

JSPS Asian Science Seminar

الندوة العلمية الآسيوية



JASS'02



جامعة البلقاء التطبيقية

Al-Balqa' Applied University

Structural Molecular Biology

Programme at SESAME



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Daresbury Laboratory, UK

Monday 28 October 2002

Greetings

Merhaba

مرحبا

μπισσα οαο

Why Do I Stand Here?

لماذا أقف هنا؟

The first Science Subcommittee Meeting, Athens, 6-7 April 2000

http://www.sesame.org.jo/events-prvs/athens_report_2000.pdf

Action 1:

Develop a full proposal for a laboratory for SMB Research at SESAME; Metaxia Vlassi and Pierre Rizkallah.

The second Science Subcommittee Meeting, Nicosia, 6-7 Dec 2000

<http://www.sesame.org.jo/events-prvs/smb-workshop6-7dec00.htm>

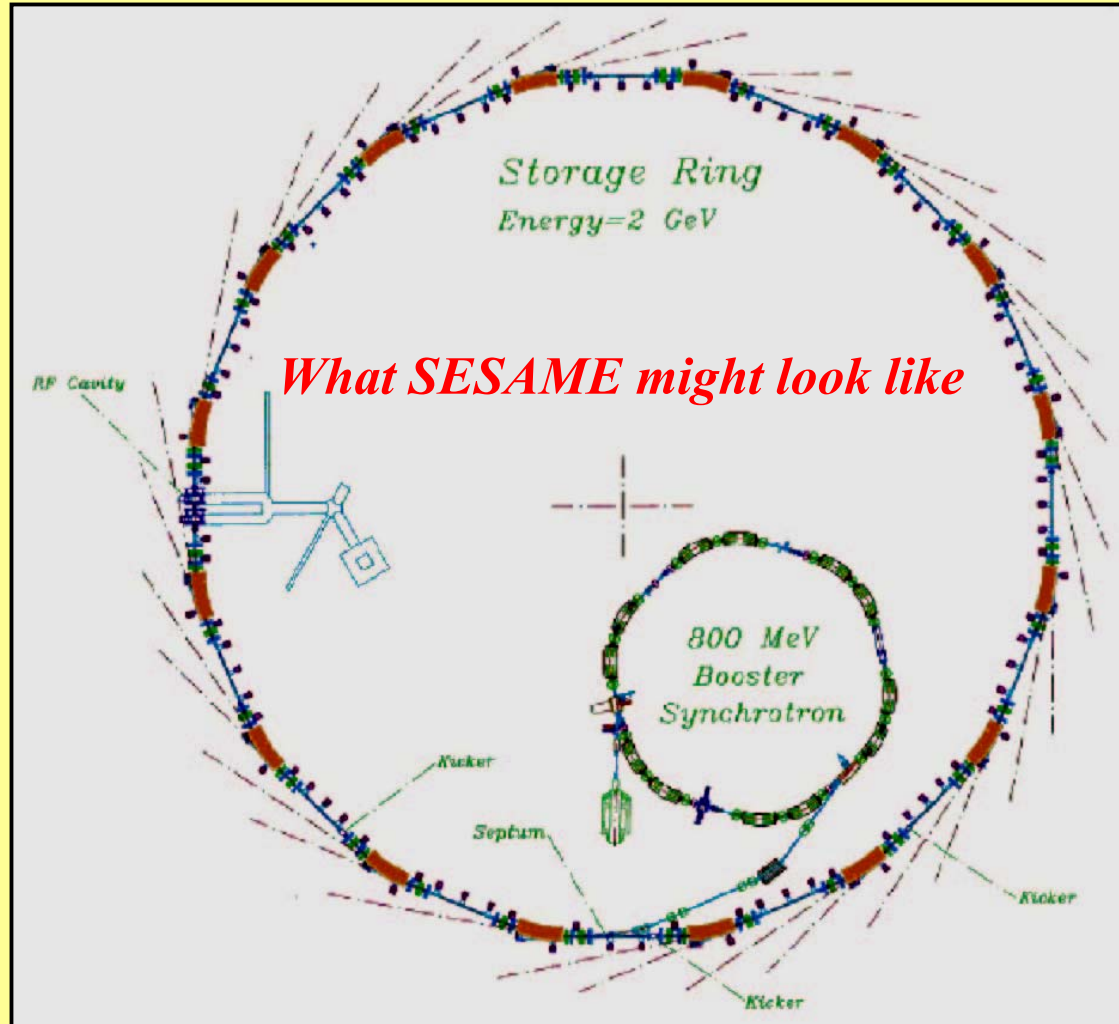
“Experience at other SR centres around the world shows clearly that such proximity of user support facilities is critical for success”

SMB First Meeting



An incredulous Ercan Alp watches a demonstration of the size of Peter Kuhn's exotic insertion device, while Pierre Rizkallah looks on in disbelief

The Vision الرؤيا



The Proposal الأقتراح

Brief:

Consultation to elicit the needs of researchers in the region, establish a plan, and make a proposal for Structural Molecular Biology activity

<http://www.dl.ac.uk/SRS/PX/sesame/wishlist5.html>

Current Status:

Structural Molecular Biology research is small and fragmented in SESAME partner countries.

High levels of skilled staff are available, but ... little ... research to address region specific problems: Health care issues, agricultural applications and biotechnological development.

Economic ability is the main limitation

... will be overcome by collaboration within the SESAME framework.

Reminder: SESAME was a 1 GeV upgraded BESSY1 at the time.

The Objectives الأهداف

The Main Objective:

'the development of the skills and infrastructure needed for SMB research' in the SESAME partner countries.

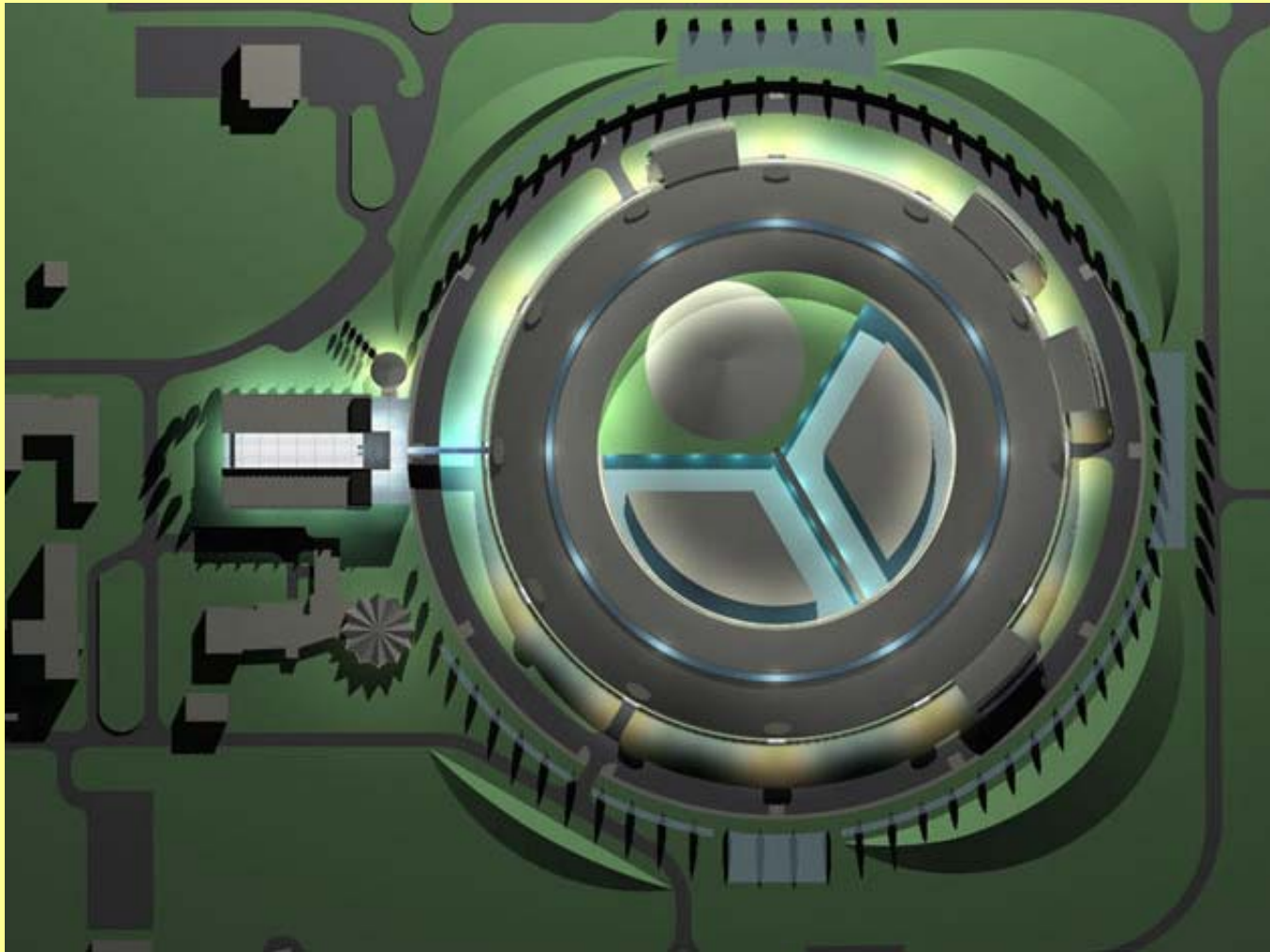
Detailed requirements:

Project initiation and Sample preparation - Structural Biology Laboratory
Data acquisition and stations - Definition of beamline facilities
Cost Estimates

Further Suggestions:

Time scales, Scheduling, Accounting, Mode of Operations, Funding

المبنى - ١ - *The Building - 1*



The Building - 2 المبنى - ٢



Case Study مثل ممیز

Zehra's Proteins:

Identification of protein of interest, isolation, cloning, expression and purification.

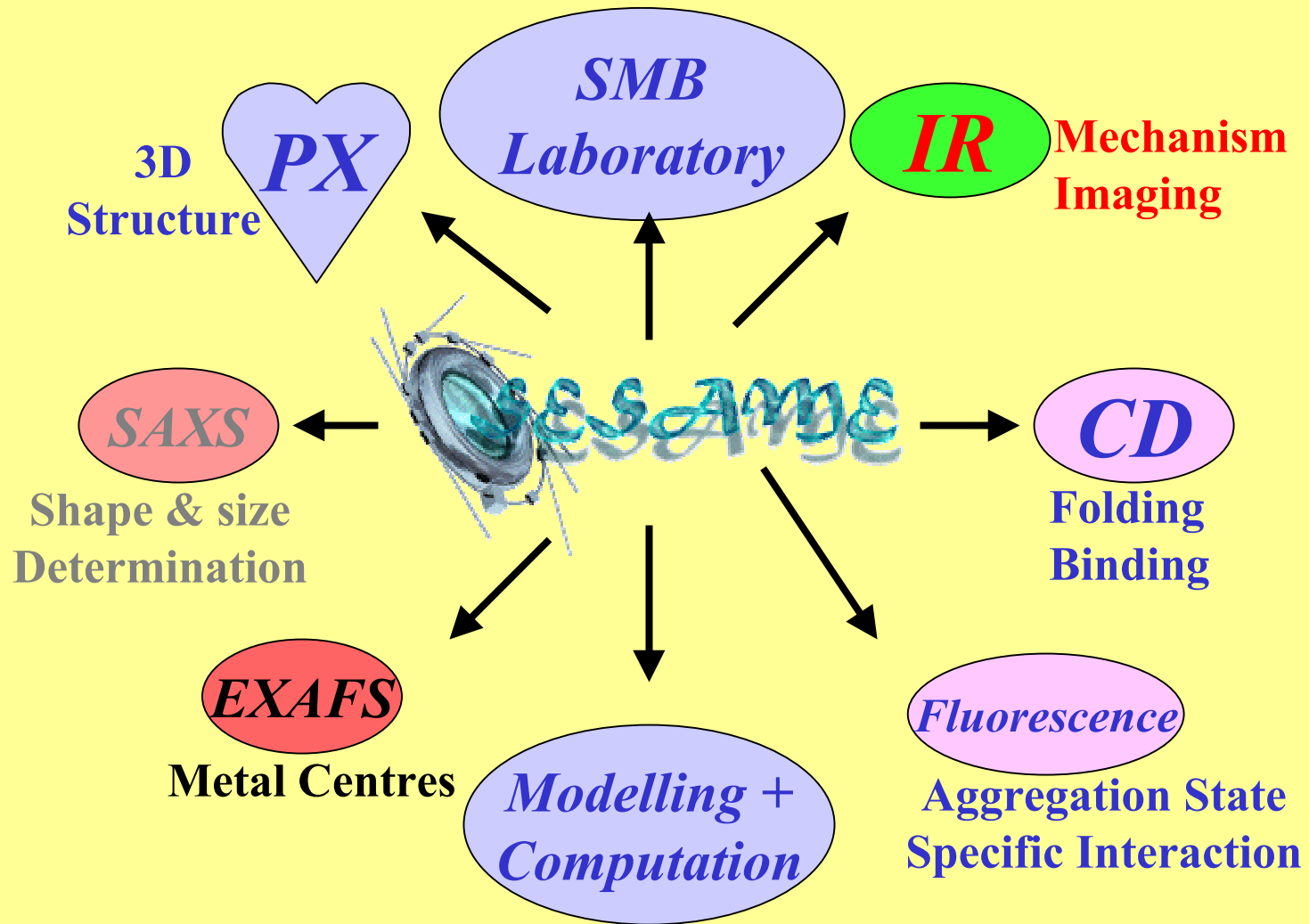
Required Knowledge:

Database searches, comparison with known structures and extrapolations into the interpretation of differences

Choice of Approach:

Techniques based on abilities, attempts to extend studies into new fields. SESAME would be the ideal partner.

Protein Knowledge معرفة البروتينات



The Biology Lab. مختبر علوم الأحياء

Containment Level 2 for genetic modifications, cloning sequencing and cell-culture experiments.

No plan to go to higher containment levels.

Basic Biochemistry equipment for protein purification, storage, and conditioning.

Centrifuges, chromatography facilities, spectrometers.

Ancillary facilities for cold storage and waste disposal.

Storage for potential despatched samples for service mode.

Genomics علم المورثات

The human genome is yielding its secrets:

30k genes, ~100k proteins.

Many other organism genomes are becoming available.

A possibility of routine genome sequencing over the next generation.

Gene products (proteins) are important individually, but macromolecular assemblies are becoming more important

The genome of a particular organism,
e.g. a snake or endangered bird.

A regional disease agent, e.g. Bilharzia

Bioinformatics الحوسبة الحيوية

The third Science Subcommittee Meeting, Istanbul, 3-8 Sep 2001

<http://www.sesame.org.jo/events-prvs/workshop3-9sep01.htm>

The workshop/school confirmed that bioinformatics and computational biology are emerging fields which could be developed in SESAME countries as a prelude to the synchrotron activities. This would help to build a user base with background in structural analysis and encourage establishing collaborations in the region.

Requirements for the facility will be detailed later.

Initially a facility which could be housed at the the existing buildings at the site at Allan is planned.

- A computer with peripherals.
- A scientist with a background in computer science or bioinformatics

Robotics المكننة

Robotics have taken off since the preparation of the proposal:

High throughput genomics, protein purification, characterisation and crystallisation.

Beamline automation is being developed widely:

Feedback alignment of beamline optics.

Automatic dispensation of samples to the specific apparatus.

Automatic methods of sample alignment.

Automated early analysis of data for better screening and strategy.

New operational modes:

Data collection service for eligible users.

Sample and data despatch and storage

The Vision الرؤيا

Laboratory

IR

CD

Fluorescence

EXAFS

SAXS

PX

Computation

Protein Knowledge

Doubt

Skills Shortage

Lethargy

Elitism

Vested Interest

Psychology

Indifference

Funds

What We Ask For ما نطلب

The Mature SESAME

XRD:

Se-edge MAD MPW station. Rapidly tunable MAD MPW station, 2.5-0.5Å.
Fixed λ 1.5Å MPW station. Longer λ BM station, 2-2.5Å.

EXAFS:

Station between 2 and 10 KeV, possibly BM.

Station between 8 KeV and max. available from MPW.

SAXS: Operational at 1.5 Å. Could be shared with XRD 3

CD: BM station, operating between 100 and 1000 nm.

UV/Vis Fluorescence Spectroscopy: BM station, between 100 and 1000 nm

Vacuum UV spectroscopy and imaging: Shared BM station

Infra-red Spectroscopy: Shared BM station with Vac/UV facility.

Requirements الحاجيات

Molecular Biology:

Sequencer, Centrifuges, Cell culture facilities, incubators, PCR, Gel electrophoresis, storage, UV spectrometers, etc.

Biochemistry Laboratory:

Chromatography systems, homogenisers, storage, ultracentrifuges.

Characterisation and Dynamics:

IR & UV/vis spectrometers, DLS, Fluorescence detectors, electrospray mass spectrometer, microspectrophotometer, stop-flow system, SPR.

Crystallisation:

Robot, pH meters, stereoscopes, CCD camera, storage, cryo-cooler, goniometer heads and other xtal handling tools.

Ancillary:

Software licenses, data storage and media, computing

PESTS v SESAME العوامل حول سيسامي

Political: *Maximise the number of users*

Economic: *Keep the costs proportionate*

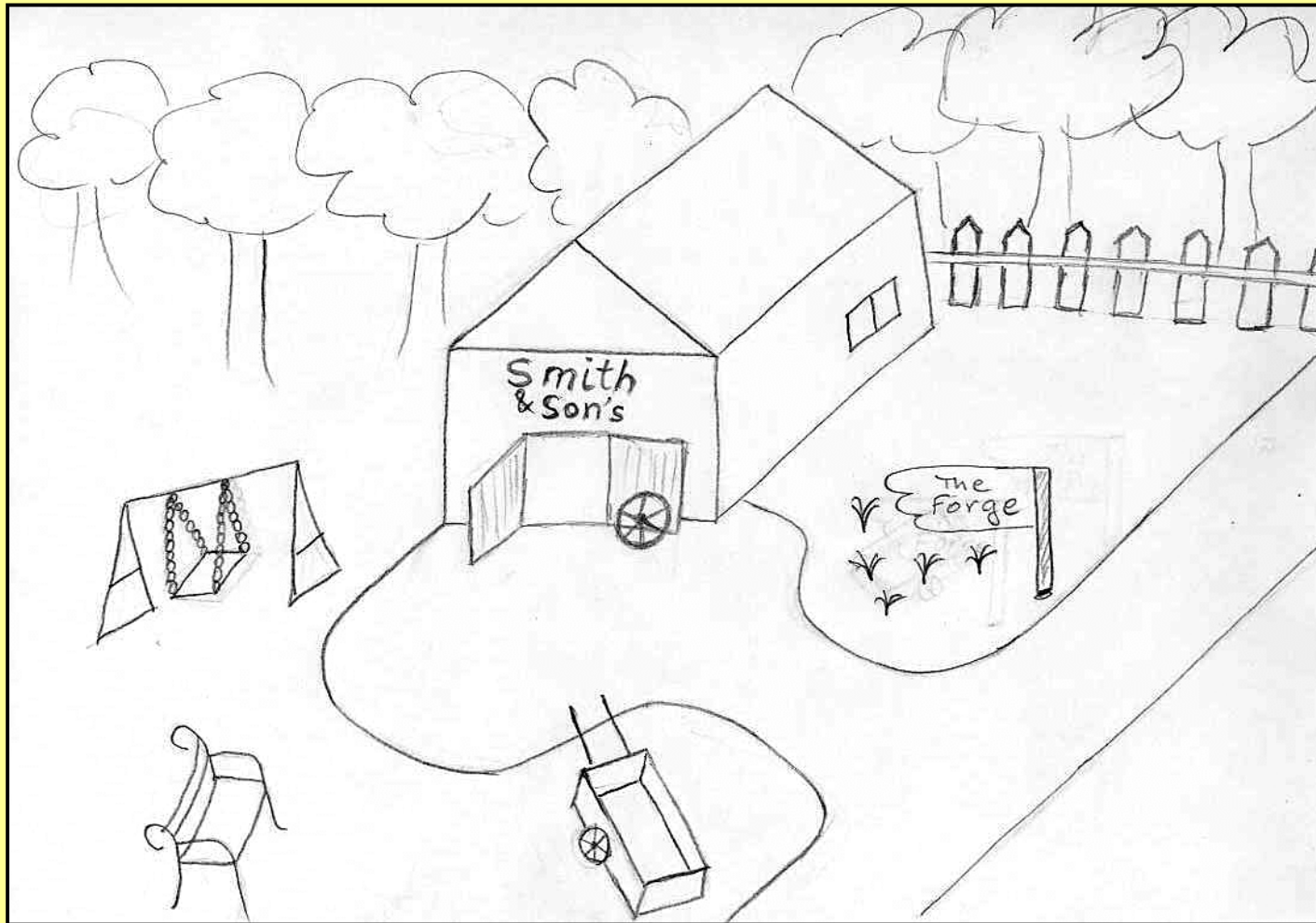
Social: *Promote exchange programmes*

Technical: *SESAME is an enabling technology*

Scientific: *Research Program to address the Region's needs*

The Case for the Local Economy

إستفادة الإقتصاد المحلي



Stakeholders

الشركاء

Customers: Governments, Industry, Universities, Charities

Competitors: Other synchrotrons, Private organisations

Suppliers: Local and Global. Best off-the-shelf?

Friends: Local schools, dignitaries, etc. PR officer?!

Total Benefit: Fully operational with ~ 200 groups/projects
2000 scientists

Staffing الفريق المسؤول

Core:

Laboratory staff	x 10 :Biochemist, Molecular Biologist, Scientists
Station staff	2 scientists + 2 technical staff per station/beamline.
Technical staff	Electrical/Electronic/Mechanical Engineers, Technicians, Computer operators/programmers.

Seconded:

Students and PDRAs Trainees / Graduates, 1 to 3 years

Associates:

Visiting partners Established researchers, others

Operations التشغيل

Collaboration: Significant intervention, Joint ownership by agreement

Association: Minimal intervention

Medium Level: Operational station, Manual of instructions,
Scientific support during normal hours

Higher Level: By agreement, Joint ownership

	<i>Y1</i>	<i>Y2</i>	<i>Y3</i>	<i>Y4</i>	<i>Y5</i>
<i>SMB Institute</i>	Building		Operation		
<i>SESAME</i>	Construction			Commissioning	
<i>First Beam</i>	No Beam	✓		Commissioning	

Funding التمويل

Priorities: Phase I limited by available funds.

Sources: National contributions, International donations.

Commercial: Open to paying customers, Industrial partnerships
SRS 10% of income. Other synchrotron centres also
attract large commercial income. Some planned
facilities even more ambitious.

Amortisation: Small part assumed in recurrent costs.
Must be examined.

Marketing: None early on, Necessary later

Next Steps الخطى القادمة

- National:*** Set up the infrastructure. Start Scientific associations
- Bilateral:*** Set up collaborations with neighbouring countries
- Regional:*** Agree priorities with partner countries
- International:*** Initiate Treaties, Agreements, Exchange programmes,
etc

The CCP4 Spirit:

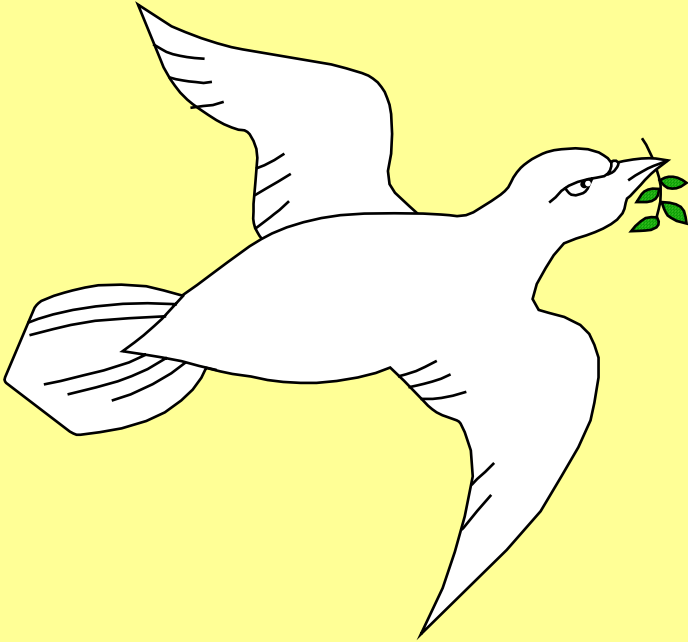
New collaborations in software development, open source packages shared by all academics free of charge. When commercially desirable, fee income would support further development.

Open O SESAME

إفتح يا سمسم

The Spirit Of SESAME

Dona Nobis Pacem



إمنحنا السلام

Grant Us Peace

Thank You

εφχαριστώ

شكرا

Tesekkürler
Ederim