

Project Links

PyPI Releases
Source Code
Issue Tracker
Chat

Contents

Flask-WTF
- Features
- User's Guide
- API Documentation
- Additional Notes

Quick search

Go

Predictions: Discover what the future holds for open source software security in 2024. **WATCH NOW!**

Ad by EthicalAds ·

Flask WTF

Simple integration of Flask and WTForms, including CSRF, file upload, and reCAPTCHA.

Features

- Integration with WTForms.
- Secure Form with CSRF token.
- Global CSRF protection.
- reCAPTCHA support.
- File upload that works with Flask-Uploads.
- Internationalization using Flask-Babel.

User's Guide

This part of the documentation, which is mostly prose, begins with some background information about Flask-WTF, then focuses on step-by-step instructions for getting the most out of Flask-WTF.

- Installation
  - Released version
  - Development
- Quickstart
  - Creating Forms
  - Validating Forms
- Creating Forms
  - Secure Form
  - File Uploads
  - Recaptcha

v: 1.2.x

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IN·TU·I·TION
/ˌINTŌŌˈISH(ə)N, ˌINTəˈWISH(ə)N/

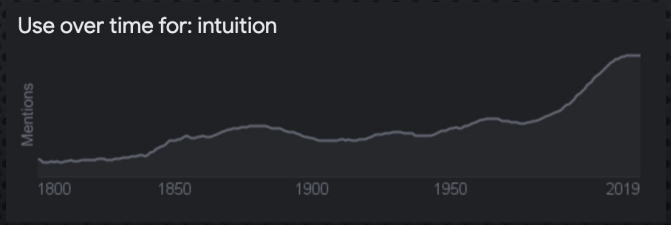
NOUN

THE ABILITY TO UNDERSTAND SOMETHING IMMEDIATELY, WITHOUT THE NEED FOR CONSCIOUS REASONING.

"WE SHALL ALLOW OUR INTUITION TO GUIDE US"

A THING THAT ONE KNOWS OR CONSIDERS LIKELY FROM INSTINCTIVE FEELING RATHER THAN CONSCIOUS REASONING.

SIMILAR: INSTINCT INTUITIVENESS SIXTH SENSE DIVINATION CLAIRVOYANCE



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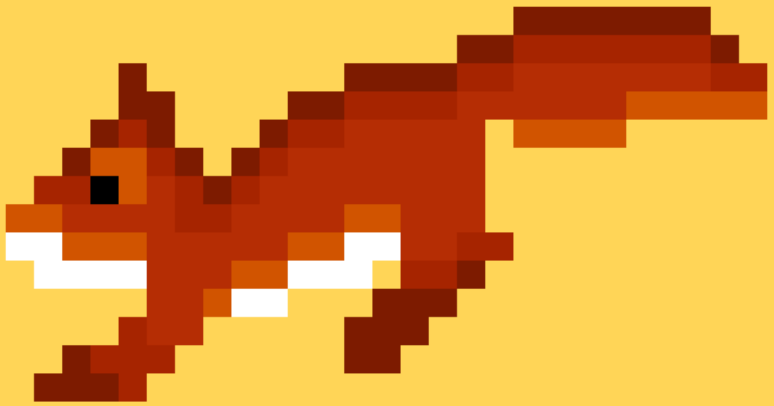
SQUIRREL!!!



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IN·TU·I·TION
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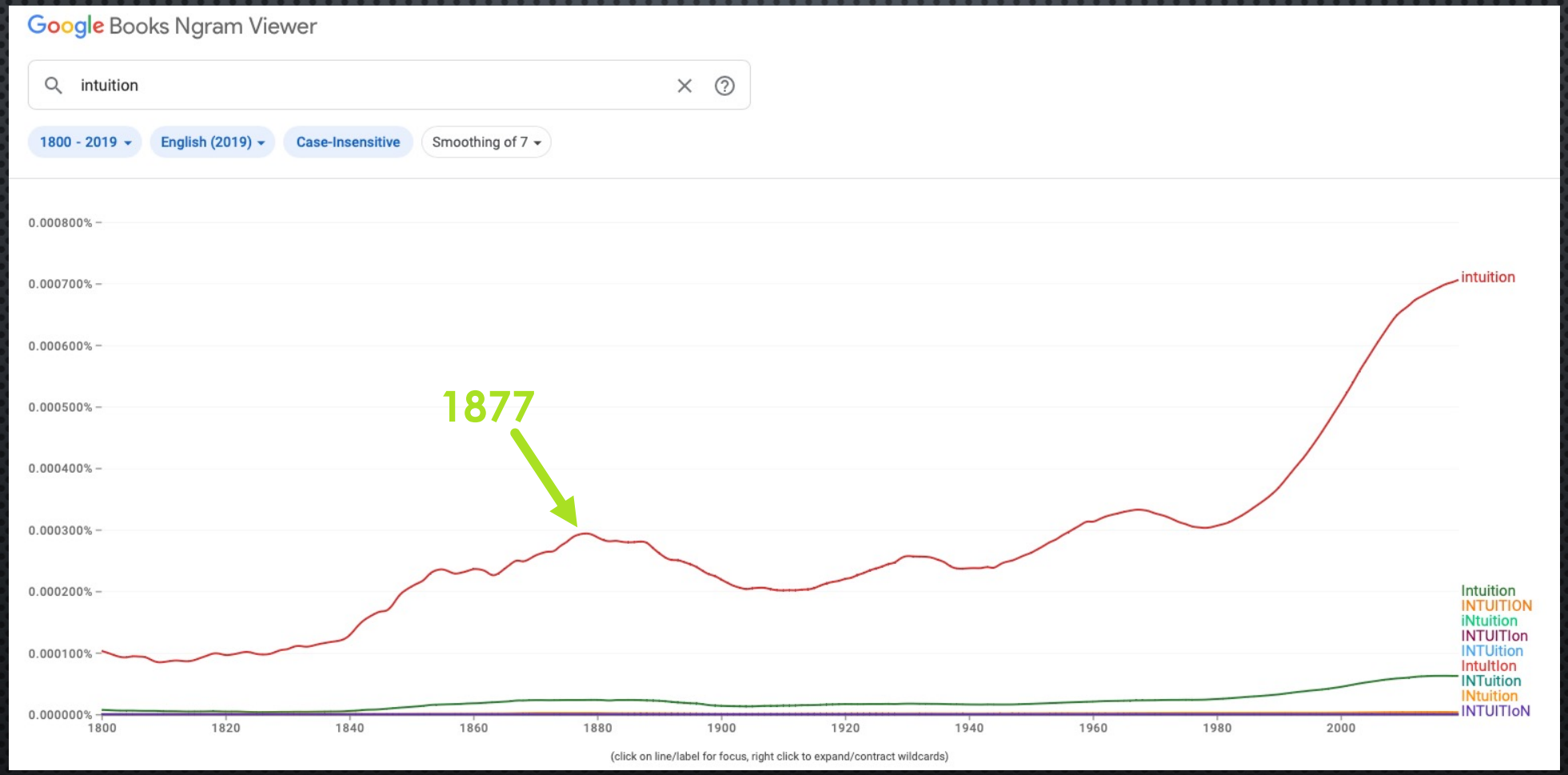

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GOOGLE "INTUITION 1877"

Intuition is that function of the intelligence by which an object presented by the mind itself is apprehended.

Henry N. Day

intuition 1877

Images | Videos | Shopping | Examples | Psychology | Meaning | Pdf | News | Maps

About 9,660,000 results (0.21 seconds)

APA PsycNet
https://psycnet.apa.org › record

Intuition.

by HN Day · 1877 — **Intuition** is that function of the intelligence by which an object presented ...
Citation. Day, H. N. (**1877**). **Intuition**. In H. N. Day, Elements of psychology ...

Wikipedia
https://en.wikipedia.org › wiki › Medical_intuitive

Medical intuitive

... **intuitive** healing practice began in 1854. Edgar Cayce (**1877**–1945) was known as one of the most well known medical clairvoyants. William M. Branham, the ...

National Institutes of Health (.gov)
https://www.ncbi.nlm.nih.gov › articles › PMC3218761

Intuition, insight, and the right hemisphere: Emergence of ...

by SM McCrea · 2010 · Cited by 62 — **Intuition** is the ability to understand immediately without conscious reasoning and is sometimes explained as a '**gut feeling**' about the ...

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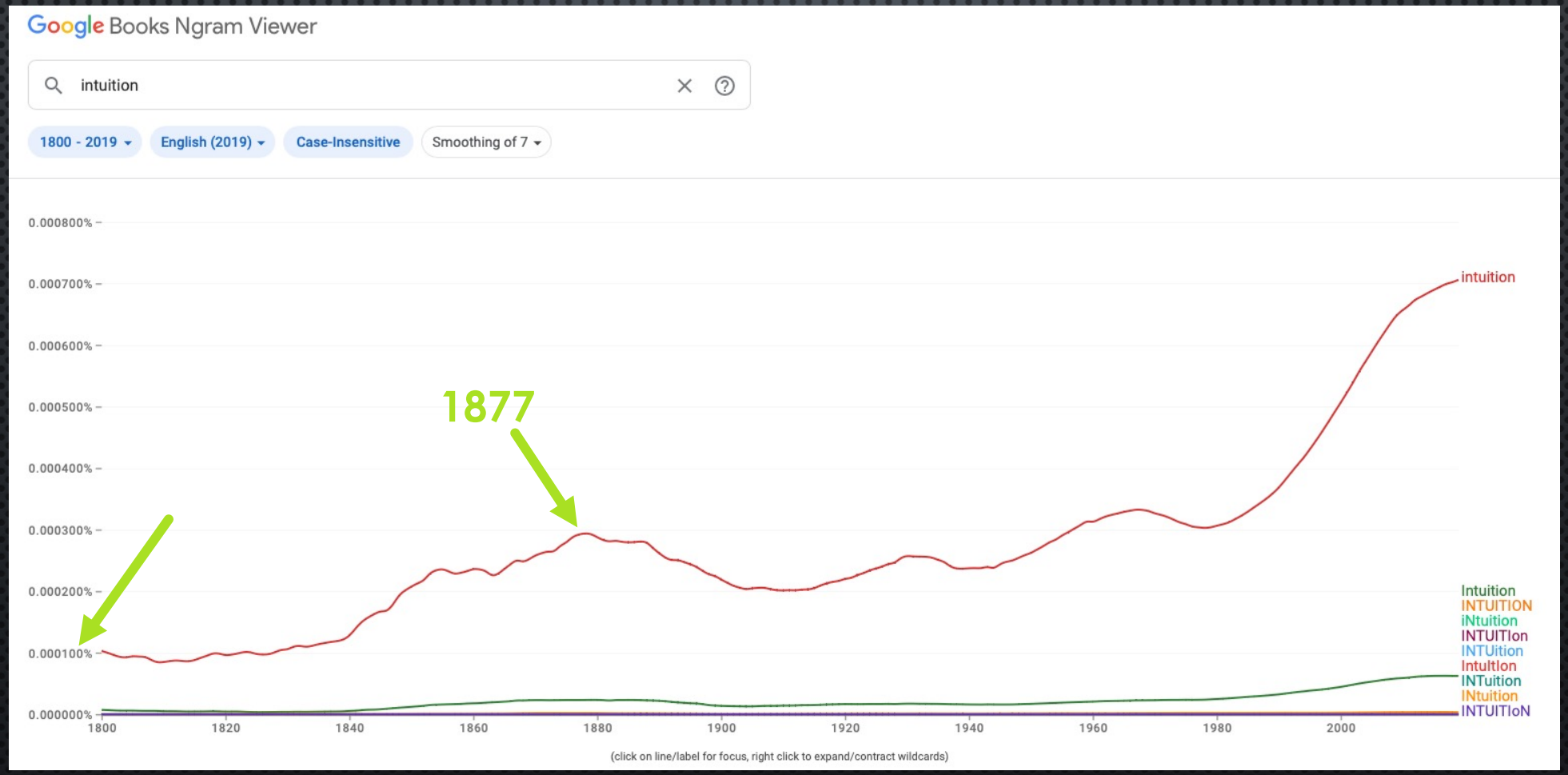

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IMMANUEL KANT (1724 – 1804)

THE MERE FORM OF INTUITION, WITHOUT SUBSTANCE, IS IN ITSELF NO OBJECT, BUT THE MERELY FORMAL CONDITION OF AN OBJECT (AS PHENOMENON), AS PURE SPACE AND PURE TIME.

THOUGHTS WITHOUT CONTENT ARE VOID; INTUITIONS WITHOUT CONCEPTIONS, BLIND.

RULES FOR HAPPINESS: SOMETHING TO DO, SOMEONE TO LOVE, SOMETHING TO HOPE FOR.

THE CRITIQUE OF PURE REASON • 1787• Second Edition

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IN·TU·I·TION
/ˌINTŌŌˈISH(ə)N,ˌINTəˈWISH(ə)N/

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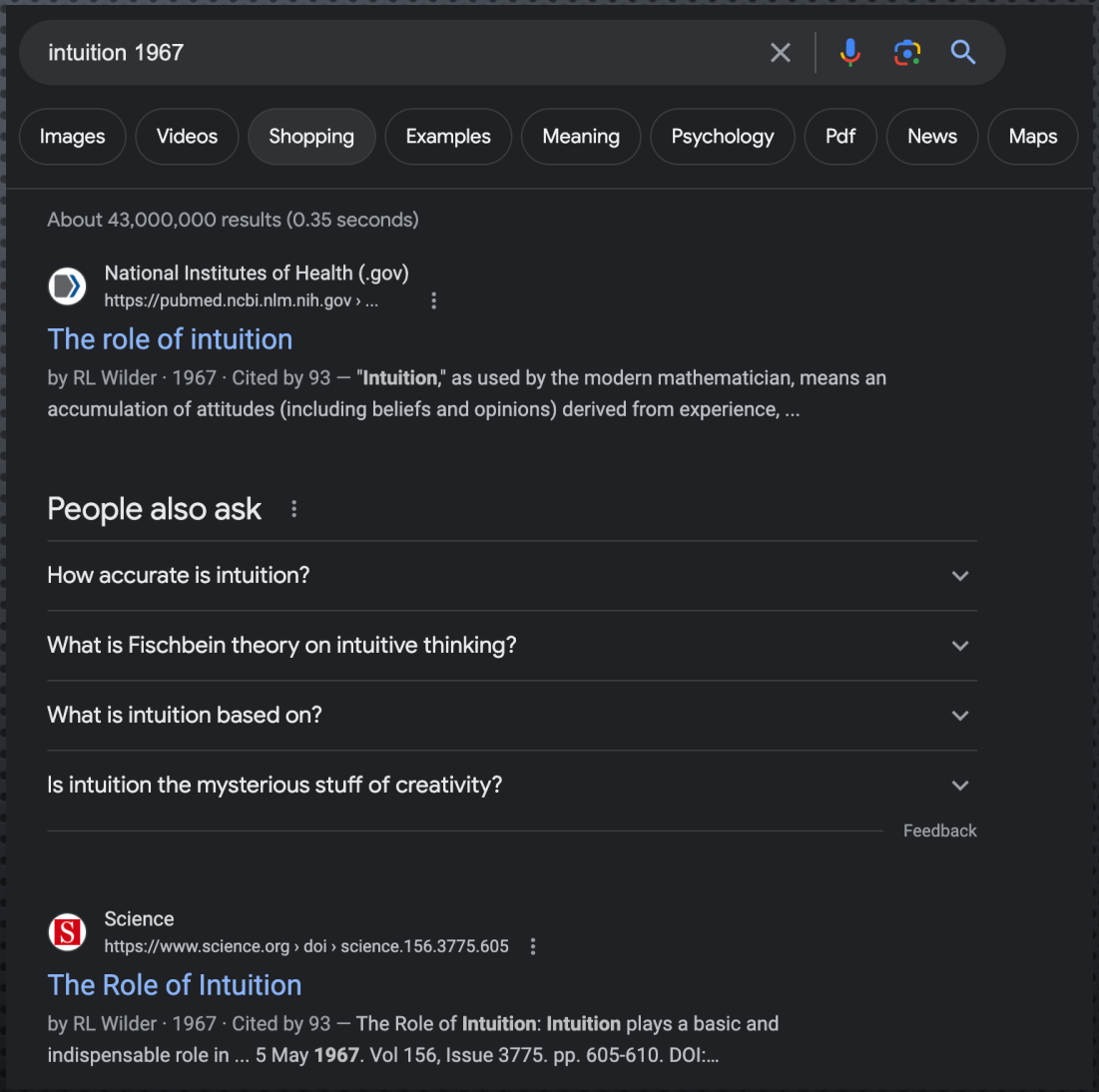
GOOGLE "INTUITION 1967"

The major role of intuition is to provide a conceptual foundation that suggests the directions which new research should take.

Raymond L. Wilder



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RAYMOND LUIS WILDER (1896 – 1982)

THE ROLE OF INTUITION IN RESEARCH IS TO PROVIDE THE "EDUCATED GUESS," WHICH MAY PROVE TO BE TRUE OR FALSE; BUT IN EITHER CASE, PROGRESS CANNOT BE MADE WITHOUT IT AND EVEN A FALSE GUESS MAY LEAD TO PROGRESS.

"INTUITION," AS USED BY THE MODERN MATHEMATICIAN, MEANS AN ACCUMULATION OF ATTITUDES (INCLUDING BELIEFS AND OPINIONS) DERIVED FROM EXPERIENCE, BOTH INDIVIDUAL AND CULTURAL.

SCIENCE • 5 May 1967 • Vol 156, Issue 3775 • pp. 605-610

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THE PARAMETERS… MATHEMATICALLY

```
USING BYTE = UNSIGNED CHAR;

INT CONTRIVED( BYTE A, BYTE B) {

…

}
```

A = 256 ✖ B = 256

65,536 Possibilities

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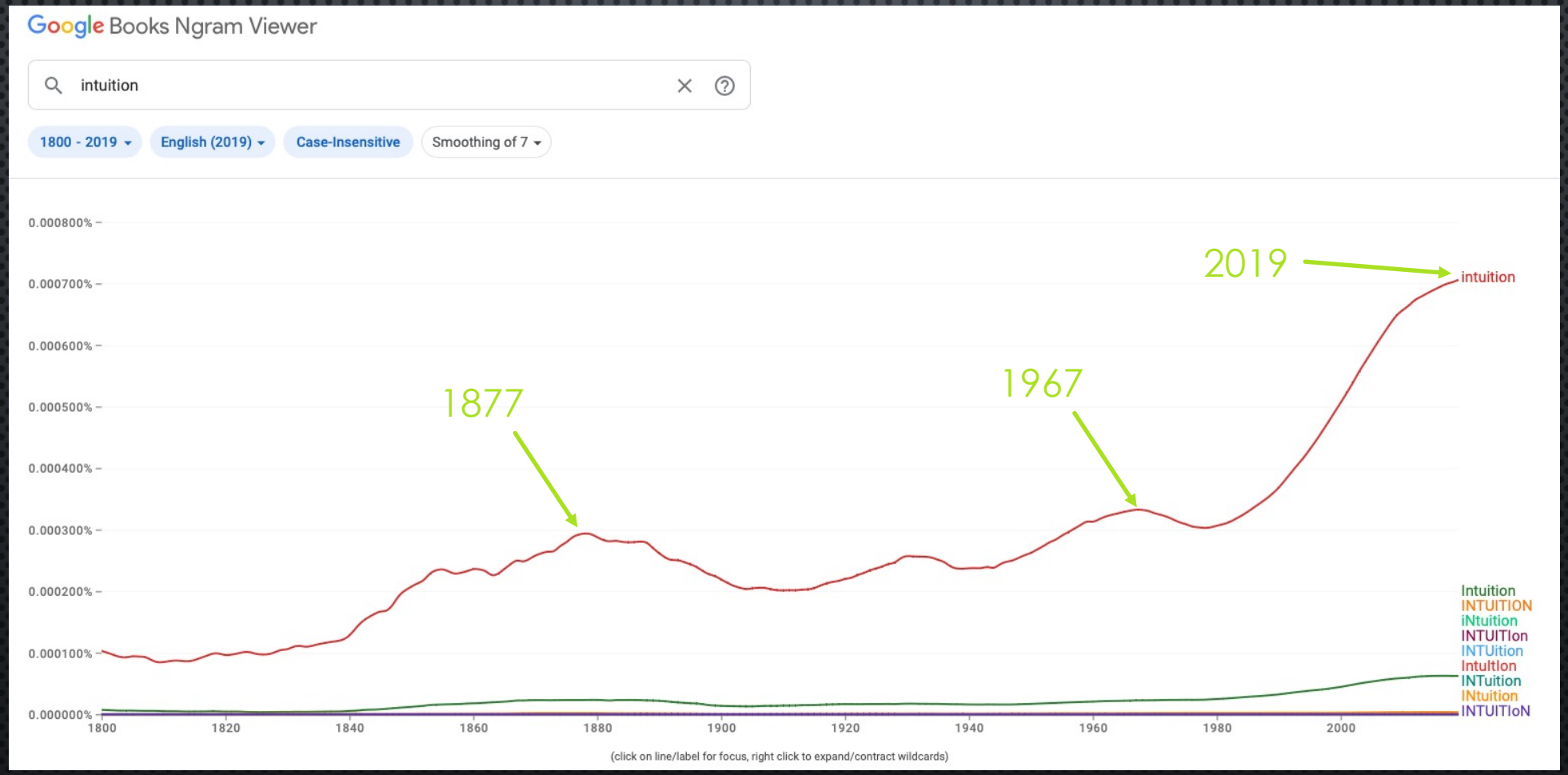
IN·TU·I·TION
/ˌINTŌŌˈISH(ə)N,ˌINTəˈWISH(ə)N/



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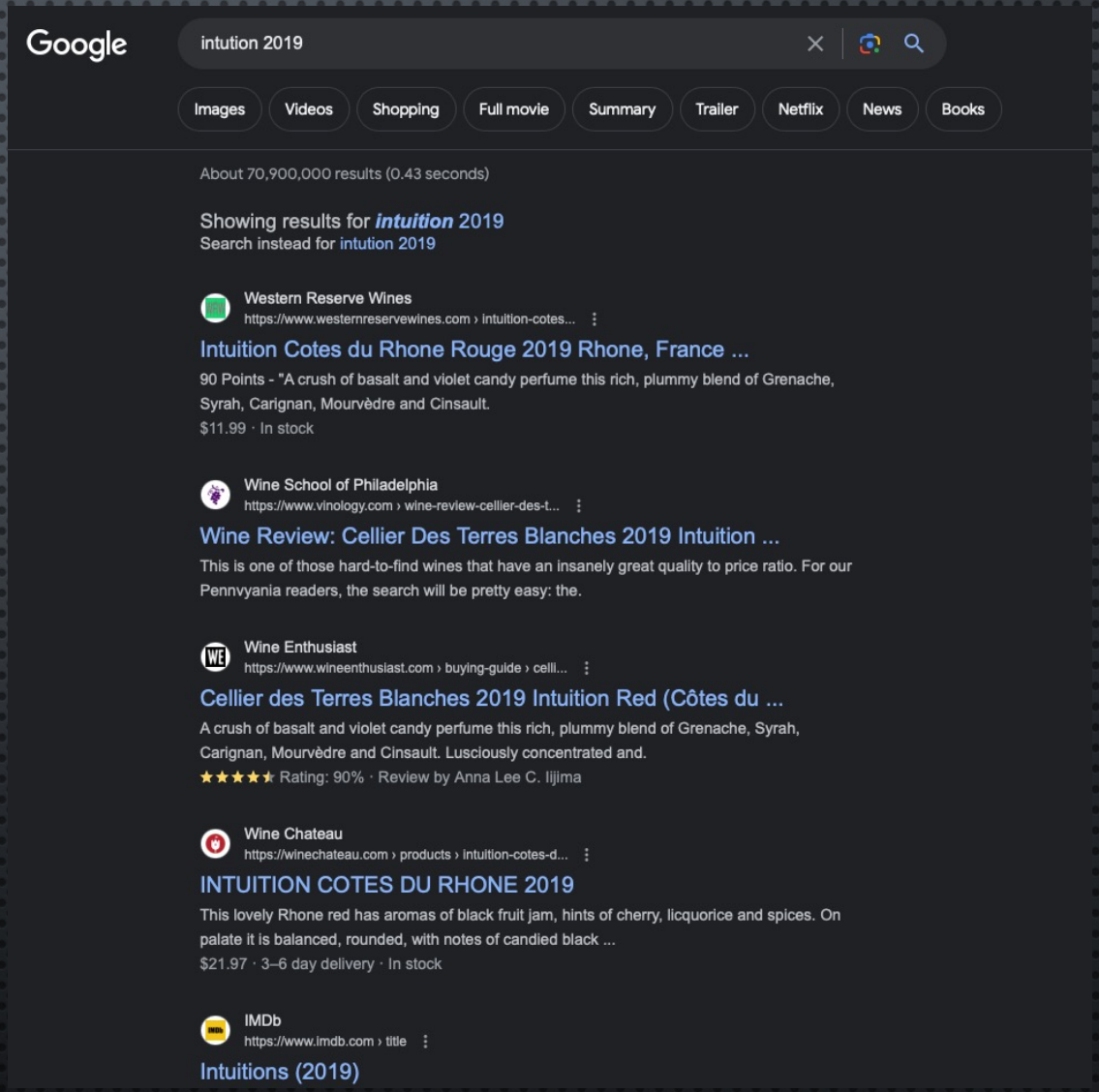
GOOGLE "INTUITION 2019"

Source: www.vinology.com



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INTUITION – KEY POINTS

- Intuition is that function of the intelligence
- Intuitionism is the epistemological view that some moral truths can be known without logical inference
- The role of intuition in research is to provide the "educated guess," which may prove to be true or false
- Rules for Happiness: something to do, someone to love, something to hope for.

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```
#include "type_traits.hpp"
#include <string>

int main() {
  static_assert(not is_void_v<int>, "int is not void");
  static_assert(not is_void_v<std::string>, "std::string is not void");
  static_assert(is_void_v<void>, "void is void");
  static_assert(is_void_v<void const>, "void const is void");
  static_assert(is_void_v<void const volatile>, "void const volatile is void");
  static_assert(is_void_v<void volatile>, "void volatile is void");

  int x = 42;
  int &y = x;
  static_assert(is_lva
  static_assert(not is
                "std::
}
```

```
#pragma once

template <typename T> struct identity_type {
```

```
m_byref                    No results
```

```
}

bool getILIntrinsicImplementationForRuntimeHelpers(MethodDesc * ftn,
    CORINFO_METHOD_INFO * methInfo)
{
    STANDARD_VM_CONTRACT;

    _ASSERTE(CoreLibBinder::IsClass(ftn->GetMethodTable(), CLASS__RUNTIME_HELPERS));

    mdMethodDef tk = ftn->GetMemberDef();

    if (tk == CoreLibBinder::GetMethod(METHOD__RUNTIME_HELPERS__IS_REFERENCE_OR_CONTAINS_REFERENCES)->GetMemberDef())
    {
        _ASSERTE(ftn->HasMethodInstantiation());
        Instantiation inst = ftn->GetMethodInstantiation();

        _ASSERTE(ftn->GetNumGenericMethodArgs() == 1);
        TypeHandle typeHandle = inst[0];
        MethodTable * methodTable = typeHandle.GetMethodTable();

        static const BYTE returnTrue[] = { CEE_LDC_I4_1, CEE_RET };
        static const BYTE returnFalse[] = { CEE_LDC_I4_0, CEE_RET };

        if (!methodTable->IsValueType() || methodTable->ContainsPointers())
        {
            methInfo->ILCode = const_cast<BYTE*>(returnTrue);
        }
        else
        {
            methInfo->ILCode = const_cast<BYTE*>(returnFalse);
        }

        methInfo->ILCodeSize = sizeof(returnTrue);
        methInfo->maxStack = 1;
        methInfo->EHcount = 0;
        methInfo->options = (CorInfoOptions)0;
        return true;
    }
```

```
arobins@Aarons-MacBook-Pro-2 runtime %
```

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Many different interfaces

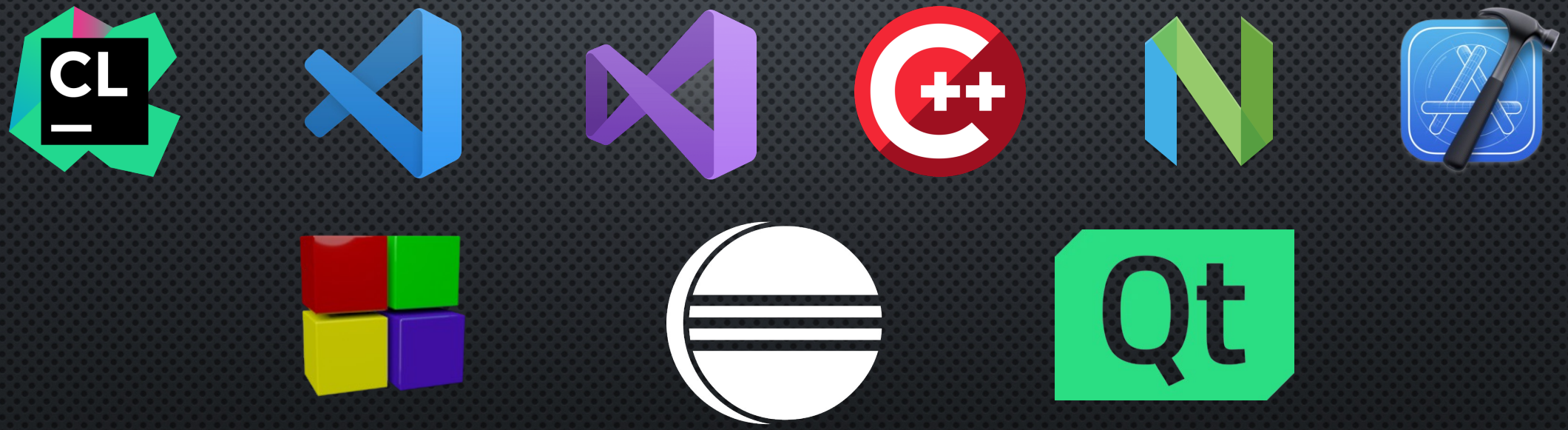
and

Multiple OS's

Common Tools

Problems...

INTERFACES



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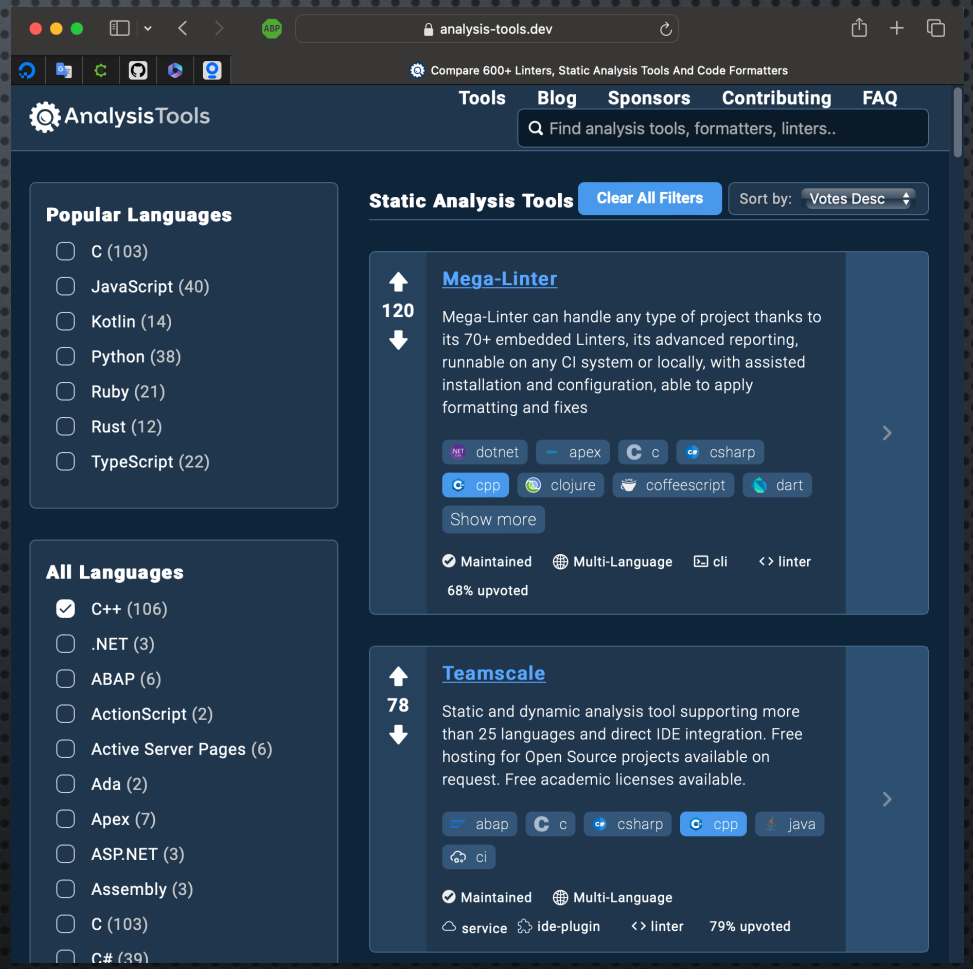
COMPILERS

STATIC ANALYZERS

https://analysis-tools.dev/



PVS-Studio

sonar

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HOW WELL DO YOU USE THEM?

ARE THEY DOING ALL THEY CAN FOR YOU?

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3 TYPES OF PROBLEMS (AT LEAST…)

- Compile time
  - Syntax errors (violate standard, or that which is implemented in the compiler)
  - Templates ☺
- Link time
  - Missing libraries
  - Versioning issues
- Run time
  - Logical errors
  - Semantic errors (uninitialized values – correct statements that don't make sense)

COMPILERS OF YORE...

```
≡ File  Edit  Search  Run  Compile  Debug  Project  Options   Window  Help
[■]═══════ \TURBOC3\PROJECTS\HELLO.C ═══════4=[↑]
#include <stdio.h>
#include <conio.h>

int add(int a, int b) { return a + b; }

void main()
{
        printf("Welcome to Meeting C++\n");
        printf("%d",  add(2000,23));
        getch();
}
═══ 4:37 ═══
Message 3
•Compiling ..\PROJECTS\HELLO.C:

F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
```

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COMPILE TIME ERRORS OF OLD…

```
≡ File  Edit  Search  Run  Compile  Debug  Project  Options    Window  Help
                    \TURBOC3\PROJECTS\HELLO.C                          4
#include <stdio.h>
#include <conio.h>

int add(int a, int b) { return a + b }

void main()
{
        printf("Welcome to Meeting C++\n");
        printf("%d",  add(2000,23));
        getch();
}
 *      4:35
[■]                          Message                              3=[↑]
 Compiling ..\PROJECTS\HELLO.C:
•Error ..\PROJECTS\HELLO.C 4: Return statement missing ;
 Error ..\PROJECTS\HELLO.C 6: Declaration is not allowed here
 Error ..\PROJECTS\HELLO.C 7: Declaration syntax error
 Error ..\PROJECTS\HELLO.C 12: Declaration missing ;
 Error ..\PROJECTS\HELLO.C 12: Compound statement missing }
 Warning ..\PROJECTS\HELLO.C 12: Parameter 'a' is never used
 Warning ..\PROJECTS\HELLO.C 12: Parameter 'b' is never used
F1 Help  Space View source  ↵ Edit source  F10 Menu
```

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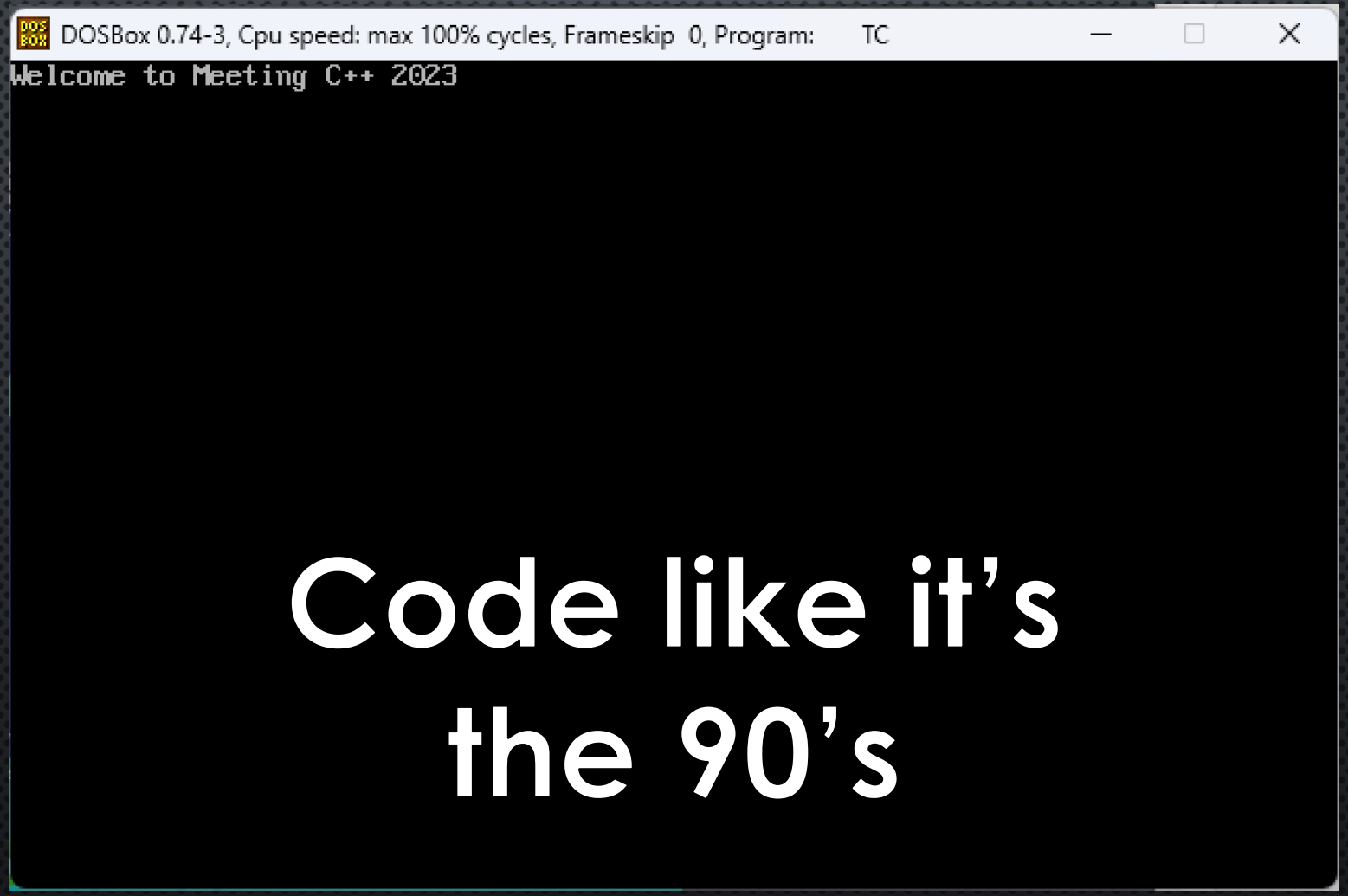
COMPILE TIME ERRORS OF OLD…



Code like it's the 90's

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COMPILE TIME ERRORS

```
#INCLUDE <IOSTREAM>

INT MAIN() {
  STD::COUT << "WELCOME TO CPPONLINE.UK 2024\N"
  RETURN 0;
}
```

X86-64 gcc 4.6.4

Compiler options...

```
<SOURCE>: IN FUNCTION 'INT MAIN()':
<SOURCE>:5:5: ERROR: EXPECTED ';' BEFORE 'RETURN'
```

COMPILE TIME ERRORS

```
#INCLUDE <IOSTREAM>

INT MAIN() {
  STD::COUT << "WELCOME TO CPPONLINE.UK 2024\N"
  ;RETURN 0;
}
```

X86-64 gcc 4.6.4

Compiler options...

```
WELCOME TO CPPONLINE.UK 2024
```

COMPILE TIME ERRORS

```
#INCLUDE <IOSTREAM>

INT MAIN() {
  STD::COUT << "WELCOME TO CPPONLINE.UK\N"
  RETURN 0;
}
```

X86-64 clang 3.3

Compiler options...

```
<SOURCE>:4:44: ERROR: EXPECTED ';' AFTER EXPRESSION
STD::COUT << "WELCOME TO CPPONLINE.UK\N"
                                       ^
                                       ;
1 ERROR GENERATED.
```

SHAVEDYAKS

COMPILE TIME ERRORS

```
#INCLUDE <IOSTREAM>

INT MAIN() {
  STD::COUT << "WELCOME TO CPPONLINE.UK\N"
  RETURN 0;
}
```

X86-64 clang 17.0.1

Compiler options...

```
<SOURCE>:4:44: ERROR: EXPECTED ';' AFTER EXPRESSION
    4 |     STD::COUT << "WELCOME TO CPPONLINE.UK\N"
      |                                            ^
      |                                            ;
1 ERROR GENERATED.
```

SHAVEDYAKS

COMPILE TIME ERRORS

```
#INCLUDE <IOSTREAM>

INT MAIN() {
  STD::COUT << "WELCOME TO CPPONLINE.UK\N"
  RETURN 0;
}
```

X86-64 gcc (trunk) | Compiler options...

```
<SOURCE>: IN FUNCTION 'INT MAIN()':
<SOURCE>:4:44: ERROR: EXPECTED ';' BEFORE 'RETURN'
    4 |     STD::COUT << "WELCOME TO CPPONLINE.UK\N"
      |                                            ^
      |                                            ;
    5 |     RETURN 0;
      |     ~~~~~~
```

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COMPILE TIME ERRORS

USE A MODERN COMPILER.

IF YOU CAN'T – USE TWO.

COMPILE TIME ERRORS – BASED ON STANDARDS

```
#INCLUDE <IOSTREAM>

#INCLUDE <FUNCTIONAL>


INT MAIN() {

[OUT = STD::REF(STD::COUT << "WELCOME TO ")](){ OUT.GET() << "CPPONLINE.UK 2024\N"; }();

RETURN 0;

}
```

X86-64 clang 3.7

Compiler options...

```
<SOURCE>:5:2: ERROR: EXPECTED EXPRESSION

 [OUT = STD::REF(STD::COUT << "WELCOME TO ")](){ OUT.GET() << "CPPONLINE.UK 2024\N"; }();

 ^

1 ERROR GENERATED.
```

COMPILE TIME ERRORS - STANDARDS

```
#INCLUDE <IOSTREAM>

#INCLUDE <FUNCTIONAL>


INT MAIN() {

[OUT = STD::REF(STD::COUT << "WELCOME TO ")](){ OUT.GET() << "CPPONLINE.UK 2024\N"; }();

RETURN 0;

}
```

X86-64 clang 3.7 | -std=c++14

```
WELCOME TO CPPONLINE.UK 2024
```

SHAVEDYAKS

COMPILE TIME ERRORS - BASED ON STANDARDS

USE A MODERN COMPILER.

3 TYPES OF PROBLEMS (AT LEAST…)

- COMPILE TIME
  - ~~SYNTAX ERRORS (VIOLATE STANDARD, OR THAT WHICH IS IMPLEMENTED IN THE COMPILER)~~
  - TEMPLATES
- LINK TIME
  - MISSING LIBRARIES
  - VERSIONING ISSUES
- RUN TIME
  - LOGICAL ERRORS
  - SEMANTIC ERRORS (UNINITIALIZED VALUES – CORRECT STATEMENTS THAT DON'T MAKE SENSE)

TEMPLATE ERRORS

DO YOU LOVE TEMPLATES?

TEMPLATE ERRORS

```
#INCLUDE <VECTOR>
#INCLUDE <ALGORITHM>

INT MAIN()
{
  INT A;
  STD::VECTOR< STD::VECTOR <INT> > V;
  STD::FIND( V.BEGIN(), V.END(), A );
}
```

X86-64 gcc 4.9.4 | -std=c++14

```
/OPT/COMPILER-EXPLORER/GCC-4.9.4/INCLUDE/C++/4.9.4/BITS/STL_ALGOBASE.H:71:0,
                 FROM /OPT/COMPILER-EXPLORER/GCC-4.9.4/INCLUDE/C++/4.9.4/VECTOR:60,
                 FROM <SOURCE>:1:
/OPT/COMPILER-EXPLORER/GCC-4.9.4/INCLUDE/C++/4.9.4/BITS/PREDEFINED_OPS.H: IN INSTANTIATION OF 'BOOL
__GNU_CXX::__OPS::_ITER_EQUALS_VAL<_VALUE>::OPERATOR()(_ITERATOR) [WITH _ITERATOR =
__GNU_CXX::__NORMAL_ITERATOR<STD::VECTOR<INT>*, STD::VECTOR<STD::VECTOR<INT> > >; _VALUE = CONST INT]':
/OPT/COMPILER-EXPLORER/GCC-4.9.4/INCLUDE/C++/4.9.4/BITS/STL_ALGO.H:120:22:   REQUIRED FROM '_RANDOMACCESSITERATOR
STD::__FIND_IF(_RANDOMACCESSITERATOR, _RANDOMACCESSITERATOR, _PREDICATE, STD::RANDOM_ACCESS_ITERATOR_TAG) [WITH
_RANDOMACCESSITERATOR = __GNU_CXX::__NORMAL_ITERATOR<STD::VECTOR<INT>*, STD::VECTOR<STD::VECTOR<INT> > >; _PREDICATE =
__GNU_CXX::__OPS::_ITER_EQUALS_VAL<CONST INT>]'
/OPT/COMPILER-EXPLORER/GCC-4.9.4/INCLUDE/C++/4.9.4/BITS/STL_ALGO.H:162:43:   REQUIRED FROM '_ITERATOR
STD::__FIND_IF(_ITERATOR, _ITERATOR, _PREDICATE) [WITH _ITERATOR = __GNU_CXX::__NORMAL_ITERATOR<STD::VECTOR<INT>*,
STD::VECTOR<STD::VECTOR<INT> > >; _PREDICATE = __GNU_CXX::__OPS::_ITER_EQUALS_VAL<CONST INT>]'
/OPT/COMPILER-EXPLORER/GCC-4.9.4/INCLUDE/C++/4.9.4/BITS/STL_ALGO.H:3780:50:   REQUIRED FROM '_IITER STD::FIND(_IITER,
_IITER, CONST _TP&) [WITH _IITER = __GNU_CXX::__NORMAL_ITERATOR<STD::VECTOR<INT>*, STD::VECTOR<STD::VECTOR<INT> > >; _TP
```

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TEMPLATE ERRORS

```
#INCLUDE <VECTOR>
#INCLUDE <ALGORITHM>

INT MAIN()
{
  INT A;
  STD::VECTOR< STD::VECTOR <INT> > V;
  STD::FIND( V.BEGIN(), V.END(), A );
}
```

X86-64 clang (trunk) | -std=c++14

```
IN FILE INCLUDED FROM <SOURCE>:1:

IN FILE INCLUDED FROM /OPT/COMPILER-EXPLORER/GCC-SNAPSHOT/LIB/GCC/X86_64-LINUX-
GNU/14.0.0/../../../../INCLUDE/C++/14.0.0/VECTOR:62:

IN FILE INCLUDED FROM /OPT/COMPILER-EXPLORER/GCC-SNAPSHOT/LIB/GCC/X86_64-LINUX-
GNU/14.0.0/../../../../INCLUDE/C++/14.0.0/BITS/STL_ALGOBASE.H:71:

/OPT/COMPILER-EXPLORER/GCC-SNAPSHOT/LIB/GCC/X86_64-LINUX-
GNU/14.0.0/../../../../INCLUDE/C++/14.0.0/BITS/PREDEFINED_OPS.H:270:17: ERROR: INVALID OPERANDS TO BINARY EXPRESSION
('STD::VECTOR<INT>' AND 'CONST INT')

  270 |         { RETURN *__IT == _M_VALUE; }

      |                  ~~~~~ ^  ~~~~~~~~
```

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TEMPLATE ERRORS

Do you -Wall?

TEMPLATE ERRORS

```
#INCLUDE <VECTOR>
#INCLUDE <ALGORITHM>

INT MAIN()
{
  INT A;
  STD::VECTOR< STD::VECTOR <INT> > V;
  STD::FIND( V.BEGIN(), V.END(), A );
}
```

X86-64 clang (trunk) | -std=c++14 -Wall

```
<SOURCE>:7:36: WARNING: VARIABLE 'A' IS UNINITIALIZED WHEN PASSED AS A CONST REFERENCE ARGUMENT HERE [-WUNINITIALIZED-CONST-REFERENCE]
7 | STD::FIND( V.BEGIN(), V.END(), A );
| ^
IN FILE INCLUDED FROM <SOURCE>:1:
IN FILE INCLUDED FROM /OPT/COMPILER-EXPLORER/GCC-SNAPSHOT/LIB/GCC/X86_64-LINUX-GNU/14.0.0/../../../../INCLUDE/C++/14.0.0/VECTOR:62:
IN FILE INCLUDED FROM /OPT/COMPILER-EXPLORER/GCC-SNAPSHOT/LIB/GCC/X86_64-LINUX-
GNU/14.0.0/../../../../INCLUDE/C++/14.0.0/BITS/STL_ALGOBASE.H:71:
/OPT/COMPILER-EXPLORER/GCC-SNAPSHOT/LIB/GCC/X86_64-LINUX-GNU/14.0.0/../../../../INCLUDE/C++/14.0.0/BITS/PREDEFINED_OPS.H:270:17:
ERROR: INVALID OPERANDS TO BINARY EXPRESSION ('STD::VECTOR<INT>' AND 'CONST INT')
270 | { RETURN *__IT == _M_VALUE; }
| ~~~~~ ^ ~~~~~~~~
```

TEMPLATE ERRORS FIX

```
#INCLUDE <VECTOR>
#INCLUDE <ALGORITHM>

INT MAIN()
{
  STD::VECTOR<INT> A;
  STD::VECTOR< STD::VECTOR <INT> > V;
  STD::FIND( V.BEGIN(), V.END(), A );
}
```

const int a

X86-64 clang (trunk) | -std=c++14

```
PROGRAM RETURNED: 0
```

SHAVEDYAKS

HTTPS://GITHUB.COM/VITTORIOROMEO/CAMOMILLA

camomilla

license mit ? python 3

What is it?

`camomilla` is a simple Python 3 script that simplifies errors produced by C++ compilers. It is very useful while dealing with heavily-templated code *(e.g. when using boost::hana or boost::fusion)*.

`camomilla` transforms the error text to make it easier to read. It supports *JSON configuration files* that can include each other recursively and *caches the last error* so that the user can quickly *reprocess* the original error with different transformation options.

Example errors

The table below shows the size reduction of the errors in the `example_errors` folder. The original error was generated from a real project, ecst, by simply mispelling a member field name in a template-heavy context.

	Bytes (original)	Bytes (after camomilla)	Relative size change
g++ 6.1.1	38487	3680	-90.43%
clang++ 3.8.1	16856	2990	-82.26%

A size reduction often means that the error is easier to pinpoint. Using `-r` (`--reprocess`) to incrementally "add detail" to the error is then a good approach to gather more information on its cause/origin.

Thanks Daniel Evers

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BEN DEANE SAYS...

what-does-it-take-to-impl...

26+ new messages since 9:30 AM

compiler? Why is it so much harder?

elbeno Today at 10:30 AM

A good newbie tip for dealing with a wall-of-text diagnostic is to look at the top and the bottom. That'll usually tell you what actually went wrong in the depths, as well as what top-level code caused it. (Then all you have to do is understand those two things...!)

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COMPILER WARNINGS AND OPTIONS

EVERYONE SHOULD…

-WALL -WEXTRA -PEDANTIC

https://gcc.gnu.org/onlinedocs/gcc/Warning-Options.html

COMPILER WARNINGS AND OPTIONS

IN FACT, EVERYONE SHOULD…

https://github.com/cpp-best-practices/

AI TOOLING - EXPLAIN AND SUGGEST FIXES

https://youtu.be/19Sr8XhN0BM

https://github.com/plasma-umass/cwhy

3 TYPES OF PROBLEMS (AT LEAST…)

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  - ~~TEMPLATES~~
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  - MISSING LIBRARIES
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LINKER ERRORS

- Cannot find symbols / Undefined Reference
- Missing libraries
- Versioning issues

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LINKER ERROR – UNDEFINED REFERENCE

```cpp
#include <iostream>

int Main() {
    std::cout << "C++ Online 2024";
    return 0;
}
```

Output of x86-64 gcc (trunk) (Compiler #1)

A Wrap lines Select all

```
ASM generation compiler returned: 0
/opt/compiler-explorer/gcc-trunk-20240302/bin/../lib/gcc/x86_64-linux-gnu/14.0.
1/../../../../x86_64-linux-gnu/bin/ld: /lib/x86_64-linux-gnu/crt1.o: in
function `_start':
(.text+0x1b): undefined reference to `main'
collect2: error: ld returned 1 exit status
Execution build compiler returned: 1
```

x86-64 gcc (trunk) (Editor #1)

x86-64 gcc (trunk) -Wall

```
.LC0:
        .string "C++ Online 2024"
Main():
        push    rbp
        mov     rbp, rsp
        mov     esi, OFFSET FLAT:.LC0
        mov     edi, OFFSET FLAT:_ZSt4cout
        call    std::basic_ostream<char, std::char_traits<char> >
        mov     eax, 0
        pop     rbp
        ret
```

Output (0/0) x86-64 gcc (trunk) i - 6029ms (186623B) ~12043 lines filtered Compiler License

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LINKER ERRORS?

```
STRUCT A {
  VIRTUAL ~A() = 0;
};
STRUCT B: A {
  VIRTUAL ~B(){}
};
EXTERN INT X;
VOID FOO();
INT MAIN() {
  X = 0;
  FOO();
  B B;
}
```

X86-64 gcc 4.9.4

-Wall -Wextra

```
COMPILER RETURNED: 0
```

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LINKER ERRORS?

```
STRUCT A { VIRTUAL ~A() = 0; };
STRUCT B: A { VIRTUAL ~B(){}};
EXTERN INT X;
VOID FOO();
INT MAIN() {
  X = 0;
  FOO();
  B B;
}
```

X86-64 gcc (trunk) | -Wall -Wextra

```
/OPT/COMPILER-EXPLORER/GCC-TRUNK-20231113/BIN/../LIB/GCC/X86_64-LINUX-GNU/14.0.0/../../../../X86_64-LINUX-GNU/BIN/LD:
/TMP/CCMT7OUG.O: IN FUNCTION `MAIN':

<SOURCE>:6: UNDEFINED REFERENCE TO `X'

/OPT/COMPILER-EXPLORER/GCC-TRUNK-20231113/BIN/../LIB/GCC/X86_64-LINUX-GNU/14.0.0/../../../../X86_64-LINUX-GNU/BIN/LD:
<SOURCE>:7: UNDEFINED REFERENCE TO `FOO()'

/OPT/COMPILER-EXPLORER/GCC-TRUNK-20231113/BIN/../LIB/GCC/X86_64-LINUX-GNU/14.0.0/../../../../X86_64-LINUX-GNU/BIN/LD:
/TMP/CCMT7OUG.O: IN FUNCTION `B::~B()':

<SOURCE>:2: UNDEFINED REFERENCE TO `A::~A()'

COLLECT2: ERROR: LD RETURNED 1 EXIT STATUS

COMPILER RETURNED: 1
```

LINKER ERRORS?

```
STRUCT A { VIRTUAL ~A() = 0; };
STRUCT B: A { VIRTUAL ~B(){}};
EXTERN INT X;
VOID FOO();
INT MAIN() {
  X = 0;
  FOO();
  B B;
}
```

X86-64 clang (trunk) | -Wall -Wextra

```
/OPT/COMPILER-EXPLORER/GCC-SNAPSHOT/LIB/GCC/X86_64-LINUX-GNU/14.0.0/../../../../X86_64-LINUX-GNU/BIN/LD: /TMP/EXAMPLE-AFD2BD.O: IN FUNCTION `MAIN':

<SOURCE>:6: UNDEFINED REFERENCE TO `X'

/OPT/COMPILER-EXPLORER/GCC-SNAPSHOT/LIB/GCC/X86_64-LINUX-GNU/14.0.0/../../../../X86_64-LINUX-GNU/BIN/LD: <SOURCE>:7: UNDEFINED REFERENCE TO `FOO()'

/OPT/COMPILER-EXPLORER/GCC-SNAPSHOT/LIB/GCC/X86_64-LINUX-GNU/14.0.0/../../../../X86_64-LINUX-GNU/BIN/LD: /TMP/EXAMPLE-AFD2BD.O: IN FUNCTION `B::~B()':

<SOURCE>:2: UNDEFINED REFERENCE TO `A::~A()'

CLANG++: ERROR: LINKER COMMAND FAILED WITH EXIT CODE 1 (USE -V TO SEE INVOCATION)

COMPILER RETURNED: 1
```

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LINKER ERRORS

Output

Show output from: Build

```
Build started at 4:26 AM...
1>------ Build started: Project: DM_VS2015, Configuration: Debug Win32 ------
1>cm.obj : error LNK2019: unresolved external symbol "public: __thiscall CGXExMapHolder::CGXExMapHolder(void)" (??0CGXExMapHolder@@QAE@XZ) referenced in function "public: __thiscall CCmApp::CCmApp(void)" (??0CCmApp@@QAE@XZ)
1>cm.obj : error LNK2019: unresolved external symbol "public: __thiscall CGXExMapHolder::~CGXExMapHolder(void)" (??1CGXExMapHolder@@QAE@XZ) referenced in function __unwindfunclet$??0CCmApp@@QAE@XZ$2
1>cm.obj : error LNK2019: unresolved external symbol "public: void __thiscall CGXExMapHolder::SetHandlerMap(class CGXExcelMap<class CGXExcelHandler> *)" (?SetHandlerMap@CGXExMapHolder@@QAEXPAV?$CGXExcelMap@VCGXExcelHandler@@@@@Z)
1>cm.obj : error LNK2019: unresolved external symbol "public: void __thiscall CGXExMapHolder::SetTableMap(class CGXExcelMap<class CGXExcelTable> *)" (?SetTableMap@CGXExMapHolder@@QAEXPAV?$CGXExcelMap@VCGXExcelTable@@@@@Z) referenc
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelChildFrame::classCGXExcelChildFrame" (?classCGXExcelChildFrame@CGXExcelChildFrame@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass CGXExTabWndMgr::classCGXExTabWndMgr" (?classCGXExTabWndMgr@CGXExTabWndMgr@@2UCRuntimeClass@@A)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelFontTable::classCGXExcelFontTable" (?classCGXExcelFontTable@CGXExcelFontTable@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelColorTable::classCGXExcelColorTable" (?classCGXExcelColorTable@CGXExcelColorTable@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelStyleTable::classCGXExcelStyleTable" (?classCGXExcelStyleTable@CGXExcelStyleTable@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelXFTable::classCGXExcelXFTable" (?classCGXExcelXFTable@CGXExcelXFTable@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelFormatTable::classCGXExcelFormatTable" (?classCGXExcelFormatTable@CGXExcelFormatTable@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelSSTTable::classCGXExcelSSTTable" (?classCGXExcelSSTTable@CGXExcelSSTTable@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelBoundSheetTable::classCGXExcelBoundSheetTable" (?classCGXExcelBoundSheetTable@CGXExcelBoundSheetTable@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelLabelHandler::classCGXExcelLabelHandler" (?classCGXExcelLabelHandler@CGXExcelLabelHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelRkHandler::classCGXExcelRkHandler" (?classCGXExcelRkHandler@CGXExcelRkHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelMulRkHandler::classCGXExcelMulRkHandler" (?classCGXExcelMulRkHandler@CGXExcelMulRkHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelColInfoHandler::classCGXExcelColInfoHandler" (?classCGXExcelColInfoHandler@CGXExcelColInfoHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelRowHandler::classCGXExcelRowHandler" (?classCGXExcelRowHandler@CGXExcelRowHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelFormulaHandler::classCGXExcelFormulaHandler" (?classCGXExcelFormulaHandler@CGXExcelFormulaHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelBOFHandler::classCGXExcelBOFHandler" (?classCGXExcelBOFHandler@CGXExcelBOFHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelBlankHandler::classCGXExcelBlankHandler" (?classCGXExcelBlankHandler@CGXExcelBlankHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelMulBlankHandler::classCGXExcelMulBlankHandler" (?classCGXExcelMulBlankHandler@CGXExcelMulBlankHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelLabelSSTHandler::classCGXExcelLabelSSTHandler" (?classCGXExcelLabelSSTHandler@CGXExcelLabelSSTHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelDimensionHandler::classCGXExcelDimensionHandler" (?classCGXExcelDimensionHandler@CGXExcelDimensionHandler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelWindow2Handler::classCGXExcelWindow2Handler" (?classCGXExcelWindow2Handler@CGXExcelWindow2Handler@@2UCRuntimeClass@@B)
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelMergedCellsHandler::classCGXExcelMergedCellsHandler" (?classCGXExcelMergedCellsHandler@CGXExcelMergedCellsHandler@@2UCRuntimeC
1>cm.obj : error LNK2001: unresolved external symbol "public: static struct CRuntimeClass const CGXExcelNumberHandler::classCGXExcelNumberHandler" (?classCGXExcelNumberHandler@CGXExcelNumberHandler@@2UCRuntimeClass@@B)
1>cmView.obj : error LNK2019: unresolved external symbol "public: __thiscall CGXExcelWndDocAdapter::CGXExcelWndDocAdapter(void)" (??0CGXExcelWndDocAdapter@@QAE@XZ) referenced in function "public: void __thiscall CCmView::SaveExcel
1>cmView.obj : error LNK2019: unresolved external symbol "public: virtual __thiscall CGXExcelWndDocAdapter::~CGXExcelWndDocAdapter(void)" (??1CGXExcelWndDocAdapter@@UAE@XZ) referenced in function "public: void __thiscall CCmView::
1>cmView.obj : error LNK2019: unresolved external symbol "public: void __thiscall CGXExcelWndDocAdapter::SaveExcelFile(class ATL::CStringT<char,class StrTraitMFC<char,class ATL::ChTraitsCRT<char> > > const &)" (?SaveExcelFile@CGXE
1>cmView.obj : error LNK2019: unresolved external symbol "public: void __thiscall CGXExcelWndDocAdapter::SetGrid(class CGXGridCore *)" (?SetGrid@CGXExcelWndDocAdapter@@QAEXPAVCGXGridCore@@@Z) referenced in function "public: void _
1>cmView.obj : error LNK2019: unresolved external symbol "public: __thiscall CGXExcelGrid::CGXExcelGrid(class CWnd *,class CDocument *,int)" (??0CGXExcelGrid@@QAE@PAVCWnd@@PAVCDocument@@H@Z) referenced in function "protected: __th
1>cmView.obj : error LNK2019: unresolved external symbol "public: virtual __thiscall CGXExcelGrid::~CGXExcelGrid(void)" (??1CGXExcelGrid@@UAE@XZ) referenced in function "public: virtual __thiscall CCmView::~CCmView(void)" (??1CCmV
1>cmView.obj : error LNK2001: unresolved external symbol "public: virtual int __thiscall CGXExcelGrid::OnPasteFromClipboardImpl(class CGXRange const &)" (?OnPasteFromClipboardImpl@CGXExcelGrid@@UAEHABVCGXRange@@@Z)
1>cmView.obj : error LNK2001: unresolved external symbol "public: virtual int __thiscall CGXExcelGrid::OnCheckClipboardFormatImpl(void)" (?OnCheckClipboardFormatImpl@CGXExcelGrid@@UAEHXZ)
1>cmView.obj : error LNK2001: unresolved external symbol "public: virtual int __thiscall CGXExcelGrid::CopyRangeImpl(class CGXRangeList const &)" (?CopyRangeImpl@CGXExcelGrid@@UAEHABVCGXRangeList@@@Z)
1>cmView.obj : error LNK2001: unresolved external symbol "public: virtual int __thiscall CGXExcelGrid::IsFormulaMode(void)" (?IsFormulaMode@CGXExcelGrid@@UAEHXZ)
1>cmView.obj : error LNK2001: unresolved external symbol "protected: virtual class CGXGridCore * __thiscall CGXExcelGrid::GetCorePtr(void)" (?GetCorePtr@CGXExcelGrid@@MAEPAVCGXGridCore@@XZ)
1>Debug\dm620d07XP32.exe : fatal error LNK1120: 38 unresolved externals
1>Done building project "DM_VS2015.vcxproj" -- FAILED.
========== Build: 0 succeeded, 1 failed, 0 up-to-date, 0 skipped ==========
========== Build completed at 4:27 AM and took 05.159 seconds ==========
```

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HTTPS://WWW.YOUTUBE.COM/WATCH?V=H4S891KVN80

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3 TYPES OF PROBLEMS (AT LEAST…)

- COMPILE TIME
  - ~~SYNTAX ERRORS (VIOLATE STANDARD, OR THAT WHICH IS IMPLEMENTED IN THE COMPILER)~~
  - ~~TEMPLATES~~
- LINK TIME
  - ~~MISSING LIBRARIES~~
  - ~~VERSIONING ISSUES~~
  - ~~CANNOT FIND SYMBOLS~~
- RUN TIME
  - LOGICAL ERRORS
  - SEMANTIC ERRORS (UNINITIALIZED VALUES – CORRECT STATEMENTS THAT DON'T MAKE SENSE)

RUN TIME ERRORS

- WHAT THE COMPILER DOESN'T CATCH…
  - LOGICAL ERRORS
  - SEMANTIC ERRORS (UNINITIALIZED VALUES – CORRECT STATEMENTS THAT DON'T MAKE SENSE)

LOGIC ERRORS – BAD SYNTAX STILL COMPILES

```cpp
#include <iostream>
using namespace std;

int main() {
    int j;
    for(j=0;j<=5;j++);
    {
        cout << "C++ Online!";
    }
    return 0;
}
```

Output of x86-64 gcc 4.9.4 (Compiler #1)

A Wrap lines Select all

```
Compiler returned: 0
```

x86-64 gcc 4.9.4 (Editor #1)

x86-64 gcc 4.9.4 -Wall

```asm
.LC0:
        .string "C++ Online!"
main:
        push    rbp
        mov     rbp, rsp
        sub     rsp, 16
        mov     DWORD PTR [rbp-4], 0
        jmp     .L2
.L3:
        add     DWORD PTR [rbp-4], 1
.L2:
        cmp     DWORD PTR [rbp-4], 5
        jle     .L3
```

Output (0/0) x86-64 gcc 4.9.4 - 1418ms (59419B) ~4097 lines filtered

Compiler License

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LOGIC ERRORS

```cpp
#include <iostream>
using namespace std;

int main() {
    int j;
    for(j=0;j<=5;j++);
    {
        cout << "C++ Online!";
    }
    return 0;
}
```

Output of x86-64 clang 17.0.1 (Compiler #1)

A Wrap lines Select all

```
<source>:6:22: warning: for loop has empty body [-Wempty-body]
    6 |     for(j=0;j<=5;j++);
      |                      ^
<source>:6:22: note: put the semicolon on a separate line to silence this warning
1 warning generated.
ASM generation compiler returned: 0
<source>:6:22: warning: for loop has empty body [-Wempty-body]
    6 |     for(j=0;j<=5;j++);
      |                      ^
<source>:6:22: note: put the semicolon on a separate line to silence this warning
1 warning generated.
Execution build compiler returned: 0
Program returned: 0
```

x86-64 clang 17.0.1 (Editor #1)

x86-64 clang 17.0.1 -Wall

```
main:                                   # @main
        push    rbp
        mov     rbp, rsp
        sub     rsp, 16
        mov     dword ptr [rbp - 4], 0
        mov     dword ptr [rbp - 8], 0
.LBB0_1:                                # =>This Inner Loop Header:
        cmp     dword ptr [rbp - 8], 5
        jg      .LBB0_4
        jmp     .LBB0_3
.LBB0_3:                                #   in Loop: Header=BB0_1 D
        mov     eax, dword ptr [rbp - 8]
        add     eax, 1
        mov     dword ptr [rbp - 8], eax
        jmp     .LBB0_1
.LBB0_4:
        mov     rdi, qword ptr [rip + std::cout@GOTPCREL]
        lea     rsi, [rip + .L.str]
        call    std::basic_ostream<char, std::char_traits<char>>& s
        xor     eax, eax
        add     rsp, 16
        pop     rbp
        ret
.L.str:
        .asciz  "C++ Online!"
```

Output (/5) x86-64 clang 17.0.1 i - 1428ms (271148B) ~4536 lines

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SHAVEDYAKS

SEMANTIC ERRORS

```
#INCLUDE <IOSTREAM>
#INCLUDE <VECTOR>

INT PRODUCT(STD::VECTOR<INT>& NUMBERS) {
  INT PRODUCT;
  FOR (INT N : NUMBERS) { PRODUCT *= N; }
  RETURN PRODUCT;
}

INT MAIN() {
  STD::VECTOR<INT> NUMBERS = {1, 2, 3, 4, 5};
  STD::COUT << "PRODUCT: " << PRODUCT(NUMBERS) << STD::ENDL;
  RETURN 0;
}
```

X86-64 gcc (trunk) | -Wall -Wextra -Werror

```
PROGRAM RETURNED: 0

PRODUCT: 0
```

SEMANTIC ERRORS – SYNTACTICALLY CORRECT…

```
#INCLUDE <IOSTREAM>
#INCLUDE <VECTOR>

INT PRODUCT(STD::VECTOR<INT>& NUMBERS) {
  INT PRODUCT;
  FOR (INT N : NUMBERS) { PRODUCT *= N; }
  RETURN PRODUCT;
}

INT MAIN() {
  STD::VECTOR<INT> NUMBERS = {1, 2, 3, 4, 5};
  STD::COUT << "PRODUCT: " << PRODUCT(NUMBERS) << STD::ENDL;
  RETURN 0;
}
```

X86-64 clang (trunk) | -Wall -Wextra -Werror

```
<SOURCE>:6:29: ERROR: VARIABLE 'PRODUCT' IS UNINITIALIZED WHEN USED HERE [-WERROR,-WUNINITIALIZED]
    6 |     FOR (INT N : NUMBERS) { PRODUCT *= N; }
      |                             ^~~~~~~
<SOURCE>:5:16: NOTE: INITIALIZE THE VARIABLE 'PRODUCT' TO SILENCE THIS WARNING
    5 |     INT PRODUCT;
      |                ^
      |                 = 0
1 ERROR GENERATED.
COMPILER RETURNED: 1
```

RUNTIME ERRORS

```
1  #include <iostream>
2  using namespace std;
3
4  int main()
5  {
6      int arr[3] = {1, 2, 3};
7      std::cout << arr[3] << std::endl;
8      return 0;
9  }
```

Output of x86-64 gcc 4.6.4 (Compiler #1)

A Wrap lines Select all

```
ASM generation compiler returned: 0
Execution build compiler returned: 0
Program returned: 0
  32675
```

x86-64 gcc 4.6.4 (Editor #1)

x86-64 gcc 4.6.4 -Wall

```
1   main:
2           push    rbp
3           mov     rbp, rsp
4           sub     rsp, 16
5           mov     DWORD PTR [rbp-16], 1
6           mov     DWORD PTR [rbp-12], 2
7           mov     DWORD PTR [rbp-8], 3
8           mov     eax, DWORD PTR [rbp-4]
9           mov     esi, eax
10          mov     edi, OFFSET FLAT:_ZSt4cout
11          call    std::basic_ostream<char, std::char_traits<char> >:
12          mov     esi, OFFSET FLAT:_ZSt4endlIcSt11char_traitsIcEERSt
13          mov     rdi, rax
14          call    std::basic_ostream<char, std::char_traits<char> >:
15          mov     eax, 0
16          leave
17          ret
18  __static_initialization_and_destruction_0(int, int):
19          push    rbp
20          mov     rbp, rsp
21          sub     rsp, 16
22          mov     DWORD PTR [rbp-4], edi
23          mov     DWORD PTR [rbp-8], esi
24          cmp     DWORD PTR [rbp-4], 1
25          jne     .L2
```

Output (/0) x86-64 gcc 4.6.4 - 1202ms (57852B) ~3887 lines

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SHAVEDYAKS

RUNTIME ERRORS

```
1  #include <iostream>
2  using namespace std;
3
4  int main()
5  {
6      int arr[3] = {1, 2, 3};
7      std::cout << arr[3] << std::endl;
8      return 0;
9  }
```

Output of x86-64 clang 17.0.1 (Compiler #1)

A Wrap lines Select all

```
<source>:7:18: warning: array index 3 is past the end of the array (that has type 'int[3]')
[-Warray-bounds]
    7 |     std::cout << arr[3] << std::endl;
      |                  ^   ~
<source>:6:5: note: array 'arr' declared here
    6 |     int arr[3] = {1, 2, 3};
      |     ^
1 warning generated.
ASM generation compiler returned: 0
<source>:7:18: warning: array index 3 is past the end of the array (that has type 'int[3]')
[-Warray-bounds]
    7 |     std::cout << arr[3] << std::endl;
      |                  ^   ~
<source>:6:5: note: array 'arr' declared here
    6 |     int arr[3] = {1, 2, 3};
      |     ^
1 warning generated.
Execution build compiler returned: 0
Program returned: 0
```

x86-64 clang 17.0.1 (Editor #1)

x86-64 clang 17.0.1 -Wall

```
1   main:                                   # @main
2           push    rbp
3           mov     rbp, rsp
4           sub     rsp, 16
5           mov     dword ptr [rbp - 4], 0
6           mov     rax, qword ptr [rip + .L__const.main.arr]
7           mov     qword ptr [rbp - 16], rax
8           mov     eax, dword ptr [rip + .L__const.main.arr+8]
9           mov     dword ptr [rbp - 8], eax
10          mov     esi, dword ptr [rbp - 4]
11          mov     rdi, qword ptr [rip + std::cout@GOTPCREL]
12          call    std::ostream::operator<<(int)@PLT
13          mov     rdi, rax
14          mov     rsi, qword ptr [rip + std::basic_ostream<char, st
15          call    std::ostream::operator<<(std::ostream& (*)(std::o
16          xor     eax, eax
17          add     rsp, 16
18          pop     rbp
19          ret
20  .L__const.main.arr:
21          .long   1                       # 0x1
22          .long   2                       # 0x2
23          .long   3                       # 0x3
```

Output (/7) x86-64 clang 17.0.1 i - 1525ms (269485B) ~4511 lines

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SHAVEDYAKS

3 TYPES OF PROBLEMS (AT LEAST…)

- Compile time
  - ~~Syntax errors (violate standard, or that which is implemented in the compiler)~~
  - ~~Templates~~
- Link time
  - ~~Missing libraries~~
  - ~~Versioning issues~~
  - ~~Cannot find symbols~~
- Run time
  - ~~Logical errors~~
  - ~~Semantic errors~~

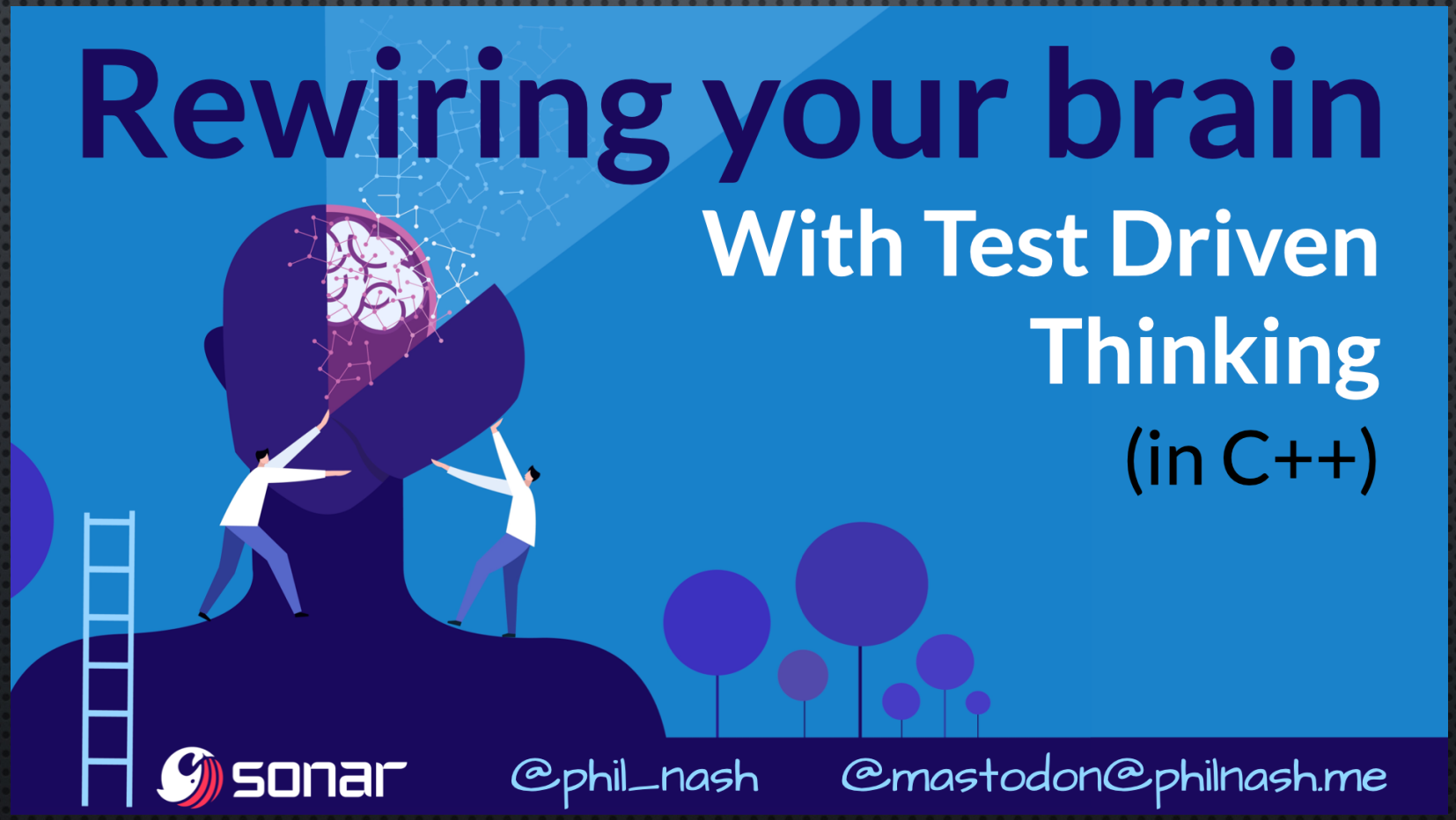
SHAVEDYAKS

CATCH (2) YOUR RUNTIME ERROR'S

```
//-----------------------------------------------------------------------
TEST_CASE( "BCD - decimal_to_bcd 99", "[visa][unit][bcd]" ) {
    const int input = 99;
    std::bitset< byte_sz > correct{ str: "10011001" };
    std::bitset< byte_sz > incorrect{ str: "01111001" };
    auto sut: std::vector<std::uint8_t> = epx::decimal_to_bcd( n: input );

    REQUIRE( correct ≠ incorrect );
    REQUIRE( std::bitset< byte_sz >{ sut[ 0 ] } ≠ incorrect );
    REQUIRE( std::bitset< byte_sz >{ sut[ 0 ] } == correct );
}

//-----------------------------------------------------------------------
TEST_CASE( "BCD - decimal_to_bcd 45", "[visa][unit][bcd]" ) {
    const int input = 45;
    std::bitset< byte_sz > correct{ str: "01000101" };
    std::bitset< byte_sz > incorrect{ str: "01111001" };
    auto sut: std::vector<std::uint8_t> = epx::decimal_to_bcd( n: input );

    REQUIRE( correct ≠ incorrect );
    REQUIRE( std::bitset< byte_sz >{ sut[ 0 ] } ≠ incorrect );
    REQUIRE( std::bitset< byte_sz >{ sut[ 0 ] } == correct );
}
```

SHAVEDYAKS

TESTING AND TDD



https://www.youtube.com/watch?v=Hx-1Wtvhvgw

BUILDING INTUITION FURTHER…

SHAVEDYAKS

SONAR LINT & CLANG-TIDY (OR CLANGD)

- ⚠ Remove the commented out code. sonarlint(cpp:S125) [Ln 74, Col 3]
- ⚠ function 'handleSIGINT' could be declared with attribute 'noreturn' sonarlint(cpp:S5271) [Ln 78, Col 11]
- ⚠ Do not implicitly decay an array into a pointer; consider using g... clang-tidy(cppcoreguidelines-pro-bounds-array-to-pointer-decay) [Ln 80, Col 11]
- ⚠ Use "function_name" member function of "std::source_location" instead of "__func__" predefined value. sonarlint(cpp:S6190) [Ln 80, Col 11]
- ⚠ Method 'dumpError' can be made static clang-tidy(readability-convert-member-functions-to-static) [Ln 85, Col 11]
- ⚠ This function should be declared "const". sonarlint(cpp:S5817) [Ln 85, Col 11]
- ⚠ Pass expensive to copy object "error" by reference to const. sonarlint(cpp:S1238) [Ln 85, Col 21]
- ⚠ The parameter 'error' is copied for each invocation but only used as a const r... clang-tidy(performance-unnecessary-value-param) [Ln 85, Col 28]
- ⚠ Use a trailing return type for this function (fix available) clang-tidy(modernize-use-trailing-return-type) [Ln 91, Col 11]
- ⚠ This function should be declared "const". sonarlint(cpp:S5817) [Ln 91, Col 11]
- ⚠ Define and throw a dedicated exception instead of using a generic one. sonarlint(cpp:S112) [Ln 96, Col 13]
- ⚠ Define and throw a dedicated exception instead of using a generic one. sonarlint(cpp:S112) [Ln 101, Col 13]
- ⚠ Throw the exception by value. sonarlint(cpp:S1035) [Ln 110, Col 11]
- ⚠ Variable 'dumpReset' of type 'bool' can be declared 'const' (fix available) clang-tidy(misc-const-correctness) [Ln 118, Col 3]
- ⚠ Do not implicitly decay an array into a pointer; consider using ... clang-tidy(cppcoreguidelines-pro-bounds-array-to-pointer-decay) [Ln 124, Col 31]
- ⚠ Use "function_name" member function of "std::source_location" instead of "__func__" predefined value. sonarlint(cpp:S6190) [Ln 124, Col 31]
- ⚠ Variable 'tempConfiguration' of type 'json' (aka 'basic_json<>') can be declared 'const' (fix av... clang-tidy(misc-const-correctness) [Ln 130, Col 3]
- ⚠ function 'configThread' could be declared with attribute 'noreturn' sonarlint(cpp:S5271) [Ln 135, Col 11]

SHAVEDYAKS

OUR COMPILERS MATTER

- CLANG HAS (GENERALLY) ALWAYS DONE AN EXCELLENT JOB AT REPORTING.
- USE THE NEWEST COMPILER YOU CAN.
- EVEN ON AN OLDER COMPILER SET STANDARD LEVELS IF NECESSARY.
- ADD YOUR COMPILER OPTIONS

MICROSOFT VISUAL STUDIO (WINDOWS)

/permissive- - Enforces standards conformance.
/W4 /w14640 - use these and consider the following (see descriptions below)

- /W4 All reasonable warnings
- /w14640 Enable warning on thread unsafe static member initialization

Not recommended
- /Wall - Also warns on files included from the standard library, so it's not very useful and creates too many extra warnings.
- Since VS2022, /external:anglebrackets /external:W0 can be used to turn off warnings from all headers included with angle brackets, e.g. #include <utility>.

WHEN THE PROBLEM PERSIST…

"It's not that I'm so smart, it's just that I stay with problems longer"

Albert Einstein

SHAVEDYAKS

NOT C++ - BUT SQL...

IntegrityError

```
sqlalchemy.exc.IntegrityError: (sqlite3.IntegrityError) UNIQUE constraint failed: order.user_id
[SQL: INSERT INTO "order" (timestamp, monday, tuesday, wednesday, thursday, friday, user_id) VALUES (?, ?, ?, ?, ?, ?, ?)]
[parameters: ('2024-03-02 01:13:29.754904', 'None (N)', 'None (N)', 'None (N)', 'None (N)', 'None (N)', '1')]
(Background on this error at: https://sqlalche.me/e/20/gkpj)
```

Traceback (most recent call last)

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/sqlalchemy/engine/base.py", line *1960*, in `_exec_single_context`

```
self.dialect.do_execute(
^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/sqlalchemy/engine/default.py", line *924*, in `do_execute`

```
cursor.execute(statement, parameters)
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

The above exception was the direct cause of the following exception:

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *1488*, in `__call__`

```
return self.wsgi_app(environ, start_response)
       ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *1466*, in `wsgi_app`

```
response = self.handle_exception(e)
           ^^^^^^^^^^^^^^^^^^^^^^^^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *1463*, in `wsgi_app`

```
response = self.full_dispatch_request()
           ^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *872*, in `full_dispatch_request`

```
rv = self.handle_user_exception(e)
     ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *870*, in `full_dispatch_request`

```
rv = self.dispatch_request()
     ^^^^^^^^^^^^^^^^^^^^^^^^
```

File "/Users/kcarpenter/Projects/lunch.cpp.events/.venv/lib/python3.12/site-packages/flask/app.py", line *855*, in `dispatch_request`

```
return self.ensure_sync(self.view_functions[rule.endpoint])(**view_args)  # type: ignore[no-any-return]
       ^^^^^^^^^^^^^^^^^^^
```

CPP WEEKLY

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