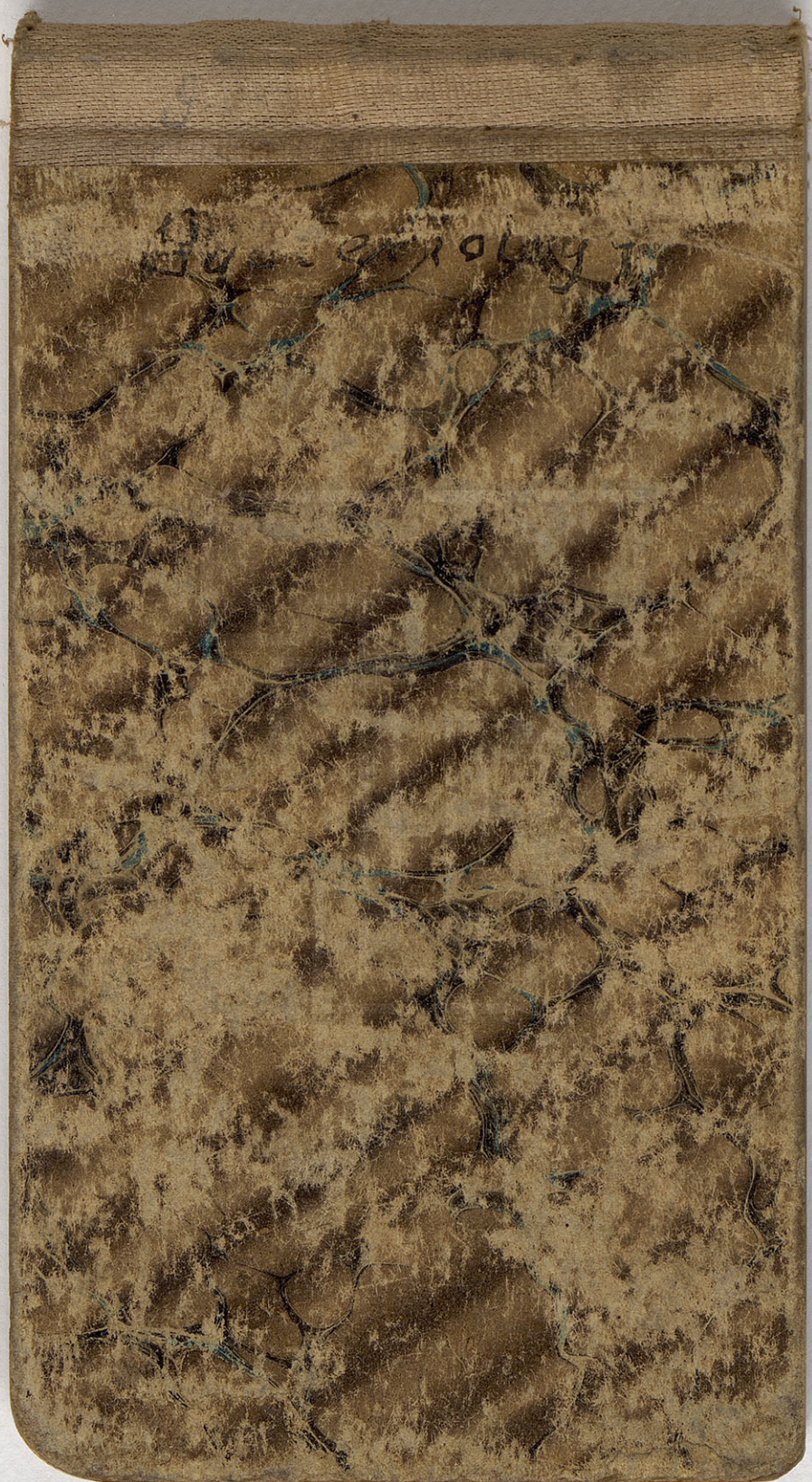
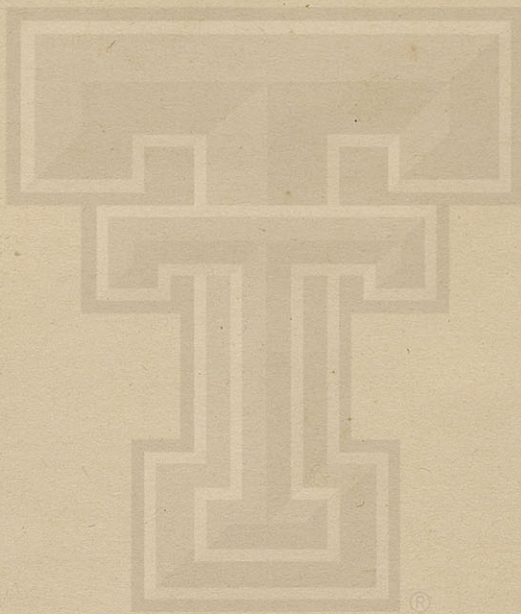




$$a = TR^2$$



Bacteriology Oct. 16th 06
Bacteriology is that branch
of science which treats
of Bact. their properties,
+ characteristics.

A Bacterium (using the
term in a general sense)
is a unicellular vegetable
microorganism devoid
of chlorophyll, living upon
previously organic
material & typically re-
producing by direct cell
division.

Highest Divisions of Plants.

1. Phanerogams (flowering).
2. Cryptogams (none flowering).
 1. Aspidosperms or ferns.

2. Bryophytes or Mosses,
3. Protohytes or Thallophytes
 - 1⁺ algae,
 - 1⁺ Fungi,
 - 1² Hysshomycetes or moulds.
 - 2³ Saccharomycetes - yeasts
 - 3³ Schizomycetes - bacteria
 - 1³ Thiobacteriaceae (colored)
 - 2² Eubacteriaceae (colorless).
 - 1⁴ Coccaceae ::
 - 2⁴ Bacteriaceae --
 - 3⁴ Spirillaceae ~~~~~
 - 4⁴ Mycobacteriaceae >>>
 - 5⁴ Chlamydo bacteriaceae =

Properties of Bacteria,

1st Reproduction,

Bact. may reproduce in one or more of 3 ways

namely by direct cell division, by spore

fact, may reproduce
one or more of 3 ways

namely by direct cell
division, by spore
formation, & by zooid
formation.

Direct cell Division
is the most usual
method of division.

In this the individual
cell merely enlarges
& splits into 2, these
individuals then in
turn divide in like
manner.

This division may be in
1-2 - or 3 planes. If
they divide in one plane
& the individuals hang
together to form chains
we use the prefix strepto

to indicate this.

If they divide in two planes & remain in sheets of a single organism in thickness we speak of them as *menisopodia*.

If the cocci which are rounded organisms, usually spheroidal, divide in three planes & remain in packets of 8 they are *sarcina*



If the division be in 2 planes & they remain in fours we call them *tetrads*. If division be

in one plane & the organs remain in pairs we

tetrads. If division be

in one plane + the organs
remain in pairs we
indicate this by the prefix
diplo. If they be spher-
-ical organisms or
cocci & arranged
in irregular masses
like bunches of grapes
we speak of these
as proplex.

Spore & Formation.
A spore is a round or
oval shining highly re-
fractive & resistant
body formed by some
bact. normally, but
by others under abnormal
conditions of moisture,
temp., & food.

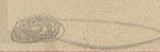
It is merely a resting stage of the bacterium & when placed under favorable conditions will develop into an adult organism like its parent. It differs from its parent in being more refractive, having a thicker envelope, a somewhat different protoplasm and is more resistant to destructive agents. Some of these spores may exist for as much as 10 hours. If the spore is within the cell it

is called an endospore. If entirely outside the cell it is an exospore.

16 hours. If the spore
is within the cell it

is called an endospore.
If entirely outside the
cell it is an exospore.
If attached to one
end it is an ortho-
spore.

Germination of Spores,
As mentioned before,
if placed under
proper conditions it will
develop. This germ may
be one of three kinds

1. Polar 

2. Bipolar 

3. Equatorial 

Gonidia Formation,

These are formed by
the cell body itself
breaking up into small
round or oval forms,

They are less frequent,
less shining & refract-
ive & smaller than
spores & are more apt
to be oval. Are not
so resistant to destruc-
tive agents & are often
seen at the junction
of roots.

They also have the prop-
erty of developing into adults
like their parents.

Conditions for Growth.
In order that Bact.
grow & multiply they
must have proper food.
This must contain N, O,
H, & some minerals

such as Mg, Na, Ca, &
P. Iron. Certain

of soil must contain N, C,
H, + some minerals

such as Mg, Na, Ca, +
P, Now certain
bact. have the property
of taking N. from the
air + holding it in
the soil either free
or combined as
nitrites, these are
the nitrifying Bact.
Others are capable of
reducing the nitrates
of the soil to nitrites
+ even free N.

Corn peas are good
denitrifying Bact.
which are contained in
swellings on the roots,
and are common to
the family of the

Leguminosa.

Some Bact. cannot live except in the body of a living animal + must get their food from this source, these are obligate parasites. Other organisms may live on the body of a higher organism or may exist + multiply away from it.

These are facultative parasites.

Saprophytes are those which live upon dead organized material.

Another condition
of proper nutrition

upon the
material.

another condition
of proper moisture
Bact always grow
best if there is present
70% or more of H_2O .
They grow very little
if at all where the
moisture is reduced
below 40%.

Bact. Oct 18th 1906.
They must have proper
atmosph. conditions
where Bact will not
grow unless free O is
present they are called
obligate aerobes
If only where free
 O is absent they
are called obligate

anaerobes.

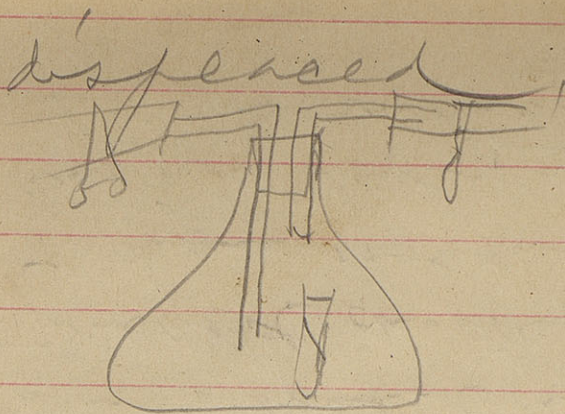
Facultative anaerobes
grow either in or without
free O

The most of the pathogen-
ic bacteria are anaerobes.
The Tetanus Bacillus
is an Obligate
anaerobe.

Methods of securing
anaerobic conditions
One method is to
place the infected
tube loosely cotton
plugged in a jar,
& run H₂ gas in
to this jar, until
air is entirely

displaced.
H₂ H₂ H₂ H₂

air is ~~entirely~~ ^{partially} ~~entirely~~



The above secures
anaerobic conditions.
Another method
is to insert a small
test tube filled
with antiseptic medium
into a larger tube
containing some
antiseptic med. This
is then sterilized
now if by means of a
crooked needle you
inoculate.

The simplest method
is to inoculate
a tube of agar,
then pour into
the tube another
tube of melted
agar and harden
in use paraffine
or heavy oil.
The advantage of
the paraffine being
that you can melt
the edges of paraffine
& remove it
with forceps.
4th condition
of growth is proper

Temp. Nearly every
species of bact.

4th condition
of growth is proper

Temp. Nearly every
species of bact. has a particular
temp at which it
grows best. This
is called its opti-
mum temp.

The lowest temp
at which the micro-
organism will grow
but feebly is the
minimum temp.

The highest temp.
it will grow but
feebly is maximum

We have three
grand divisions
of organisms.

The Psychrophiles
grow best at room
temp. - $16-20^{\circ}\text{C}$

The mesophiles
grow best in $37-39^{\circ}\text{C}$

The thermophiles like
a hot temp. $45-55^{\circ}\text{C}$

most of the path-
ogenic are
are mesophilic.

The putrefying bact.
are usually thermo-
philic

a freezing temp.

will not kill

Bact. but will

inhibit their growth

Proper light,

Exposure to direct

sun light for a

few hours will

kill most bact.

Proper light,
Exposure to direct

sun light for a
few hours will
kill most bacteria.

Even the diffuse
light will retard
the growth of many
organisms. Bacteria
seem to grow best
where they have
short periods of light
alternating with
long periods of
darkness.

Bacteria have property
of motility.
All bacteria are common
with all other
finely divided
matter whether
organic or inorganic

is possessed of
a finely ^{vibrating or} dancing
movement, called
the Biberian
movement.

We never speak
of this with reference
to Bact motility.

Some Bact have
the power to move
from place to
place, a definite
forward progressive
change of position.
Is true motility of Bact,
this is the true
motility of Bact.

The method of
determining the

motility of bacter.

The method of determining the motility of bacter. a liquid culture - preferably a young one is chosen. A drop is placed on a cover glass. This mounted on a hanging drop slide.

This culture is then examined with the $\frac{1}{2}$ lens for forward progressive movement. If this be seen the cover glass is carefully

removed & a
drop of a known
disinfectant is
added placed
on the slide
& reexamined
if the progress
movement has
stopped it indicates
that the movement
was due to a vital
process.

care should
be taken not
to mistake little
currents in the
liquid for movement
This motility is
due either to flagellae

or to a gelatinous
capsule. flagellae

This motility is
due either to flagellae

or to a gelatinous
capsule. flagellae
are long whips,
like protoplasmic
projections from the
body of the cell,
If they entirely
surround the
cell body they are
called peritrichia
If only at one end
a pole they are
monotrichic. If
at both poles
they are amphitrichic.
If gathered in
a cluster at one
they are lophotrichic

assimilation
& growth is another
prop. these Baro,
take up a portion
of the nutritive
substance & convert
it into definite
compounds for its
own use.

In doing so they
increase in size
and finally subdivide
Another prop.
common to some
is that of the
products of coloring
matter or pigments
various colors

may be represented
pink red & blue

various colors

may be represented
pink, red, blue,
black, yellow,
orange.

The coloring matter
may be in the
colony or dispersed
in the culture
medium.

Divided into
2 classes.

Chromogenic +
non-chromogenic

These colors produced
are a result of
the vital activity
of the cell & differ
in their chemical
condition & solubility.

ity, a great
refracting chromogenic
fact. It will not
produce these
colors under
adverse circumstances
the presence of
air or free O_2
nearly always
essential.
Another property
is that of phospho-
rescence. This
is best seen in
the fact, in sea
hard,

Bacteriology Oct 23 ad 66
Others have the ability

Bacteriology Oct 23rd 66

Others have the ability
to produce certain
Chemical substances,
Among these various
aromatic substances,
a specially important
one being indole.
This is found in old
cultures of certain
Bact., as for example
B. coli; the micro
Spirillum, &
others. To test for
its presence a peptone
culture 8-10 days old
is taken diluted
with an equal bulk of
2.5% H_2SO_4 , & warmed

slightly if a red
color results it
indicates that not
only indol but also
nitrites have been
produced. This has
been found in old
cultures of *Vibrio*
cholerae &
called the cholera
red reaction.
However if NO_2^- is
not present add
1 drop of a weak
sol. 1% of NaNO_2
when a red color
indicates the presence
of indol.

Bact. may also
produce ferment of

of form dol

Bact. may also
produce ferments of
various kinds,
They may produce a
proteolytic or albumin
splitting ferment.
It is the production
of such a substance
that gives rise to the
bacterial liquefaction
of gelatine. That it
is due to a ferment
& not the bodies of
the B themselves
may be proven by
filtering such liquefied
gelatine through a
porcelain boogie
this freeing it from
organisms.

a portion of free
starch added
to solid gelatin will
add to its liquefaction
again for the purpose
of diastasis ferment
which has the
property of converting
starch into glucose
To test this an old
culture is tested
by Fehling's reagent
for sugar. If no
reduction takes place
a thin starch paste
is added to the
culture & placed
in the incubator
& after a few hours

again tested

for sugar

in the incubator
& after a few hours

again tested
for sugar
When of the testat
a ferment is present
the characteristic test
is obtained. To prove
that it is the ferment
& not bact. that
produces the reduction
add some thymol to
the starch paste
An invertin ferment
may be formed
& cane sugar is
inverted into glucose
To old culture tested
as before a sol. of
cane sugar is added
may stay in incubator
a few hours & test

for glucose by *B. coli*,
two other fermenters,
a rumet ferment
which curdles milk
There are 2 causes
for curd. of milk
one the product
of lactic acid the
other due to the
action of a rumet
ferment. Test
this. Sterilize milk
is inoculated &
if it curdles with
change of color it
is due to the rumet
ferment.

B. may produce gas.
that is some.

Different B. will
produce dif. gases.

B. may produce gas.
that is some,

Different B. will
produce dif. gases.

CO_2 , H_2 , H_2S , &

a number of others

C_2H_4 . To test

gas production the

best way is to

inoculate it in

various sugar sol.

in a fermentation

tube.

To estimate the amt.

of CO_2 present the

level of the gas in the

fermentation tube is

marked. The bulb is

filled with NaOH

sol. & gas shaken

back & forth several

times & finally rise
up in the afternoon
again. The effusion
removed & the
difference in the
height of the
gas represents the
H₂O₂. He 8 can
be tested with
acetate of lead.

Acid Production
by B

H₂C₆H₃O₂, Butyric,
Lactic, acids
being common
ferments. Inoculation
into litmus milk
or into Rosolia's

pepton. in the
case of acids

into albumin milk
or into Rosol's acid

peptone. in the
case of acids
be formed the
paper is changed
to an orange

alkalies may be
produced usually
some form of NH_3

Bact may produce
Ptoin, an
alkaloidal substance
as produced by non
photogenic organisms
on dead or decaying
tissue.

Sarcosins are
alkaloidal subst
produced by Pathogens
from the living tissue

and are capable
of forming salts
if ~~been~~ combined
with acids.

Toxins: These are
albumins from the
living tissue produced
by pathogens,
are non-cryst.
& will not combine
with acids to form
salts.

Toxalbumins are
derived from the
bact. themselves
not from the tissue
they are specific
and non-cryst,
do not form salts

with acids &
may be produced

and non-cryst,
do not form salts

with acids +
may be produced
in artificial culture
medium even tho
it does not contain
albumin

a g glutination
involves the clumping
of B, + the cessation
of movement, which
is due to a specific
substance produced
in the diseased body.

These substances
are called agglutinins
They seem to be closely
related to the
fibrinogen + globulins
They resist drying.

their activity is
diminished by heat-
ing to 60°C . but
not destroyed
until 80°C is reached.
Quite a large no.
of Bact. seen to
have the power
of prod. agglutins
when inoculated
either accidentally or
intentionally.
Advantages taken
this as in the Widal
reaction,
A bacillus, of
known typhoid
Bacilli is made

+ incubated for
18-24 hrs.

12 bacilli fls made

+ incubated for
18-24 hrs.

A few drops of
Blood from the
suspected case is
drawn into a
tube allowed to
clot, a drop of the
serum is blown
into a dish + fifty
times this amt. of
typhoid culture is
added + mixed
A drop of this mixture
is mounted on a
Kang drop slide +
examined with the
 $\frac{1}{7}$ lens. if the reaction
is positive within

60. minutes the bact.
will cease their
motion and gather
together in clumps
or groups & cease
their motion.

After release the
reaction will
occur. If it does
give reaction at first
it is liable to cause
a relapse.

A similar react.
may be obtained with
dead cultures of
typhoid bacilli.
A similar method
is used in the
diagnosis of dysentery

caused by the Bacillus
of Shiga

of animal method
is used in the
diagnosis of dysentery

caused by the Bacillus
of Shiga

Bac. may also produce
dysentery. May
do this in 4 ways
1st By products of
toxins or poisons
2nd By the mechanical
irritation of their
presence. 3rd way
by the absorption
and destruct. of
important substances
needed by the body.

4th By stopping up
important passages
nodes of entry.
1st Throught the
natural channels

as alimentary
canal, Desoglycus.
+ through the joints
injury apparatus.
+ through wounds.
320 may get in
through the unbroken
skin by different
glands.

On the unconscious.
They may get in
thru the gland openings
The Koch's postulates
These were form-
ulated by Koch
as guides for the
determination of the
pathogenicity of
micro organisms.

With in the tissues
or fluid of the

pathogenicity of the
micro organism,

With in the tissues
or fluid of the
diseased individ-
ual, a definite caus-
ative micro organism
may be found.

2nd This organism
must be isolated
in pure culture
and by successive
inoculation - prove
uniform in character-
istics.

3rd By inoculation
into previously healthy
individuals suscep-
tible of the disease
in question the definite
symptoms of disease

must be produced
4th From fluid
or tissues of
the individual
the organisms
must be isolated
and proven the
cause as the
one inoculated
5th By every possible
means try to produce
the same disease

Bact. OCT 24th 06
Scheme for identi-
fication of an unknown
1. Make a record of the
source.

2. Isolate in pure culture
3. Inoculate into.

Source.

2. Isolate in pure culture

3. Inoculate into:

1. Agar - by means of
stroke stab + plate.

2. Ditt's gelatine: stroke
stab + plate.

3. Plain Bouillon.

4. Milk - plain + litmus.

5. Peptone sol. - plain -
rosolic acid - agar sol. in
fermentation tubes.

6. Blood serum - plain
- Loeffler's.

7. Potato.

8. Special media.

4. Description of these
colonies.

5. Staining from various
colonies.

1. ² Ordinary stains,
2. ² Gram's method,
3. ² Carbol-fuchsin +
Gobberts Blue,
4. ² For spores,
5. ² For flagellae,
6. ² Examination of hanging
drop preparation,

7. ² Compare with scheme.
Chester's Determinative Bacteriology
Specific Microorganism
I. Cocci.

1. Micrococcus. Is a
spherical microorganism.
reproduce. by direct
cell div. Non motile
Has no flagellae. +
usually occurring in 1-2 or

irregular groups.

1. Micrococcus Pyogenes

usually occurring in 1-2 or

irregular groups.

1st Micrococcus Pyogenes
Amens. Very frequent,
called, Staphylo. coccus.
This organism is most frequent
cause of pus.

General characteristics
non motile.

non flagellate,

non sporogenous,

Liquefying, Chromogenic,
Pathogenic, Fr. a cult-
ative Anaerobe, from

7/10 to 8/10 of the Indian

Its optimum temp. is

37°C

2nd Staining

stains by all ordinary
lab. stains

also by Gram's method
thus distinguishing it
from gonococcus.
3rd Cultural Charact.
1 Gelatin plate cult.
small irregularly
rounded colonies
yellow in color,
pink slowly into
platin in a panacea
shape liquefaction
These colonies may
be brown with
a coarsely gran. center
& finely gran. border.
The deep colonies
are round or lens
shape, with the

border almost entire,
Gelatin stab cult.

shape, with the

border almost entire,
Gelatin stab cult.
Signification in two
to 3 days. At first
sac-like. Later cylindrical.
The contents are grayish
white, cloudy with a
yellow ppt.

Again, plate cult.
The surface colony
is round may be
4 mm across,
Orange yellow in color
faintly glistening & raised.
Smaller Deep colonies
are smaller & round
a lens shape.

Again stab cult.
ppt. Filiform later.

beaded, surface
growth orange yellow
Bonillon, uniformly
turbid, may be a
delicate scum on
top. A moderate
amt. of sediment
milk, curdled with
a product of acid,
Ingen soil, no gas
Potato, grows well
in three or 4 days deep
orange.

4th Distribution

It is widely distributed
on the banks of
the Kan in woods
with pine formation

Usually does not
occur in the

with pus formation

Usually does not
occur in the
air unless recently
contaminated.

2' m. *Pyogenes albus*
3' *Citrus*

are like the above
except the colonies of
the *albus* are white,
and, of the *Citrus*
are lemon colored,
the *Citrus* seems
to be less virulent,

4' m. *Epidermidis albus*
Import. of this one
is that it may produce
pus, & often lies
in the deeper layers
of the skin where

it cannot be reached
by dissection
5th Dr. Tetragenus
This is not a pathogen
is organ. But it
occurs frequently
in tuberculous cavities
& in the sputa of
such patients.
It occurs in groups
of four.
Each individual
of which is 1st in
diameter
& group is surrounded
by a capsule
4th Dr. Gonorrhea.
Called also Gonococcus.

This is the specific
Cause of Gonorrhea.

Called also Gonococcus.

This is the specific
Cause of Gonorrhea.
Gonococcus character
is a biscuit shaped
diplococcus. Non-motile
Non-sporogenous. Non-
liquefying. Non-flagellate
, Acids, gas, pathogenic
organism. Pathogenic
for man only.
The pair of them are
from $9/10$ to $1\frac{5}{10}$ μ
long by from $6/10$ to
 $8/10$ μ wide.
Staining. By ordinary
methods of Giemsa and
methylene blue +
also Carbol Thionine
are good.

Wright's Blood
stain is alright
for thin smears,
Gram's method is
negative

Points in diag-
nosis:

Always prepare
two slides of the
secretion, or if
only 1 slide break it
into 2. The first
slide is stained
by some ordinary
method, exam-
ined with oil immersion
lens, & exam-ined

for biscuit-shaped
gonococci, with

lens. & exam 20

for biscuit shaped
gonococci, with
flat sides, together
lying in pairs.

Second slide is
stained by Gram's method
when these organs
fail to show,



Gram's method will not
stain the gonococci.

ITS occurrence

It occurs in gon
orhea all through
the case but most
typically in early
stages.

Later on it is
obscured by the
other organisms
Is hardest to diagnose
in vaginal secretions
Difficult to recognize
in urine, In
the latter some
of the sediment is
pipetted smeared
on a glass slide
dried in the oven
or cautiously over the
flame, after which
it is fixed well 5
or 6 times through
the flame,
Anteural characters

It grows only on
human blood serum

Intelligence characters

It grows only on
human blood serum
as a rule or pleuritic fluid
but best of all in hydrocele
fluid. On this it
shows as transparent,
gray oily deposits
looking like human
Strepto Cocci.
These are spherical
organisms, dividing in
one direction &
remaining together to
form short or long
chains

General Characteristic

~~It is a non-motile~~

Strepto Cocci / pyogenes
Is non motile

non flagellate
non photosynthetic,
non lignifying
facultative anaerobic
pathogenic cocci
arranged in
chains, these chains
are best seen when
grown in fluid
media, the individ-
uals are from $\frac{1}{10}$ to $\frac{1}{16}$
in diam.

Staining
It stains well
by ordinary methods.
It stains well
by Grams method
Spectrum 37°C,

Cultural characteristics
Gelatin stab,

Spectrum 37 C,

Cuticular characters
Gelatin stab,
minutely beaded
along the line of
penetration and liquef-
action
agar stroke,
infinitely round
transparent dew drop
like colonies, not
coalescing,

Blood serum
Like the agar,
Rotato. Scout
minutec growth.
Bouillon, medium
fairly clear with
minute floculi
milk soon

can be dead & later
digested.

Toxicity & Pathogen-
icity.

As a rule it is very
virulent.

It may cause a local
erysipelas or a wide
spread & rapidly
spreading inflammation of
subcutaneous tissue
(cellulitis).

When this organism
is the cause of acute
peritonitis the case
is usually severe
& rapidly fatal.

3. *Sarcina*

4. *Planococcus*.

3. *Sarcina*

4. *Planococcus*.

5. *Planosarcina*.

II. Bacteraceae

1. *Bacterium*.

Bact. as a generic term means a non-motile non-flagellate rod or cylindrical organism.

14 *Bact. Anthracis*.

General Character,

A non-motile non-flagellate.

Sporogenous.

Requiescing.

Non-chromogenic.

Pathogen.

Aerobic

Rodded organism

from $3\frac{1}{2}$ to 10μ long,
1 to $1\frac{2}{3}\mu$ wide
with a tendency to
form long chains
or threads whose
individuals have
round or square ends
Spore formation
common & spore in
the middle of adult
and does not swell
the organism

Bact. anthracis

Lecture Oct. 25th 06,

Staining prop -
Stains well by Gram's
method & ordinary lab.
stains

Cultural charact:
Gelatin plates are:

stains

Cultural characters
gelatin plates are:
the most characteristic
thick surface
first as small
grayish white dots
which liquefy gelatin
later edges of colonies
curl out like tufts of
wool. (flocose.).

The fact lying in parallel
lines

Gelatin stab,
grows best on the
surface. The line
of punctum arborescent
The liquefaction is
irregular
Later on the whole
medium becomes liquid

(stratiform), & the
cultures ppt as a
sediment.

Agar Plate,
surface colonies are
irregular in shape
margins floccose,
the center is yellow
& finely granular.
Agar stab,

Line of punct, arbores-
cent Bacterial

Grows best on the
surface forms a thick
pellicle on sides
of tube. If shaken
kips this ppt,
but a new pellicle
forms.

Potato

Turn grayish white

forms,

Potato

Full grayish white
with a waxy border.

Sugar soft
No. 1 gas

Milk
curdled, later digest
without change in
reaction.

Pathogenicity
Is specific phase
of anthrax. Charbon
Malignant pustules
or wool scours disease
It is common in
cattle & sheep.

Modes of entry,
Through respiratory
tract & alimentary
tract or through

wounds,
When swallowed
adults are probably
destroyed by gastric
juice but spores
pass on to the
intestines, where
they develop, later
penetrating into
the blood vessels
& scatter through the
body

Two types in
man.

1st malignant pustule
it becomes infect.
This on abrasion
in a few hours is
a red painful spot

Then a small blister
filled with bloody

In a few hours it is
a red painful spot

Then a small blister
filled with bloody
serum. Then rapidly
spreading hyperemia
& then edema

If disease is not
checked these facts
get into the blood
& cause a general
infection.

2nd Form is where
inhaled into lungs.
Runs a course pract.
identical to lobar
pneumonia, is
almost surely
fatal.

Protect inoculations
against anthrax

Have been successfully
carried out
reducing the mortal-
ity among animals
from 18% to 0.5

Family of Bacilli
II Bacteria

A bacillus is a rod
shaped or cylindrical.
Microorganism, motile &
possessed of peritrichous
flagellae

1st Bacillus typhosus
Genus Chagas,
a motile, flagellated

non sporogenous
non flagging

amorphous, flagellated
a motile, flagellated

non sporogenous
non budding
non chrysozoenic
aerobic

It acquires an aerobic
pathogenic rod-like
organization.

Measures from .5 to .8 μ
in width by from
1 - 3 μ in length.

It has from 8 to 20 long
peritrichic flagella
& is very rapidly
motile.

In young cultures it
frequently forms long
filaments.

It stains readily
by ordinary methods.

but is decolor. by
Gram's method
Cultural character,
Gelatin state
Line of punctiform
surface is thin grayish
white transparent rounded
later extending to side
of tube.

Gelatin stroke
white, thin, spreading.

Gelatin plate.

Surface at first
small, slightly yellowish
punctiform
In a short time
rounded or lobulated
& shining.

Magnifying: the periphery
is clear transparent.

magnifying; the periphery
is clear transparent &
& gray. The center is
white & opaque. The
colony may be slightly
elevated. The deep
colonies are peritrichous
later rounded &
yellowish. Agar slab
like that in gelatin
agar stroke,
moderately spreading,
grayish white.
Agar plate,
surface colonies
and irregular rounded
grayish white things
& raised.
Magnified, are

rounded margins
entire bright
yellowish becoming
darker towards
center & gran,
Deep colonies are
punctiform & gray
magnified are round
or lens shaped
Border rough or smooth
brownish yellow
some what opaque
& finely gran,

Barillon is uniformly
textured much sediment
which can be disturbed
by shaking, and undoc

thick red coag.
Potato

by shaking, and undoes

thick hot coag.

Potato

a very delicate
most invisible
spreading growth.
Sugar spots.

No gas.

Special media,
Gelatin

with 103 to 105

of carbolic acid
which permit their
growth while
restraining most patho-
genic bacteria.

On Elmer's potato
medium. While the
bacillus coli
occurs in 24 hrs
as moist brown.

colonies. The B.
typhosus occurs
in 48 hrs as small
white dew drop
colonies. Distribution
of organism
Inside the
body it occurs in
H&D + soil contam-
inated by excretions
from a typhoid
patient. It also
occurs on the
bedding + dishes,
It never occurs in
a healthy person,
In the diseased
person it occurs

in the blood +
various organs

person it occurs

in the blood &
various organs
in the urine, in
the feces. Its chief
site of growth is in
the small gut,
especially about the
Peyer's patches,
& late years it is
believed that flies &
other insects have
much to do with ^{transmission}
typhoid. These
flies lighting on excreta
from typhoid patients
& then on cold food

B. coli

General charact
a motile

flagellated - non
proteogenic,
fractitative anaerobic
non chromo,
non liquefying
aerogenic,
sophrophytic &
at times, path. rod-like
organism,
from 4 to 8 μ wide
by from 1 - 3 μ long
has from 4 to 12
peritrichic flagella
actively motile
but less so than
the typhoid,
stains by ordinary
methods.

decolorized by Gram's.
Cultural charact.

method.

decolorized by Gram's.

Artificial Charact.

Gelatin & agar
like typhoid only

Brougher,

Banillon: a delicate

2 curm may form,

It produces much

invol. other wise

it is the same as

typhoid

Shiga bl. produces

much less especially

in glucose.

22

Don't know

Good culture by mobile

Waggle

Charles Pratt, Jr.

De la

Davidson

Grasse Boulton

will

Indult paid

of the same kind in
of the same kind in

Replutinal

Phorminera

12. 10. 1904

Very obliquely insulate

2-20-19

2/28/51 36-48 and male
to 155 1/2 long minute before

To Eliza's head invaluable
opening them,

Deep rivers - beautiful growth
with lovely white flowers

Given in pursuance of my power

does not care for family

newer products from

Blue, medium surfaced

*to see my last made with
brown ink black*

B Dysenteriae a

B. of China

B. Dysenteriae or
~~*B. of Shiga*~~
General Character
a motile flagellat-
ed non sporoglu,
non liq. facultative
anaerobic, non
chromogen,
non autogenic
pathogenic organ.
rod-like.
about size of *B. typhosus*
feebly motile. No. of
flagellae questionable
stain readily by
ordinary stains.
Decolourised by Gram's
Cultural character
gelatin plates.

In all regular
round dew drop
gelatin stab,
beaded dot not
liquefy, again plate,
light, bluish white
rounded moist invol-
utional forms in
48 hrs
Potato culture
1st 24 hrs invisible
later becomes
yellowish brown
then forms a thick
brown pellicle,
Bouillon,
Uniformly turbid and
same.

hilk', not curd,

salmon

milky, not curd,
moderately acid,
sugar sol,
no gas, a young
culture in bottles
with a glutinate
with blood from
a case of dysentery
just as the test
Widal's reaction ⁱⁿ pond
Pathogenicity,
claimed by Shiga
to be the cause of
dysentery & it is
possible that in
amoebic dysentery
that the amoeba merely
serve to carry bacilli
from one patient

to another,

It has been
claimed to be the
cause of summer
diarrhea in infants.
There are the so-called
colon group of bacilli,
B. Tetani

Is specific cause
of lock jaw.
General character,
a motile flagellated
spore forming, liquefying
obligate anaerobic,
non chrom.
Toxic, Pathogen,
rod shaped organ. of
the soil.

Is stained by ordinary methods
& grows.

rounded organ, of
the soil.

to stain by ordinary methods
& by Gram's.
Its special character
- is the frequent appearance
of a rounded spore,
swelling to & causing
it to look like a tennis
racket, in the middle
of this end you can find
spores, 

Grows 0.3" wide by
1-4 long
Cultured Character.
Gelatin stab
grows only at the
depth of stab -
It is odorless.

Liquefaction in 2 weeks
growth is more
rapid when glucose
is added to gelatine
agar slant,
Looks the same
only grows slower,
Growth in the
medium it has a
central nucleus,
with many off
shoots, f

Bacillus

Turbid chiefly
toward the bottom
some sediment
a peculiar charact
er.

Vital resistance
due to a quickly

Adon,

Vital resistance
admits and quickly
filled. But the spokes
may be dried for
many years in
soil & get live,
5 lb carbon sol.
does not fill in 10
hrs. but if you
add HCl it will
fill in 2 hrs.
1-1000 H₂O
pieces in 3 hrs.
but if 0.5 HCl be
added it will
fill in 30 min.
and destroyed in
streaming. Stop in
15-20 minutes.

Toxin is very virulent
Is identical in chemical
composition and poisonous
effects with streptococcus
of 1-1000 of a cc of
a virulent bacterial
culture will kill
a guinea pig.
Pathogenesis -
Is a highly toxic
organism. The
organism in its life
is never distributed
throughout the
body but remains
localized at site of
inoculation
where the toxin is
produced & carried

to other parts of
the body. Its chief

where the toxin is
produced & carried

to other parts of
the body. Its chief
effect being upon
the cord & nervous
system.
An antitoxin
has been produced
but as a curative
agent is not reliable
however it is
extremely valuable
in minimizing the
expected sequelae
& should be used
in all very dirty
puncture wounds.
Distribution
25 cc cross used
spread in manner

+ good example
T. flammus more
liable from a
rusty nail than
a smooth one
because it has
more dist on it

Lecture!

Oct. 26th 06.

Treatment of nail
rust wounds open
up the wound &
cauterize it with pure
carbolic acid, or pure
 HNO_3 acid.

Pseudomonas
minimorum
We mean a motile
rod shaped or cylindrical
organism

single flagellum at
one end.

rod shaped or cylindrical
organism

single flagellum at
one end.

Ps. Pyocyanea.

~~*Myxobolus*~~
Is the cause of blue
or green pus.

Gen. charact

A minute slender, act-
ively motile flag,
non spor.,
chrom.

Facultative anaerob-
liquefying gelatin path.
in. arg. am., 1 long
flag at one end.
3/40 μ wide by 1-2 μ
long.

Stains by ordinary
methods, Discovered by
Grams.

Cult Char.
Gel. plate.
Surface colonies are
small irregular
slightly green sinking
into gelatin,
Microscopically colonies
are rounded, are
gran. At times with
filamentous margins
Gel. stab.

Liquefact. crateriform
Agar stroke.

Grows well bright
green color
changing to deep
bluish green. The
color dissol. in
the medium

Bouillon
Turbid. Greenish

Color dissol. in
the medium

Bouillon
Turbid. Greenish
on top. This occurs
Potato; grows
well green later
brown.

Milk, coag, acid,
Digested
Color product,
sol. in CHCl_3 , only
slightly sol in $\text{C}_2\text{H}_5\text{OH}$
 OH does not produce
color in absence of
 O_2

III Spirillaceae
1st Microspira.

Is a curved or
comma shaped
organism.

Has 1 or 2 flag. at
both ends, 2 motile
1 $\frac{1}{2}$ μ , comma,

The specific cause
of Asiatic Cholera,
Gen. charact,
A motile, flag,
non, spor. Slightly,
non Chron. Flagell
tative anaerobic

curved a comma
shaped organ,
a single flag, at
each pole.

$\frac{4}{10}$ μ by 2 μ long.
In oldt cult. many
evolutional forms
including long wavy

Spirillae, & other
forms difficult to

Including long way

spirillae, & other
forms difficult to
recognize.

If planted on fresh
cult media develop
typical colonies.

Stains by ordinary
stains decol. by
Grams. Stains espe-
cially by carbol fuchsin
diluted by 10 parts of 20
Custard. Char

Gel. plate

Small, yellowish
white rounded sinking
slowly in the gel,
which erodes & leaves
a saucer like depression
in which there

may be concentric
arrangement
Microscopic,
colonies are translu-
cent coarsely gran-
ular translucent,
gel. state,
cupiform or hemi-
spherical liquefaction
later striated.
Agar plates,
surface colonies
fair sized whitish
brown moist
glistening entire
edges. Translucent
coarse granular.
Deep colonies, one
rounded in 3 or 4 days.

show a brown nucleus
with grey periphery

deep colonies, one
rounded in 3 or 4 days

show a brown nucleus
with grey periphery
Blood Serum,
Dissolved
Bohrillon
at first turbid.
Saker has a wrinkled
fragile skin,
liquid is almost
clear,
milk nearly always
curdled in 2 days at
37°C. with just
of acid,
B state.

Very acid no
growth. if slightly
acid, mnts break
a dirty white spreading

growth
Peptone sol.
produces much
indol + nitrites
Gives rise to the
cholera red reaction
Sugar sol.

No gas,
Habitat, occurs
in intestines & feces
of cholera patients.
Charact. of Asiatic
chol. feces is thin &
watery looks like rice
cups in them.
It occurs rarely
in the blood of some
of these patients.
Gotten from water

milk + vegetables
immunization

gotten from water

milk + vegetables

immunization

By inject of attenuated
colonies, one can
immunize a patient
to cholera. This
having been done
in India China +
various Eastern
countries this reduc-
ing mortality very
greatly.

IV Major Bacteriaceae

1. *Mycobacterium*

1. *Mycobacterium*

diphtheriae = Klebs

Löffler Bacillus

is specific cause
of true Diphtheria

General char,
A non motile
non spore,
non flag,
Chrom,
Signifying
aerobic
parasitic,
Pathogenic
Toxogenic,
Stains by ordinary
methods. Stains
well by Jefferies
Blue Stains by
Grams method
 $\frac{2}{10}$ Δ , μ wide
by from $1\frac{1}{2}$ - $3\frac{1}{2}$ μ
long.

Has a slight
curve with rounded

Has a slight
curve with rounded
or clubbed ends
with occasional
branched forms
slains irregularly, at
times, almost simulat-
ing streptococci

Does not form in
chains,
grows best in O
at 37°C ,

quiet chain,
gelatin
not charact,
as it grows very
poorly at room temp
no liquefaction
agar,

grows best when
1% Glycerine has
been added
Deep colonies are
round or oval &
gray. Surface
colonies grow slowly
are more translucent
white and dirty yellow
moist, elevated,
at times may show
elevated centers
with a flat surround
ing zone with
imperfect edges
On Sloffers Bld
medium. In from
12-24 hrs at 37°C

rather large china
white convex moist

12-24 hrs at 37°C

rather large china
white convex moist
colonies, somewhat
opaque,

~~Bacillus~~

a distinct whitish
gran. mass,
very brittle & falls
easily when shaken
the rest of bottle
usually clear,

potato in acid.

no growth. If alk
a delicate glistening
film same color
as potato.

milk, not coag.
react. amphoterie
Indol. is prod. in

milk in about 7 days
Sugar sol; no gas
Habitat

It resides in the
false membrane
of true diphtheria
usually about month
hard pharynx, tonsils
& Trachea.

Rarely goes deeper
than false memb.
Does not go into
the blood.

Bacteriological

Diagnosis

1st sterile swab
+ 3 tubes of Loeffler
Blood serum

Insert the swab
from false memb -

3 pieces of swabs
Blood serum

Infect the swab
from false memb -
+ smear this on
tube no 1. no labeling
it

Infect a sterile case
from the surface
of no 1. + smear it
over the surface
of no 2. Sterilize
the case infected
from the surface
of no 2. + smear
it over the surface
of no 3.

Inoculate all the
tubes at 37°C .
On the surface of
tube no 3. the colonies

will be so separated that you
can pick out
characteristic
colonies
Stamps should
be made from
various parts of
3 tubes by Loeffler's
blue + by Brown
method. Each
 $\frac{1}{2}$ inch long
for charact, thin
or wedge shaped
or irreg. stained
microorganism.

Diphtheria antitox.
Is first antitox.

to be used clinically
in combat. a fact.

Dysphtheria antitoxin
Is first antitoxin.

to be used clinically
in combat, a fact.
disease. It has reduced
the mortality
from 35% of deaths
to 7% of all cases.

If you give repeated
smaller doses of antitoxin
it develops a toxin that
combats the antitoxin.

An antitoxin unit
is ten times the
least amount of antitoxin
which will protect
a 300 gram guinea
pig against 10 times
the minimum fatal
dose. Dose for a
2 year old child

Is not less than
500 units & best a
1000 given at once

This Antitox, should
be given in the
laxative times of the
pectorals or into the
back between shoulder
-er blades

Give large doses
at infrequent intervals
to prevent. Anti, anti
toxins

Unfavorable effects
of antitox
1st Erythema may
develop

2nd an abscess is
nearly always due to

develops,

2nd an abscess is
nearly always due to
improper administration
2nd very rare
cases thrombosis
has occurred,
by the 2nd still rarer
cases tetanus is pro-
duced.

The antitoxin is
produced in the
serum of a horse by
successive inoculations
in increasing doses

of a 7 to 10 day Bouillon
day culture of diphtheria
which has been freed
of the organ by passing
through an unclotted

porcelain filter
at the end of several
months the blood
from the horse is
collected in sterile
tubes, gas filtered
+ kept in sterile
containers,
Myrobacterium tubes
cultures.

Gen. Char,
A non motile,
" " " " flag,
" " " " spore
" " " " liquefying
" " " " chronic,
Distinct aerobic
acid resisting

Parasitic,
Path. organ,

Disturbance, aerobic
acid resisting

Parasitic,
Pathogenic,
occurring as a slender
rod with rounded
ends, having a slight
curve.

2/10 to 5/10 μ by
1 1/2 to 3 1/2 μ long
may show true
branching.

may stain irreg,
stains with
ordinary stains with
difficulty but when
once stained is decolor
with difficulty.

Stained by Grams,
method.

Specific Diagnostic

Stain is Carbo
Fuchsin, counter
stained with
Gabb's blue,
when so stained
this organ is red
other ^{substances} blue
cult. Charact
does not grow
well at all
on ordinary cult
medium, but
you must add
from 4 to 8%
glycerine.
Glycerin agar
slant
24 days at 37°C

a rough white
wrinkled growth

~~slough~~
2nd 4 days at 37°C

a rough white
wrinkled growth
later becoming
warty & pink
on flesh color,
with a peculiar
yeast like odor
Bled serum
In 10 to 14 days
white dry scaly, gran-
ular colonies

Glycerin Bortil,
a whitish gray
wrinkled mass
sinking easily
glycerine potato
abundant dirty
elevated growth
no indol & H₂S

gas
Note: on
all media grows
exceedingly slow
taking from 10 to 14
days to appear
+ distinct
In tubercular
spitum, +
tubercle foci
+ dust.

Prophylaxis
1st warn the patient
about the care of
the spitum, of
Tuberculosis is cured
by plenty of something
to eat.
Mycobacterium

Lepra.
Specific cause of

Very cobalt blue

Sep 1901.

Specific cause of
Leprosy.

Gen. Chan

A non motile non
plug.

Non spor.

Purely parasitic
acid resisting organ
path. for m.p.
only.

Similar in appear^{ance}
to the tubercle
organism, is shorter thicker
+ straighter stained
red by carbol fuchsin
+ Gaff's Blue.
Is being from
the tubercle, Bacilli

by washing 3 Dses,
with commercial
alcohol.

Has not been isolated
in pure culture.

But can be found
in the leprous
lesions & especially
in the mucous parts
the nose.

Leprosy is not an inherit-
ed disease.

Micrococcus pyogenes.

drug depressant,
Opium gives a full

strong slow pulse,
Chloral Hydrate gives
a fast weak pulse.
Veronal is a white
cryst. powder dose
5-10 grs never more
than 10 grs.

Sulphonal & trional
produce bloody urine,
Ry. Aclerinal Sulphate

gr. II
Trional

The fast heart in opium
poisoning is found in the
latter stages & is
due to paralysis of
the vagi

Amyl nitrite should
not be used in puerperal
convulsions.

Nitro Glycerin is a nitrate
but when the alkalinity
of the acts on it you
get a nitrite

Nitroglycerine in anaesthesia
widens out the blood paths
It is of no use as a cardiac
stimulant.

Profound prostration and
nausea are symptoms
of lobelia poisoning.

Fr. Lobelia dose 15-20m.
Sesaminum is some
times used as a car-
diac depressant,
Opium gives a full

strong slow pulse,
Chloral Hydrate gives
a fast weak pulse

Materia Medica
Quip, Nov. 26th 06,

Homatropine produces
a slow pulse.

Atropine depresses the
peripheral motor nerves.
It checks salivation by
acting on the chorda
Tympani nerve.

Cocaine + atropine act differently
in this way atropine par-
alyzes the accommodation.

You can see things at a
distance but not close.

In Glaucoma, ^{eye.} use Eserine

Bromides depress the
sensory side of the
cord.

Amyl Nitrite widens out
the blood paths and
relieves spasms.

Pharmacology

Material
Date, Nov. 26, 06.
Hemlock pine products

Carbolic acid	2 $\frac{1}{2}$ %
Formalin	2 $\frac{1}{2}$ %
Glycerin	5 %
Water	90 %
Preserving Fluid	1 %

50

Inc. 1-1000 - 36.

45.70
5.8
2.1
2.5
2.8
2.0
2.8
1.6
1.8



