Yio Chu Kang Secondary School

Science Department Programme and Subject Information

WHAT IS SCIENCE IN YCKSS?

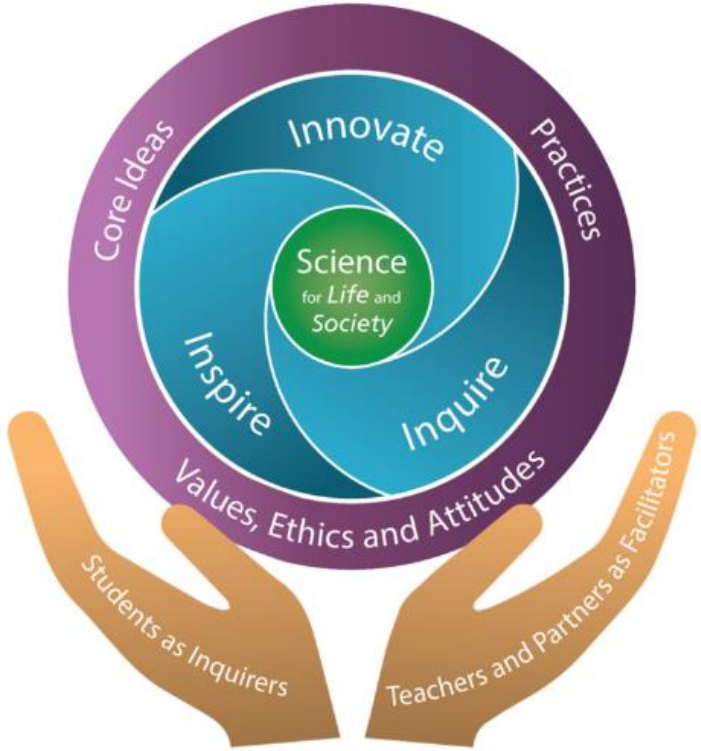
Vision

Every YCKSian to practise **scientific inquiry** and solve real-world problems both **critically** and **creatively**.

Mission

To nurture critical and creative thinkers with a life-long passion for science by fostering a spirit of inquiry and bringing real-world science into the classroom experience.

SCIENCE CURRICULUM FRAMEWORK



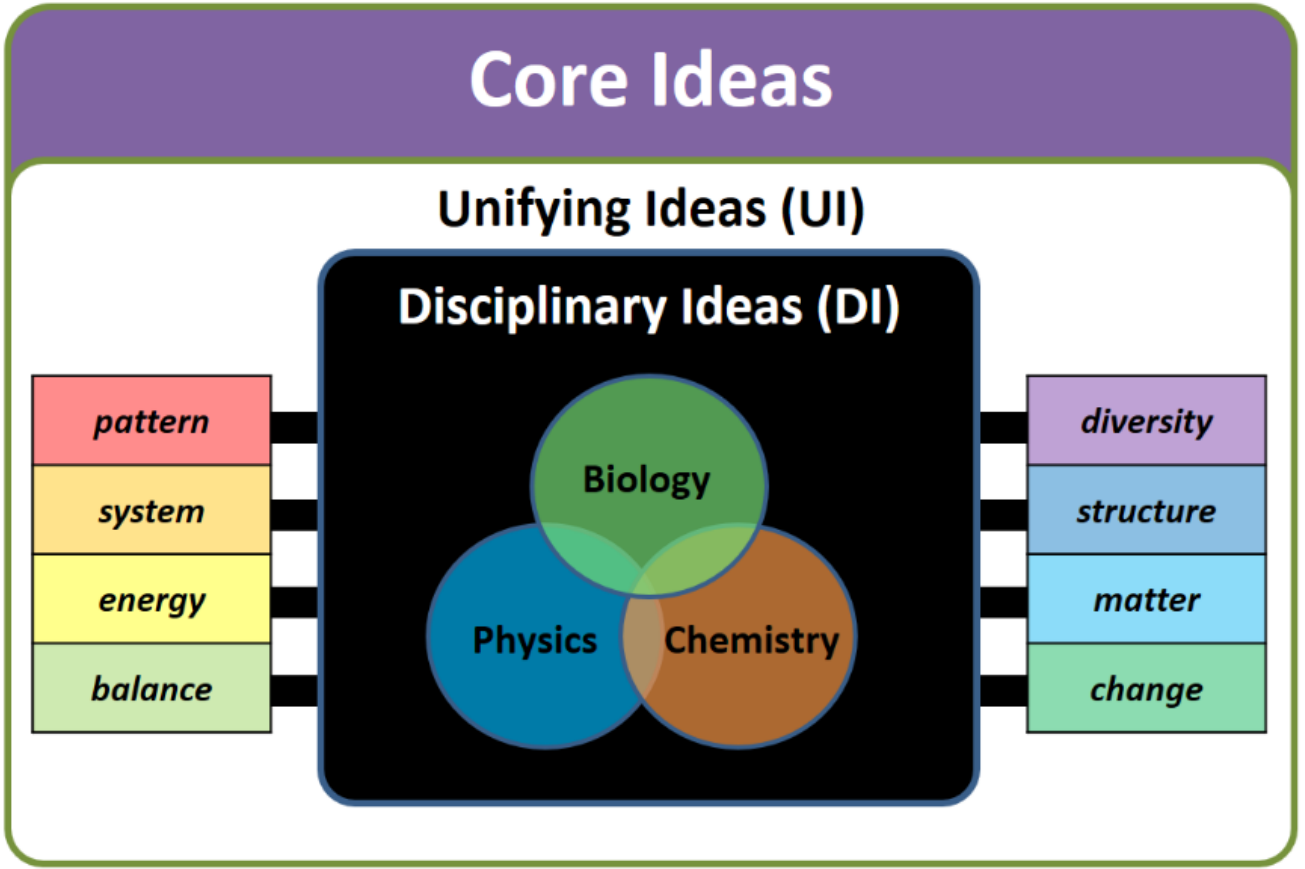
Goals
The twin goals of Science education, as represented by the tagline ***Science for Life and Society***, are central to the revised Science Curriculum Framework.

Vision (3 Ins)
Surrounding the innermost circle, the Vision of Science Education 2030 is articulated through the 3 **Ins** – *Inspire*, *Inquire*, *Innovate*.

Three Domains
The outermost layer of the framework shows three domains, *Core Ideas*, *Practices*, and *Values, Ethics and Attitudes*.

Stakeholders
The pair of hands shows *students as inquirers*, supported by *teachers and partners as facilitators* of the students' learning experiences.

Seeing the interconnectivity, coherence between three disciplinary ideas.



PRACTICES OF SCIENCE

Demonstrating WOTD		
Investigating	**Evaluating and Reasoning**	**Developing Explanations and Solutions**
Posing questions and defining problems	Communicating, evaluating and defending ideas with evidence	Using and developing models
Designing investigations	Making informed decisions and taking responsible actions	Constructing explanations and designing solutions
Conducting experiments and testing solutions		
Analysing and interpreting data		

Understanding NOS
Science is an evidence-based, model-building enterprise to understand the real world.
Science assumes natural causes, order and consistency in natural systems.
Scientific knowledge is generated through established procedures and critical debate.
Scientific knowledge is reliable, durable, open to change in light of new evidence.

Relating STSE
There are risks and benefits associated with the applications of Science in society.
Applications of Science often have ethical, social, economic and environmental implications.
Application of new scientific discoveries often drive technological advancement while advances in technology enable scientists to make new or deeper inquiry.

VALUES & ATTITUDES IN SCIENCE

DEVELOPING THE SCIENTIFIC ATTITUDE & APTITUDE

Underlying Questions:

How do we assess the scientific attitude and aptitude in our students?

How do we move beyond grades?

How can we better capture the process of learning?

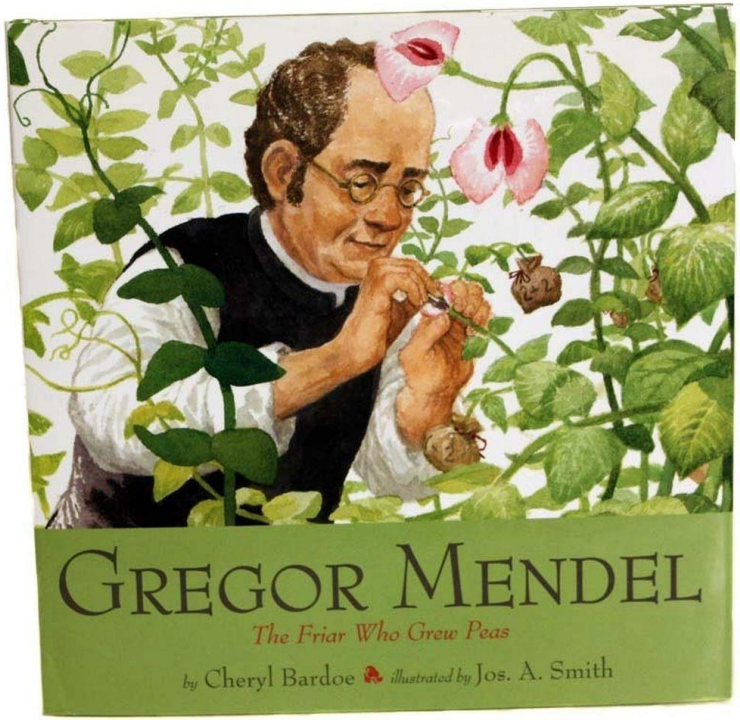
How do we allow students to have greater ownership of their learning progress?

Mendel's Garden

"Mendel's Garden" is an instructional programme inspired by a working life-size experimental greenhouse which demonstrates the applications of **vertical urban farming**.

It is named after the Father of Genetics, **Gregor Mendel**, who discovered the fundamental laws of inheritance through his work on pea plants grown in his own garden.

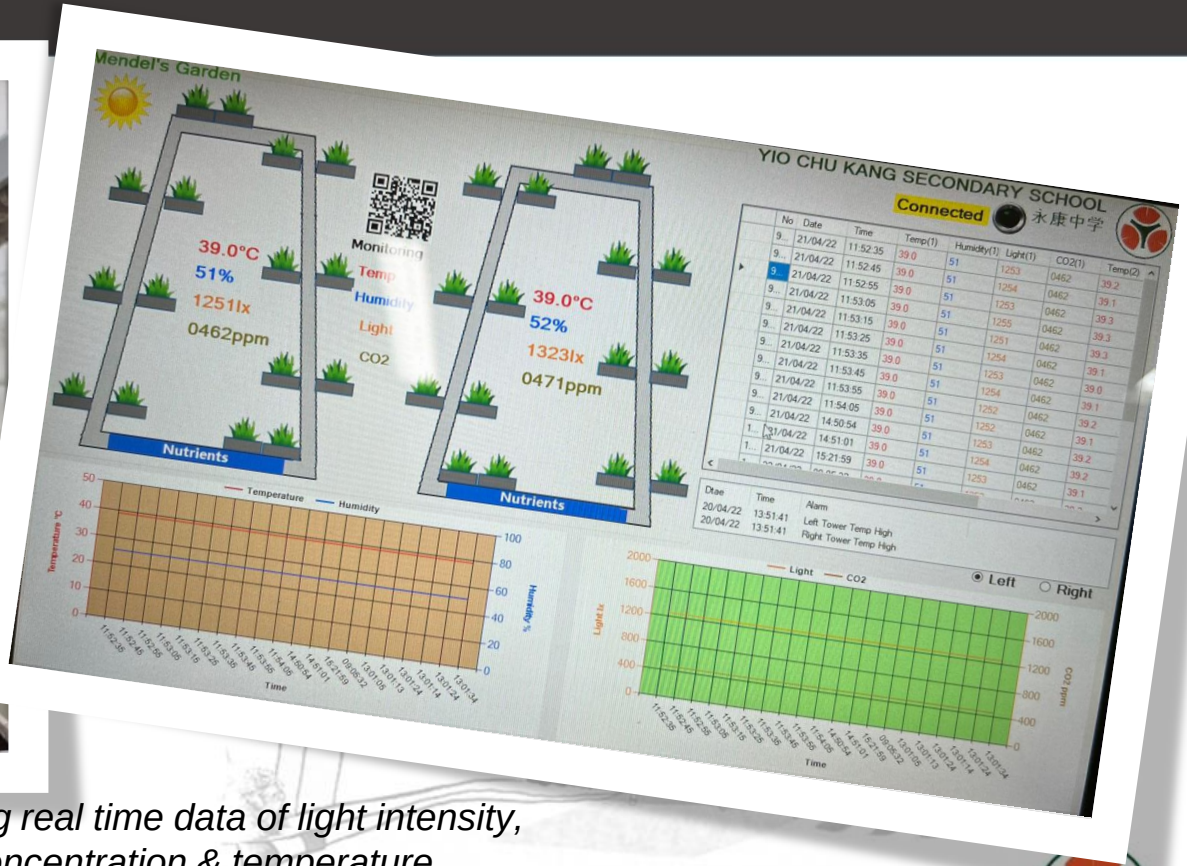
This discovery in one's own garden provided the impetus for the department to consider having its own "Mendel's Garden" where **we can provide rich learning opportunities for students to explore and experiment beyond the classroom.**



Objectives of Mendel's Garde

1. To develop independent thinking, scientific curiosity and scientific inquiry skills through **authentic learning**.
2. To provide opportunities for the application of Science concepts through real time, **hands-on experiential learning**.
3. To **develop entrepreneurial dare** in students so that they will apply what they learn and act on **developing their passions**.
4. To appreciate the efforts in **strengthening food supply resilience** given Singapore's limited resources.

Learning in a Digital Mendel's Garden

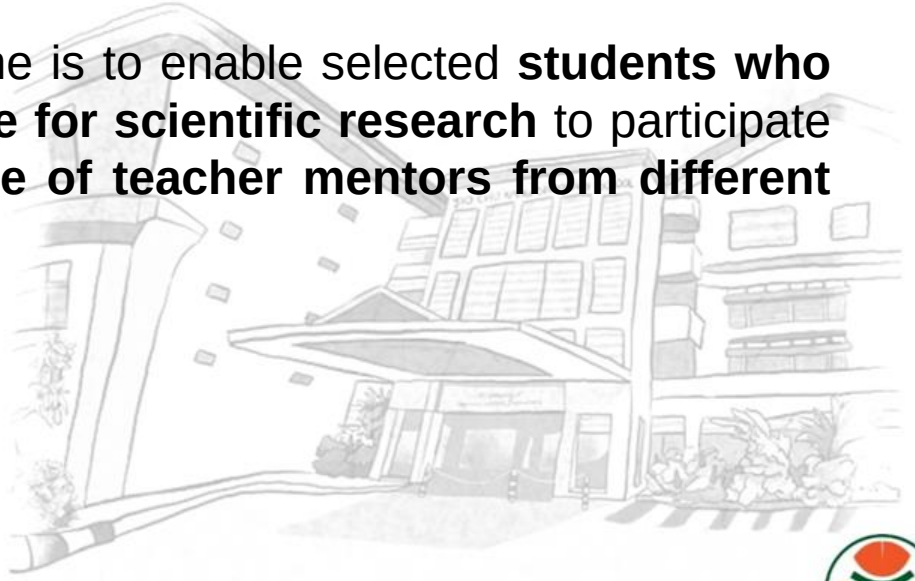


Sensors capturing real time data of light intensity, carbon dioxide concentration & temperature

Da Vinci Programme

The Da Vinci Programme is a **progressive Science Talent Development Programme** that complements the Science department's core curriculum in developing the scientific minds of our students.

The objective of the Da Vinci Programme is to enable selected **students who demonstrated an attitude and aptitude for scientific research** to participate in research projects under the **guidance of teacher mentors from different Science disciplines**.

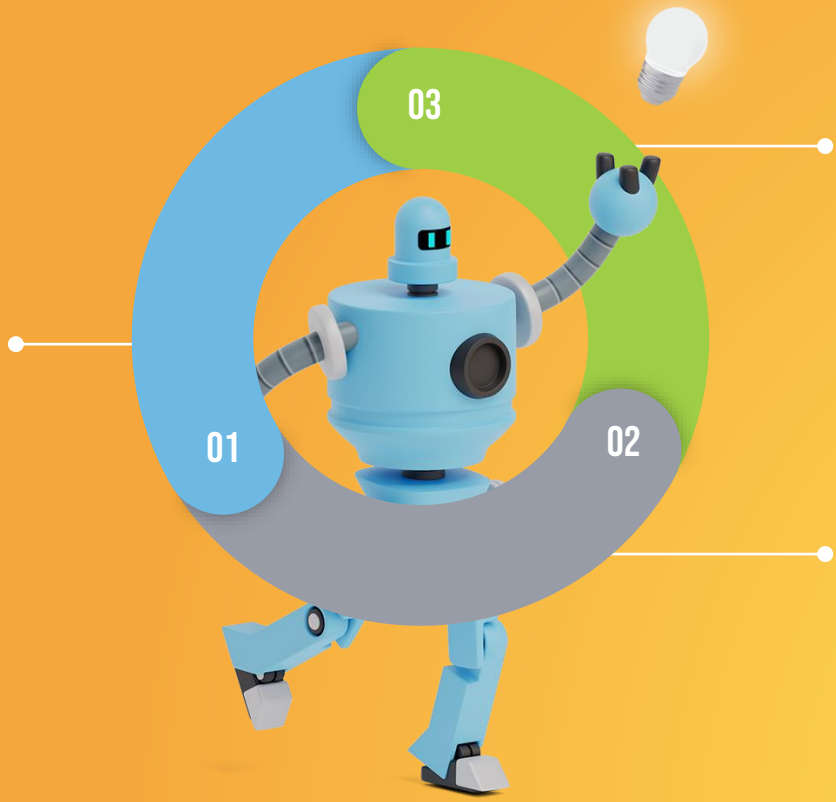


F.I.T.A – From Ideas To Action

F.I.T.A is a **multidisciplinary** programme designed to allow students to **synthesise knowledge** from various areas of learning (Humanities, D & T, Mathematics, Science) and apply it to real-life situations. Students **collaborate** with their peers and **communicate** their ideas effectively to achieve a **common objective**.

KEY FEATURES OF F.I.T.A

Acquisition of STEM knowledge and skills through real-world contexts

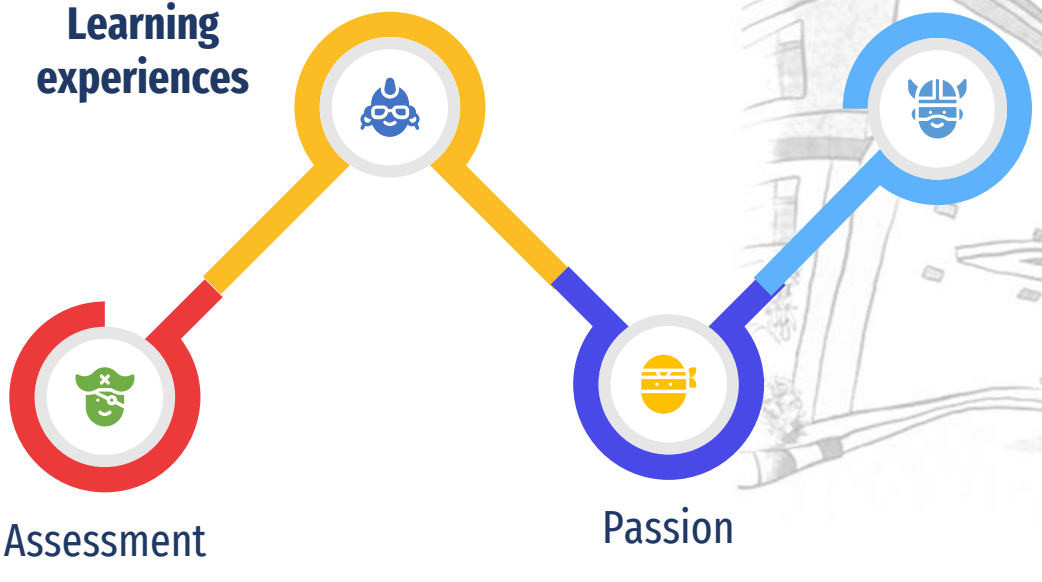


Development of 21CC skills through student-centred pedagogies with an emphasis on **Environmental Sustainability**.

Problem-finding and Problem-solving through developing empathy and integrating disciplinary knowledge and skills

SCIENCE LEARNERS' DIGITAL PORTFOLIO (SLDP)

1. To serve as an **assessment tool** of the student learning journey
2. To allow a **reflective process** for their learning journey.
3. To construct a **structured collection** of their knowledge, skills and competencies.
4. To demonstrate students **attitude and aptitude** in Science.



Benefits of SLDP

- Increase engagement and motivation levels of students
- Increase students' ownership of their learning (asynchronous and synchronous)

- This encourages:
  - collaborative learning - students work on selected KPTs using various digital tools
  - creative thinking - different modes of expression of ideas based on students' learning style and strengths
  - development of digital competencies - employ the use of different digital tools to enhance learning
  - independent learning - autonomy and choice for their personal learning experiences
  - reflective learning - better understanding of their strengths and areas of improvement as they perform the KPTs

Science Learner's Digital Portfolio - Progress

Working on Key Performance Tasks

Sec 3 Biology
Respiration – Breathing Mechanism Video

ACQUISITION

Students study information to understand critical features of a concept

PRODUCTION

Students make artefacts to articulate understanding and get feedback to refine understanding

- Students were taught the theory behind the breathing mechanism using animations and text
- Students created the Model of Lungs and created a video (with subtitles to highlight key words) to explain how the lungs work
- Teacher provides feedback for students to refine their answers/ product

Challenge by Choice

Lung Model!

You are provided with:

- A plastic bottle
- 3 balloons
- 2 straws
- Masking tape
- Scissors
- Plasticine

In pairs, create a lung model to demonstrate the breathing mechanism in humans.

Using Clips, make a video to explain the inhalation and exhalation processes. Your video should include the actions of the:

1. diaphragm
2. external and internal intercostal muscles
3. volume of thoracic cavity
4. difference in pressure

upload your Clips video above!

Pure Biology / Chemistry

Pure Physics/ Chemistry

OR

Science (Bio/Chem) & (Phy/Chem)

Combined Sciences

Candidates are required to enter for Paper 1, Paper 5 and two of Papers 2, 3 and 4.

Paper	Type of Paper	Duration	Marks	Weighting
1	Multiple Choice	1 h	40	20.0%
2	Structured and Free Response (Physics)	1 h 15 min	65	32.5%
3	Structured and Free Response (Chemistry)	1 h 15 min	65	32.5%
4	Structured and Free Response (Biology)	1 h 15 min	65	32.5%
5	Practical Test	1 h 30 min	30	15.0%

Combined Sciences Assessment Format

Paper 1	40 compulsory multiple choice items
Paper 2,3,4	Section **A** will carry **45 marks** and will contain a number of compulsory structured questions of variable mark value. Section **B** will carry **20 marks** and will contain three questions, each of 10 marks. **Candidates are required to answer any two questions.**
Paper 5	Paper consist of one or two compulsory questions on each of the two Sciences.

Pure Biology/Chemistry/Physics

Candidates are required to enter for Papers 1, 2 and 3

Paper	Type of Paper	Duration	Marks	Weighting
1	Multiple Choice	1 h	40	30%
2	Structured and Free Response	1 h 45 min	80	50%
3	Practical	1 hr 50 min	40	20%

Pure Sciences Assessment

Paper 1	40 compulsory multiple choice items
Paper 2	This paper consists of two sections. **Section A** will carry 50 marks and consists of a variable number of compulsory structured questions. **Section B** will carry 30 marks and consists of **three questions**. The first two questions are **compulsory questions**, one of which will be **a data-based question** requiring candidates to interpret, evaluate or solve problems using a stem of information. This question will carry 8–12 marks. The last question will be presented in an either/or form and will carry 10 marks.
Paper 3	A variable number of compulsory practical questions.

Choosing subject combinations

Know your child's needs and aspirations

Chemical & Life Sciences

Chemical & Green Technology

Food Science & Nutrition

Medicinal Chemistry

Molecular Biotechnology

Pharmaceutical Science

Engineering

Aerospace

Mechanical

Biomedical

Health Sciences

Nursing

Social Sciences

Chemical & Life Sciences

Chemical & Green Technology

Food Science & Nutrition

Medicinal Chemistry

Molecular Biotechnology

Pharmaceutical Science

English Language (EL1)	1 - 7
Elementary or Additional Mathematics	1 - 6
Any one of the following subjects: • Biology • Biotechnology • Chemistry • Combined Science • Food & Nutrition • Physics / Engineering Science • Science (Physics, Biology) • Science (Chemistry, Biology) • Science (Physics, Chemistry) / Physical Science	1

Choosing subject combinations

Begin with an end in mind:

Do you know

1. the subjects your child is good at?
2. your child's strengths, interests or what he or she is passionate about?
3. your child's learning style?
4. your child's dreams and aspirations?

Thank you for your kind attention!

For more information, please contact

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