Putting a value on informal industry contacts with CSIRO

Industrial Technologies
June 1995

CSIRO
AUSTRALIA

Preface

Informal contacts - contacts between CSIRO scientists and Australian industry which take place outside any formal contractual arrangements- are critical to the transfer of technology and delivery of benefit to Australian companies.

This study forms part of a program of work by the Evaluation Strategy Group of the Institute of Industrial Technologies. It is based on data collected and analysed by the consulting firm Sultech and is, I believe, a significant contribution toward delineating the size and importance of these informal contacts and their role in CSIRO's support for Australia's manufacturing sector.

The value of other more formal contacts has been canvassed in another recent Institute publication, *Creating Wealth: CSIRO and the Manufacturing Sector*. This analyses and catalogues an impressive set of research and industrial outcomes achieved through collaborative and contract research by CSIRO with large and small-medium enterprises, working with consortia, and launching new companies.

Colin Adam
Director CSIRO Industrial Technologies
June 1995

Overview

CSIRO's provides considerable assistance and technical advice to companies outside formal contractual arrangements. These contacts, which in economic terms represent a significant "knowledge spillover" benefit, are not captured by normal evaluation and reporting procedures.

Regular contacts with professional and industry colleagues has long been part of CSIRO's activities in monitoring developments and establishing future business. Moreover the number and range of informal contacts between Australian companies and CSIRO scientists is extensive. Informal contacts are an important means by which CSIRO delivers value to Australian industry.

This study by Sultech of three CSIRO manufacturing divisions indicated that **each Division was involved in over one thousand industry-initiated contacts per year, mainly from SMEs.** These resulted in:

- provision of technical advice- (65%)
- referral to other expert sources - (20%)
- discussion of R&D opportunities - (15%)

The survey revealed that individual senior scientists responded to 100 informal contacts per year and that well-established research groups were involved in upward of 300 contacts per year. These were from Australian enterprises, in the main part SMEs. In addition CSIRO was involved in significant other informal contact with local companies through telephone calls, personal and group visits to and by CSIRO scientists, as well as activities of industry associations, user-groups, and structured courses.

The value of these contacts was also investigated by Sultech. Personnel from 23 business enterprises were interviewed as to the origin, duration, nature and value of their informal professional contacts with CSIRO. All reported they attached high value to the information that they received, which was primarily in the form of technical advice either for solving problems or for investigating new technological opportunities the company was considering. A number of specific wealth creating outcomes were identified as directly attributable to these contacts. A particular benefit stressed by SMEs was the way such contacts helped them keep abreast of international scientific and technological advances which otherwise they would have difficulty accessing.

Further, the interviews revealed that with respect to these informal contacts the business personnel placed particular importance on CSIRO's :

- promptness
- understanding industry requirements
- responsiveness
- expertise
- independence

Since contacts normally involved an interchange of information, they were also valuable to CSIRO as they enabled a better appreciation of industry experience, problems in product and process development, and opportunities for future industry- relevant research.

As the contacts were normally of limited duration they were usually undertaken free-of-charge although more prolonged investigations were charged for at the Division's normal consultancy rates. In addition one Division is establishing a consulting and advisory service - a "one-stop-shop" consultancy facility for industrial, government and private clients - to deal with detailed consultancies eg involving some testing or other investigation.

Overall the picture that emerges from the survey and analysis by Sultech is one of strong informal contact networks characterised by important information exchanges. The technical advice provided by CSIRO scientists is regarded as being of high value by industry recipients, and an important ancillary way in which CSIRO can contribute to the national interest.

The consultants for this study, Sultech, wish to record its appreciation to the nominated CSIRO scientists for their cooperation in this study and, particularly, to the industry participants who at short notice willingly provided comprehensive information on the history, nature and value of their CSIRO network arrangements. Thanks are also due to David Symington for valuable editorial guidance.

Garrett Upstill
CSIRO Industrial Technologies
Canberra

1. PURPOSE AND METHODOLOGY

Purpose

The objective of the consultancy was to examine the nature and extent of CSIRO's informal contacts with manufacturing industry.

The type of contacts to be covered excluded formal contacts associated with research planning, contract or collaborative research, and those associated with commercialisation activities. Informal contacts include:

- provision of technical advice to companies based on the knowledge of scientists,
- provision of references to information sources external to CSIRO based on similar knowledge, and
- alerting companies to new R&D opportunities which they might pursue internally or collaboratively with CSIRO or other research groups (but excluding actual negotiations for CSIRO contract/collaborative research).

Details of the consultancy and conduct of the study are in Appendix 1.

Methodology

The sample: CSIRO

An initial pilot study involving interviews with nine nominated senior research scientists in the CSIRO Divisions of Applied Physics, Chemicals and Polymers, and Manufacturing Technology was conducted in December 1994. Early in 1995 the sample was extended by including a further ten senior research scientists from these three Divisions. The second set of scientists was interviewed in March 1995.

The final sample of 19 senior research scientists was distributed as follows:

Applied Physics	8
Chemicals and Polymers	3
Manufacturing Technology	8

The activities with which these scientists are involved, and interview procedures are detailed in Appendix 1. Topics covered were the:

- development of contact networks,
- nature and extent of contacts,
- type and duration of contacts, and
- business enterprises which could be approached for involvement in the study.

The sample: Business

Each interviewed scientist was asked to nominate at least one non-CSIRO recent recipient of technical advice or information who would be able to comment on the value of the advice received. The original study specification had called for interviews of at least three users nominated by each of the three Divisions involved in this study. However, the 19 scientists interviewed nominated a total of 55 companies or other users. With this extensive number of nominations, however, it was agreed that the survey of user perceptions should be extended to cover as many nominated users as possible within specified time and cost constraints.

A total of 27 business enterprises were contacted during this user survey, including at least one nominated by each of the 19 interviewed scientists. Of these 27 there were two where the nominated contact was not available, one where the contact commented generally rather than on his specific contacts, and one where the person considered all his contacts to be preliminary and directly related to a subsequent formal contract and therefore outside the study scope.

The people interviewed included representatives of large, medium and small manufacturing companies, design and technical consultancy companies, Commonwealth and State Government agencies, and business enterprises involved in

business regulation and communication and water/sewage services. The majority of interviewed users were in Sydney and Melbourne, but there were also interviewees in Adelaide, Ballarat, Bendigo, Brisbane and Port Kembla.

The topics covered in the interviews were the :

- origin, duration and extent of informal CSIRO contacts,
- nature of these contacts, and
- value to them of the advice or information provided.

The interviews were conducted by telephone with the nominated person in each of the 23 enterprises. Following these interviews a written summary of views expressed was sent to each of these people who confirmed or corrected the draft summary provided. All were alerted that their reports might be made public and all agreed that they were happy for this to be done.

2. FINDINGS OF SURVEY

2.1 Origin and Development of Contacts

Most of the contacts reported originated outside CSIRO and these generally were a consequence of knowledge of the expertise available in particular groups in Divisions, or of the capabilities and experience of individual scientists. There are a number of ways in which such knowledge is gained. CSIRO Divisions do take the initiative to make their expertise known.

With well established groups, for example in the standards areas of Applied Physics, the mechanisms for alerting industry to Divisional capabilities and individual expertise available have developed over many years. In other instances with more recently established groups particular emphasis has been placed on a program of company visits and other company information activities in order to generate an awareness of the Division's capability in the relevant industries.

Some contacts had their origin in personal contacts, in one instance going back to university days, but in most instances the contact had its origin in professional

relationships of a more recent nature and associated with company/CSIRO interactions. The origins and developments of contacts are illustrated below by reference to the activities of some specific CSIRO groups.

Standards group: Professional associations and short courses

The Temperature Standards group is in the Division of Applied Physics. The Division is required to maintain Australian standards, including temperature standards, and this by itself generates contacts from enterprises seeking advice in this field. Participation on NATA committees and certification responsibilities for NATA registered laboratories also generate awareness and consequent contacts.

Of particular importance is the "Temperature Measurement Course" run annually by the Division for many years and which attracts come 30-40 industry participants each year. Course participants are encouraged to contact Divisional scientists for future advice on problems they encounter or on design of measurement systems and techniques.

These activities, and the reputation of senior individual scientists, result in frequent calls on the group to provide advice on temperature measurement and calibration procedures. Accurate temperature measurement and control is vital for many companies for maintenance of both product quality and process efficiency. Over a period of six months some 100 company contacts result from these needs and from knowledge of where Australian expertise in this field resides. Some 90% of these inquiries are for advice on standards/measurement techniques/quality control.

Solidification and Casting Group: industry associations, industry networking

A somewhat different experience is provided by the much more recently established Solidification and Casting Program of the Melbourne laboratories of the Division of Manufacturing Technology. From the outset in order to generate both knowledge of industry needs and industry awareness of its capabilities, this group adopted a systematic program of company visits and participation in the activities of industry associations. The group participates in the monthly meetings of the Australian Die Casters Association (ADCA), and edits ADCA's magazine.

Through these mechanisms a large number of contacts have been generated, principally but not exclusively, from small and medium enterprises (SMEs) engaged

in non-ferrous die-casting. Contacts with larger companies which use castings are developed and maintained through participation in a Cooperative Research Centre and the Australian Automotive Technology Centre. An outcome of this systematic awareness program has been the generation of some 500 company originated contacts with CSIRO scientists in the 6 month period covered by the study.

Similar mechanisms exist through the Welding Technology Institute of Australia, the Cooperative Research Centres for Materials Welding and Joining and for Mining Technology and Equipment, and the CMM (Coordinate Measuring Machines) Group sponsored by the Division of Applied Physics.

Chemicals and Polymers: industry and professional associations, CSIRO Manufacturing Month

For the Division of Chemicals and Polymers the major vehicle for establishment and maintenance of industry contacts is participation in both industry and professional associations. Included in these are the Plastics and Chemicals Industry Association, and its subsidiary Polymer & Additives and Water & Wastewater Groups. These groups are particularly important for generating industry awareness among SME's. For large companies contacts are also developed and maintained through participation in the Royal Australian Chemical Institute (RACI) and its specialised groups e.g. polymers, medicinal and agricultural chemicals, and organic chemistry.

Electronic networks are assuming increasing importance in the development and maintenance of contacts. The Division has also noted some upsurge in industry contacts from its participation in CSIRO's Manufacturing Month and the associated invitations to companies to visit the laboratories, inspect the facilities available, and meet the experts in particular fields.

Link between knowledge transfer and collaborative arrangements

In some instances interviewees reported that the initial contact had been associated with formal contract or collaborative arrangements, with the confidence generated through these arrangements leading to frequent, informal, professional contacts. In other cases the reverse applied, with what started as an informal networking arrangement leading to formal contracts.

The CSIRO Information Network

In two cases the contact resulted from the company person approaching CSIRO through its information network or general information service and being referred in this way to the appropriate contact. In one case the contact originated from CSIRO seeking a partner in a pilot plant testing program.

2.2 Number of Contacts

Some scientists provided data on the number of informal contacts handled by their group (or program/project team) as a whole, the group being organised in such a way that a small number of scientists handle the majority of inquiries. In these instances it was not considered appropriate to extrapolate from the contact experience of any individual scientist. In other cases the groups are not organised in this way, but rather individual scientists respond to queries in their own recognised field of expertise. Generally these latter individuals are scientists with well established networks of industry contacts. Consequently their experience reflects that of this cohort of scientists rather than that of all scientists in the participating Divisions.

One group leader provided data on both his personal contacts (average of 1.5 per week) and also that for his group of six scientists as a whole (average of 4 per week). This breakdown is representative of that for many groups where a higher proportion of industry contacts are, naturally, directed to those senior scientists with more widely known expertise and better established networks of industry contacts.

Over the six month period in late 1994 covered by this study the contacts reported by interviewed scientists were:

- for groups: average of 6.5 per week (range from 2 to 20 per week)
- for individuals: average of 2 per week (range from 0.5 to 4 per week).

Range in the number of contacts

The range for groups is very wide representing 100 to 1000 contacts per annum at the extremes. This reflects the different group sizes, the different nature of their client industries, and also the extent of systematic efforts to generate industry awareness and promote such contacts. The largest number, 20 per week, was reported by the Casting and Solidification Program in the Division of Manufacturing Technology which from

its inception has engaged in an active program of solicitation of industry contacts, including active and direct participation in the work of the relevant industry association. The regular participation by companies in their industry association activities has also facilitated this Program's interaction with industry.

For scientists reporting on their individual contacts the range is more confined, and the average of some 100 contacts per annum is considered representative for that cohort of senior scientists with well established networks of industry contacts.

While numbers varied from group to group, taken as a whole it is estimated that each of the three surveyed Manufacturing Divisions was involved in excess of 1000 industry-initiated contacts per year.

Duration of business contact with CSIRO

The length of time that individual business personnel had maintained an informal relationship with CSIRO varied considerably ranging from a little more than 6 months to more than 20 years. The majority of relationships were relatively long-standing, typically going back 5 years or more.

Multiple contacts with CSIRO

Another feature of general interest emerging from the study was the existence of multiple contacts between enterprises and CSIRO. Business enterprises nominated by one CSIRO scientist often reported contacts with other scientists in the same Division, in other Divisions of the Institute of Industrial Technologies or, in three instances, contacts in the Institute of Minerals, Energy and Construction. People from larger enterprises also commented that they were aware that other colleagues similarly had their own networks of CSIRO contacts, in some instances associated with, or fostered by, general umbrella arrangements between their enterprise and CSIRO.

2.3. Nature of Contacts

Information was provided on the balance of contacts in the broad categories:

- provision of technical advice,
- discussion of R&D opportunities,
- reference to other specialist information sources, and
- other.

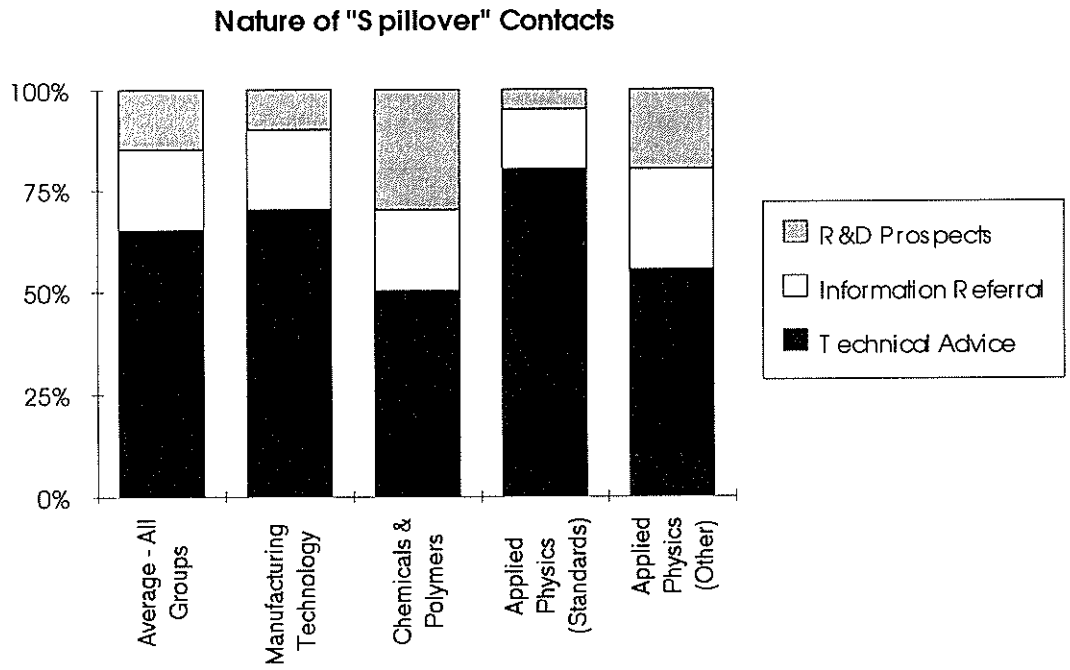
In all instances the first three categories encompassed nearly all industry contacts, those in the "Other" category, such as assisting industry with formal technology evaluations, reviewing patents, headhunting of scientists or provision of expert witness testimony being only occasional and spasmodic.

The broad nature of industry contacts for the sample as a whole, and for the separate groups, are depicted in the following table and chart.

In the Division of Applied Physics four scientists represented the "Standards" area of the Division (Light and Radiation, Temperature, Ultrasonics and Industrial Metrology) and four were from other "Non-Standards" programs (Acoustics and Mechanics, Thermal/Plasma, Instrumentation and Magnetics). These two areas have somewhat different characteristics in the nature of their industry contacts reflecting their different research roles and are reported on separately.

Nature of Contacts

Contact Category	Total Sample	Manufacturing Technology	Chemicals & Polymers	App. Physics (Standards)	App. Physics (Non-Standards)
	Mean (Range)	Mean (Range)	Mean (Range)	Mean (Range)	Mean (Range)
Technical Advice	65% (35-95%)	70% (50-80%)	50% (35-70%)	80% (45-95%)	55% (35-70%)
Information Referral	20% (0-50%)	20% (0-50%)	20% (0-30%)	15% (0-45%)	25% (20-40%)
R&D Opportunity	15% (0-35%)	10% (0-25%)	30% (25-35%)	5% (0-10%)	20% (0-30%)



In the majority of instances "provision of technical advice" was the dominant category, and in all instances it constituted a significant component of the industry contacts responded to, averaging some 65% of all contacts and ranging from a minimum of 35% to 95% of all contacts.

In the "Standards" area of the Division of Applied Physics the technical advice sought and offered was dominated (80% of such requests) by provision of advice on standards, measurement and testing techniques, and general quality control matters. In all other groups the large majority of advice solicited and provided was in relation to company products or problems or opportunities for improvements in processes , with advice on processing techniques being the more common.

Handling inquiries

The bulk of contacts for all groups are made by telephone, and the majority of these inquiries are handled "on-the-spot". Typically telephone requests of this nature are of 10-20 minutes in duration and seldom more than 30 minutes. Nevertheless, given the large number of such requests, responding to these inquiries represents a significant investment of the time of scientists.

About 10% of inquiries require follow-up investigations of some kind involving either a subsequent written advice or, in about half these cases, a meeting with the company personnel. Such meetings are generally held at the relevant Division and typically are of 2-3 hours duration.

Fee for service

Where the investigative work is of limited duration this is usually undertaken free-of-charge. In the Division of Manufacturing Technology some 0.5 days of investigative work is typically provided free-of-charge, any more prolonged investigations being charged for at the Division's normal consultancy rates. Other Divisions reported no specified policy on this issue, but the same general principle of providing a reasonable quantum of initial free support is followed.

In a small number of cases requests for assistance lead to subsequent commissioned contract or collaborative research agreements, but this generally occurs well after the initial contact and often on an unrelated topic. Scientists do not generally regard these contacts as an opportunity to solicit research funding, regarding access to their general expertise to meet companies' short-term advice requirements as an appropriate component of CSIRO's role.

Size of enterprise

In all cases scientists reported that the majority of requests for assistance came from SMEs. Requests from large companies are often handled within the context of formal R&D agreements and relationships. Such formal contracts are less common for SME's and a large part of CSIRO's assistance for such companies is achieved through provision of short-term technical advice on an informal basis through these "spillover contacts".

2.4 Significance of contacts

Perception by CSIRO staff

The extent of contacts revealed by this study is large and represents both a significant investment of time by CSIRO's professional scientists and also an important mechanism for information and technology transfer to companies. Participating scientists all expressed the view that this informal assistance to companies was

appropriate for a largely publicly-funded research organisation, and that their investment of time in providing assistance of this nature was an important aspect of their role as CSIRO scientists. While subsidiary to their main tasks of performing research and transferring the results of that research to industry and other users, this informal transfer of knowledge was regarded as an important ancillary responsibility.

Moreover, while the purpose of the industry contact was the solicitation of advice, in numerous instances the explanation of the problem involved provided them with valuable information also. They therefore tended to regard the outcome of the contact as being more in the nature of an "information exchange" of benefit to both parties.

Perception by business

The majority of requests for information, advice or referrals were by telephone and were generally originated by the company. However, in almost all instances there had also been visits by the company to the CSIRO laboratories, and in most cases similar visits by the CSIRO scientists to the company premises. These personal contacts, including joint conference attendance, were reported as important for cementing network relationships and for gaining better understanding of each party's capabilities and needs.

A further important feature of the informal contacts from the user viewpoint, as also stressed by the CSIRO scientists interviewed, was the two-way exchange of information which frequently occurred during the contacts and the mutual benefit consequently associated with the interchange. Company personnel reported that CSIRO scientists contacted appeared to appreciate being alerted to "real-world" problems and opportunities associated with applying new technologies. They believed this was of general benefit to CSIRO in shaping its research programs, as well as providing them with engineering and product manufacturing information not otherwise readily accessible.

3. ASSESSING THE VALUE OF INFORMAL CONTACTS

3.1 Value to Industry

A detailed assessment of the value of informal contacts with industry is difficult and beyond the scope of this study. What was sought was a demonstration of the kind of value put on these contacts by industry and the factors that were important.

It is of interest to note that the CSIRO personnel interviewed generally were unaware of how the assistance they had given was received. However, the interviews with industry people indicated that what had been provided had been much appreciated.

The detailed interview records are provided at Appendix 2. A few selected quotes from the interview data give an indication of the appreciation of the service provided.

In some instances industry personnel were able to point to specific benefits to Australia flowing from the contact with CSIRO.

> Without the input from CSIRO we wouldn't have won recently awarded contracts in New South Walesa worth more than $2 million. They help us to compete successfully in both domestic and international markets.
>
> **Equipment Manufacturer, Melbourne**

> Following the successful demonstration of the process capability we then designed the full-scale plant. ..... it has resulted in significant reductions in our costs.
>
> **Water Authority, Ballarat**

> The CSIRO scientist played the key role in identifying the failure mechanisms ..... This led to us partial line replacement with substantial savings for us.
>
> **Petroleum Mining, Melbourne**

3.2 Key Factors

The interview data reveal the features of CSIRO assistance which were valued. Those mentioned were:

PROMPTNESS

Our requests for advice are not on mundane matters, but rather on matters of some technical complexity. Nevertheless they are usually able to be dealt with on the spot.

Metal Product Manufacturer, Melbourne

There is a lot of work I have undertaken over the past year which I would not have been able to undertake without their timely and expert assistance.

Communication Services, Melbourne

These contacts are very valuable to us. It is important in highly sophisticated engineering to recognise that much has already been done and avoid re-inventing the wheel. Often timely expert advice helps us to avoid starting from scratch in a new area.

Heavy Engineering, Bendigo

UNDERSTANDING INDUSTRY REQUIREMENTS

In particular we appreciate their understanding of commercial realities and how industry operates. ..... We derive a lot of benefit from dealing with scientific experts from CSIRO who are industry oriented and appreciative of commercialisation costs.

Chemical Products, Brisbane

The quick and informal access to NML people who understand well our measurement requirements for developing and testing our new designs has been central to our technology development program. It is the only way a small company like ours can tap into world class science and be kept aware of international developments which impact upon our business.

System Manufacturer, Melbourne

RESPONSIVENESS

The most pleasing aspects of these exchanges from our viewpoint have been the friendly, professional and enthusiastic way our queries are dealt with and the responsiveness of everyone from the Division Chief down.

Tyre Manufacturer, Melbourne

Overall the advice we have received from CSIRO has been very constructive and helpful to us, and we have found that they are also good listeners and receptive to our ideas and practical experience. They are prepared to discuss things through and give reasons for their advice which builds confidence.

Metal Fabricator, Melbourne

EXPERTISE

We believe we have developed a strong mutually beneficial relationship and we will continue to draw on their expertise to maintain our competitiveness.

Precision Components, Sydney

We are conscious of the need to be constantly improving our technology through keeping abreast of emerging scientific opportunities. It is therefore particularly useful for us to have someone with expertise that we can bounce our ideas off and to know that CSIRO scientists are only a phone call away and have a genuine interest in what we are doing and what we are trying to achieve.

Automotive Components, Sydney

INDEPENDENCE

We approached CSIRO in 1992 who nominated a scientist with the required expertise. He has since provided a scientific input to the specification for a solar simulator. ..... the climate for ongoing objective reconsideration of this specification is now much improved. It is very healthy for our Committees to have new ideas put forward, particularly by independent and authoritative persons.

Commonwealth Agency, Sydney

I now have a number of on-going informal contacts with that CSIRO scientist which I consider important to my business. CSIRO's expertise and independence enable it to make a unique contribution in this field.

Technical Consultant, Sydney

4. SUMMARY

The picture that emerges from this survey is one of extensive informal contacts with Australian industry, notably SMEs, on a regular basis across the three surveyed Divisions. This is perceived to be of distinct benefit to the companies in contact with CSIRO, although the extent of this benefit has not been quantified in this study.

These contacts are moreover in the main perceived by scientists as helpful in understanding better relevant industry and informing them of practical problems which can inform their future work - as part of CSIRO working with industry.

Observations arising from the study are that CSIRO inititiatives designed to make its expertise known by and available to business enterprises have been of benefit. The CSIRO Helpline is serving a valuable role in dealing with public enquiries and also filtering and referring to relevant research areas. In addition CSIRO scientists who are active members of professional and industry associations are important in providing an industry profile for CSIRO's research. Turning to the future there may be value in extending CSIRO's role in short courses and technology awareness exercises for sectors of Australian industry, as a basis for wider industry collaboration. Finally further work is needed to quantify the benefits of CSIRO's informal contacts, notably actions consequent to the initial contacts.

CONSULTANCY TASK

APPENDIX 1

Purpose

The objective of the project is to examine in a systematic way the nature and extent of CSIRO's more informal contacts with manufacturing industry. Information on such contacts is to be accessed through the conduct of interviews with a representative sample of Divisional professional scientists. A small number of more detailed case studies on known industry utilisation of proffered advice and information is also to be presented.

Definition

The type of contacts to be covered exclude formal contacts associated with research planning, contract or collaborative research, and those associated with commercialisation activities. The less formal contacts to be comprehended have been referred to as "spillover contacts with industry" and include:

- provision of technical advice to companies based on the knowledge of scientists, .
- provision of references to information sources external to CSIRO based on similar knowledge, and
- alerting companies to new R&D opportunities which they might pursue internally or collaboratively with CSIRO or other research groups (but excluding actual negotiations for CSIRO contract/collaborative research).

Methodology

The methodology specified involves interviews with a sample group of nominated scientists from each of three Divisions selected by the Institute. Because the contacts with industry to be covered by this survey are likely to be sporadic in nature, scientists will be asked to recall, as comprehensively as possible, contacts over the preceding 6-month period.

Information will also be solicited on known industry utilisation of advice/information provided, and a number of these instances will be explored in more depth as illustrative case studies. It is intended that industry comment on its utilisation of the advice/information provided will also be solicited.

It is not intended that scientists will complete a prepared questionnaire; rather the following "Interview Topics" list will be provided in advance so that the nominated scientists have the opportunity to reflect on relevant information which will then be recorded during personal interviews with each scientist.

SURVEY DETAILS

CSIRO : CSIRO personnel were interviewed on following topics

<u>Development of contacts</u>
Describe in general terms how contacts with industry have been developed, and the relative importance of each, for example through:

- membership of industry associations
- membership of scientific associations
- attendance at industry/scientific conferences
- previous industry employment
- Divisional or program advisory groups
- Divisional or program research planning activities
- contract/ collaborative/ commercial-isation activities
- other (please specify)

Comment on whether contacts are more frequent with larger companies which have recognised research groups (e.g. qualifying for AIRG membership) than with SME's is also to be solicited and, if so, how contacts with the latter might be expanded/enhanced.

Information on whether these contacts are ad hoc, or the consequence of a more systematic attempt to establish and maintain a contact "network", will be sought; and also on whether in maintaining these contacts the scientist usually acts on his/her own behalf or acts as a representative of a wider group in the Division.

Nature and extent of contacts

Information is requested on the number of contacts (during the preceding 6 months) where advice/information has been proffered and/or solicited in the following categories:

- technical advice on e.g.:
  - standards
  - measurement techniques
  - product problems/opportunities
  - process problems/opportunities
  -design of company research programs
- references to appropriate information sources e.g.:
  - other people/ research groups
  - publications/ reports/ conference proceedings
- new R&D opportunities e.g.:
  - for the company
  - for collaborative/contract research (but preparatory to formal negotiations)
- other (please specify).

Origin, Type and Duration of Contacts

For a sample of the preceding contacts information is requested on the following:

- with which company
- by whom originated
- type of contact e.g.:
  - telephone
  - meeting (regular/ad hoc)
  - scientific conference
  - industry conference
  - other (specified)
- duration of contact
- time spent on follow-up
- outcome of contact (if known)

Possible business enterprise follow-up

Information will be sought on which of the identified contacts would be appropriate for a more detailed case study.

Scientific Fields : CSIRO Scientists were from following areas

Division of Chemicals and Polymers

Specialty Chemicals
Waste Technologies
Biomaterials
Chemical Devices
Polymers.

Division of Applied Physics

Thermal Plasma and High Current Technologies
Acoustics and Mechanics
Light and Radiation
Temperature Measurement
Instrumentation
Applied Ultrasonics
Applied Magnetics
Industrial Metrology

Division of Manufacturing Technology

Vision Systems
Mechanical Engineering (Transport and Automation)
Mining Technology and Equipment
Laser Technology
Welding and Joining Technologies (2 scientists)
Metal Solidification and Casting
Machining and Surface Finishing

In addition to the 19 scientists representing the above Divisions the scientist who performs (among other duties) the role of Information Officer for the Division of Manufacturing Technology was interviewed . It was apparent from this interview that a large number of general inquiries are handled by both Information Officers and Librarians, which are responded to by providing reference material or pre-prepared information sheets or, where appropriate

and less frequently, by onward referral of the inquiry to a specialist in the inquiry area. It is these latter contacts which are the subject of this study. However, the important role played by such staff in handling quite large numbers of more general inquiries, both in satisfying the inquiry and saving the time of specialist staff, should not be overlooked. Many inquiries of a general nature are handled in this way, and in two of the subsequent company interviews it was ascertained that such general referral systems were employed to establish contacts with specialists where information transfer of the more specific nature covered by this study then took place.

An important feature of the sample is that in some cases information was provided by the interviewed scientist on relevant contacts by all members of their program or project team, whereas in other instances scientists reported on their individual contacts (in one case the scientist reported on both). These differing responses reflect, in part, the different structure of different program/project teams, and also the differing ways in which the handling of industry informal contacts have developed and are managed by these teams. This variability does not affect the analysis of the nature of industry of industry contacts, but it does mean that caution is needed in the interpretation of data on the extent of contacts.

Incitec, Brisbane
Mr Tony Brown

We manufacture agricultural chemicals and my first contacts with CSIRO go back to 1986 when we approached the Division of Chemicals and Polymers with an idea for a new process for urea production for our fertiliser products. This led to a contract research program of some 3-4 years duration. We regarded the outcome as very successful in technical terms, although we did not proceed to introduce the new process for a combination of financial reasons and lack of interest by equipment manufacturers. During this project I got to know the CSIRO people well. We met every 4 to 6 weeks and developed a good synergistic relationship.

Since then we have often approached each other for informal advice and this has involved quite a number of people from that CSIRO Division. On occasion they have undertaken tests for us, for example in providing information on the chemical composition of a coating agent. They have also provided us with useful references to other sources of expertise, including to scientists in their Institute of Minerals, Energy and Construction.

I consider the information provided to us informally in this way of considerable value. In particular we appreciate their understanding of commercial realities and how industry operates. By contrast we have found that many university researchers have little comprehension of commercial constraints or of the costs of taking a discovery through to the market place. We derive a lot of benefit from dealing with scientific experts from CSIRO who are industry oriented and appreciative of commercialisation costs in their contract negotiations.

Victorian Casino Control Authority, Melbourne
Ms Anne-Marie Cowley, Gaming Inspector

Our Authority is responsible for ensuring that gaming equipment is operating within specification so as to promote public confidence in the Victorian Casino. To confirm equipment operation we require access to high quality test equipment and/or reliable testing agencies.

The Victorian Weights and Measures agency, who test and weigh our Keno balls, recommended we approach the CSIRO Division of Applied Physics for expert advice on instrumentation required for testing roulette wheels. The Melbourne office of this Division was able to recommend to us the type and quality of equipment we needed and identify a reliable South Melbourne supplier of the components we would need. It also referred us to the Instrument Calibration and Metrology Services Centre of ADI at Footscray whom we subsequently consulted for undertaking the requisite tests on our behalf.

The CSIRO's provision to us, in a very timely fashion, of expert advice on our instrumentation needs, and the referral it provided to appropriate suppliers and testing facilities, were invaluable to us.

Sultech

A. C. Hatrick Chemicals, Sydney
Mr Brian Lourey

We are a research-oriented company. I have a personal association with one of the CSIRO scientists going back to our university days. We often bounce ideas off each other in an informal way and I believe this has been of general benefit to both of us. As a result of this a presentation was made by a scientist from the CSIRO Division of Applied Physics to our industry association, the Surface Coatings Association Australia. I then invited him to give a similar presentation to a group of professionals from our company. This led ultimately to our undertaking a joint investigation with CSIRO and we are now considering entering into a further collaborative research project. I also have regular contacts with CSIRO scientists through my participation at NATA Executive and Council meetings. Overall I believe that the informal contacts we have developed and maintained with CSIRO scientists are of considerable mutual advantage to both parties.

South Pacific Tyres, Melbourne
Mr Les Lewis

Our contacts with CSIRO originated about 5 years ago. We were looking at introducing laser technology into our processing and wanted to test our ideas with someone who had expertise in this field. A colleague of mine in another company suggested we contact CSIRO. This led to a visit to our company by a CSIRO scientist from its Industrial Laser Centre and subsequently to our engaging CSIRO to undertake an 18 month contract laser research project on our behalf. We regarded this project as 100% successful and the results now form an important part of our IP portfolio.

From this initial contact we became aware also of the work being undertaken in the Divisions of Applied Physics and Manufacturing Technology on optical technology more broadly, including on vision systems, and this led to a further contract research agreement. We visited the NML in Sydney on a number of occasions during these projects and the CSIRO scientists have also visited our company. We have now developed close links with several scientists in both these Divisions.

As a consequence of these close linkages and a developed healthy mutual respect we now also frequently seek technical advice through informal contacts on a wide range of matters where we are looking for a quick informed response. In most cases we get that advice on the spot, but where they believe someone outside CSIRO is better placed to help us they are happy to provide us with a referral to that source. Both of these responses are extremely valuable to us and we plan to continue and expand such contacts.

We believe the interchange of ideas that take place during these contacts is also useful to CSIRO in alerting them to the type of projects of real interest to industry. The most pleasing aspects of these exchanges from our viewpoint have been the friendly, professional and enthusiastic way our queries are dealt with and the responsiveness of everyone from the Division Chief down.

Optical and Photometric Technology, Melbourne
Mr John Xanthos

We provide commercial services in the fields of optical design, optical spectral measurements and instrumentation calibration. Our specialised technical services in these fields are closely aligned with the expertise of the optical groups in the CSIRO Division of Applied Physics, and since our establishment in 1986 we have had regular contact with quite a number of their scientists in the fields of measurement of UV radiation, optical design and technical aspects of visible light photometry.

We regard our informal contacts with this CSIRO Division as very valuable to us. When we have queries from our customers or staff we find it very useful to talk these queries over with the CSIRO scientists. We normally do this by telephone, but we have also visited the NML in Sydney and their scientists have visited us when they are in Melbourne.

Our ability to refer queries and get sound and independent technical advice acts as a good form of quality assurance for us as well as helping us in finding solutions to problems that from time to time arise. We also pay NML for calibrating our standards, and when customers request tests from us outside our capabilities we refer them to NML to have those tests undertaken on a commercial basis by them.

Over the years we have developed a high regard for the quality and impartiality of the advice we receive from CSIRO and we plan to continue both our informal and formal contacts with their scientists.

Cigweld, Melbourne
Mr Robert Wiseman

Our contacts with the CSIRO Division of Manufacturing Technology have developed over a number of years through our membership of the Welding Technology Industry Association (WTIA) which has wide representation by CSIRO on its industry panels. In recent years these contacts have been enhanced through our associate membership of the Cooperative Research Centre (CRC) for Materials Welding and Joining of which this CSIRO Division is a core partner. I am a member of the CRC's Research Advisory Committee. Through both these mechanisms we have good information exchange, and we are also alerted to generic prospects for advances in the technology.

We also have regular informal contact with scientists from this Division, mainly in the form of telephone requests we originate for technical advice or information in areas where we know they have expertise. These usually involve a two-way exchange of information where either technology problems or research prospects are discussed. Our requests for advice are not on mundane matters, but rather on matters of some technical complexity. Nevertheless they are usually able to be dealt with on the spot.

We regard this informal advice as very useful for us and, I believe, their advice of this nature is also regarded as important to the industry as a whole. CSIRO originated an informal technical awareness system and are also regular presenters of papers at WTIA conferences. Both of these are important for ensuring their expertise is accessible to the industry.

Sultech

Telstra Research, Melbourne
Mr Chris Kelly

Some 18 months ago I was seeking to locate a scientist with expertise in the field of magnetics in relation to information I required on the magnetic performance of Phonecard. I looked quite extensively for such expertise, initially without success, at which stage a colleague of mine suggested I try CSIRO. I telephoned the CSIRO "Help Line" and was immediately referred to a scientist in the Division of Applied Physics in Sydney who had just the expertise I was seeking. He provided the technical assistance I needed and subsequently we provided material to him for tests which they conducted on a charge basis.

From this initial telephone contact I developed a high regard for the Division's capabilities and over the past year I have followed-up that contact with a number of further telephone inquiries and I also visited the NML in Sydney to meet them. I cannot be certain that they are the only group with expertise in this field in Australia, but I did look extensively and unsuccessfully before approaching CSIRO, and I believe they do have a unique and very valuable capability. There is a lot of work I have undertaken over the past year which I would not have been able to undertake without their timely and expert assistance.

Australian Defence Industries (ADI), Bendigo
Mr Geoff Foster

We are engaged in heavy and medium-scale engineering and manufacture with an emphasis on precision work to meet defence requirements. CSIRO and ADI have a general Memorandum of Understanding for collaboration and interchange. Regular meetings of senior representatives take place, a major feature of which is the nurturing of contact points broadly across both our organisations. In addition to the informal contacts promoted in this way we are also involved with CSIRO in more formal collaborative ventures.

My main personal contacts with CSIRO developed initially through the Welding Technology Industry Association (WTIA) and more recently through the Cooperative Research Centre on Materials Welding and Joining. These have led to valuable 2-way interchanges of information originated by both parties. These include advice on other relevant contacts and conferences of mutual interest, but there are also frequent contacts on more specific technical matters. For example we sought and got a useful reference from them on titanium machining.

These contacts are very valuable to us. It is important in highly sophisticated engineering to recognise that much has already been done and avoid re-inventing the wheel. Often timely expert advice helps us to avoid starting from scratch in a new area; rather we can build on existing knowledge. Similarly we provide information to CSIRO scientists on our engineering expertise, and we believe the contacts are of considerable mutual benefit to both parties.

Hawker de Havilland, Sydney
Mr Garry Bowden

Over a period of at least 5 years I have had numerous contacts with a number of scientists in the CSIRO Division of Applied Physics. Some of these have been 2-way interchanges of information associated with our joint involvement in the Boeing project, but I have also had numerous contacts of a more informal nature unrelated to that project.

There have been a number of occasions where I have informally sought technical advice from these CSIRO scientists. The majority of these have been by telephone and have generally been dealt with on the spot, but there have also been meetings at both our sites. Often these requests for advice lead to a 2-way interchange of information. For example, in relation to a query I had concerning ultrasonic transducers they were able to provide information of value on specifications, and in turn I was able to alert them to relevant work in this field being conducted by ANSTO.

Overall I regard our informal contacts with these CSIRO scientists as being very valuable. Sometimes they provide new information and on other occasions a confirmatory second opinion, which in an industry like the aerospace industry requiring very high standards is also very valuable.

Epirez, Sydney
Mr Max Simmons

We are a technology oriented company and have had a close association with CSIRO going back over many years. Our longest relationship has been with the former Division of Building Research, but more recently we have also developed a close relationship with the Division of Manufacturing Technology. Both these relationships have been excellent, particularly in recent years with an enhancement of CSIRO's general climate of responsiveness to industry. We have obtained very useful advice from CSIRO scientists over the years, and often we share our ideas with them which we believe is useful to them also in extending their appreciation of industry needs and opportunities.

Our contact with the Division of Manufacturing Technology resulted from a meeting with the Division Chief. He thought a group in his Division could help us and meetings were arranged at both our premises. We were looking for technical advice on systems for spraying one of our products on sewerage pipes and were alerted that they had developed an automated system for inspection of pipes which might be adaptable to our needs. The CSIRO scientists we consulted about this opportunity could not have been more helpful. The system still has problems to be sorted out for our application, but we are confident a system that meets our needs will be developed.

New technologies are going to be of increasing importance to our company and access to expert CSIRO advice will continue to be of considerable value for us.

Sultech

Applied Design Development Company, Adelaide
Mr Mark McAlister

My initial contact with CSIRO scientists involved in ultrasonics was as a result of a recommendation from a former CSIRO employee that I contact them. I was referred to the CSIRO Division of Applied Physics in Sydney and from there put on to the scientist with the relevant expertise. It took a few phone calls, but was not onerous and their reference system seemed to work well.

We are a product design development company and I was seeking advice in relation to an ultrasound handpiece we were commissioned to develop for physiotherapy applications. There is some physics involved in getting the design right and an Australian standard that must be met. We knew that there was a new more stringent standard being developed and that that would need to be taken into account in our design and product testing. That was the area where we particularly needed sound expert advice.

The ultrasonics expert in CSIRO we located was extremely helpful and forthcoming, both in providing relevant technical information and in providing references to other people I should contact concerning the incoming standard. We will now be using CSIRO to do independent product testing for us to ensure standards compliance, but the value of the advice we received far exceeds the charge for these tests. Overall their advice and references have been of considerable value to us and we intend to maintain our contacts with them.

United Surface Technologies, Melbourne
Mr Richard Moore

Our contacts with CSIRO go back over more than 7 years, predominantly with the Melbourne scientists in the Division of Manufacturing Technology, but also on occasion with that Division's Adelaide people. We are a relatively small company which limits our capability for entering into formal R&D contracts, and the informal provision of timely expert advice is therefore particularly important for us. We also often pass information on to CSIRO based on our practical industrial experience. Our contacts are usually by telephone and cover provision of technical advice, exchange of information and occasional referrals to others with expertise.

Our most recent contact has been through a former R&D customer of CSIRO whose surgical spraying product we are now commercialising. The CSIRO scientist who undertook the original research is being very helpful to us in providing background information. This assistance will assist us to make sure this product is a commercial success, which is of benefit to all the involved parties. At the same time we are feeding back to CSIRO engineering advice coming out of our commercialisation of this product which we believe is also very useful to them.

Simmons Wheels, Sydney
Mr Tony Simmons

Our first contact with CSIRO was about 5 years ago and the scientist we contacted then was very helpful to us on a number of matters in response to our telephone queries. We met the CSIRO people personally for the first time some 2-3 years ago at a seminar on squeeze casting at the University of Queensland. This was followed by our attending Magnesium Institute seminars in Sydney and Melbourne which were tremendously valuable. My only reservation is that I believe that the proponents of magnesium applications should recognise that it will start small for aircraft and motor racing applications, where it has immediately recognisable advantages, and then build up from there rather than find widespread application from the outset.

The CSIRO scientists have been very helpful to us in supplying constructive advice in our research into a form of squeeze casting we have dubbed "compression casting". This technology has the potential for wide application since it is suitable for low volume applications and involves low initial capital costs. In one field we are looking for a technical advantage which will be recognised as competitive with forged products being introduced by our international competitors.

We are very much a technology oriented company and we are conscious of the need to be constantly improving our technology through keeping abreast of emerging scientific opportunities. It is therefore particularly useful for us to have someone with expertise that we can bounce our ideas off and to know that CSIRO scientists are only a phone call away and have a genuine interest in what we are doing and what we are trying to achieve. Our contacts are usually by telephone, but we also occasionally meet. For example we all got together with the Canadian Magnesium Institute people during the seminar and occasions like that are very helpful for cementing good professional relationships. The CSIRO casting group have good contacts with the Canadian Institute which looks like being of considerable value to us also.

In the main our informal contacts are oriented to testing with independent experts our own conceptual ideas. We then get confirmation as to whether as a company we should proceed further with those ideas or not. The CSIRO scientists we approach in this way have always been very forthcoming, helpful and responsive and this has definitely been of value to our company. With recent developments and prospects in our company we expect they will be of even more value in the future.

Nu-lec Pty Ltd, Brisbane
Greg Nunn,

We manufacture electrical switchgear and have a wide range of products. One of our new products is a medium voltage gas switch incorporating a rare-earth permanent magnet to reduce the arcing time. The idea for this product originated from within our company and the subsequent CSIRO advice through a number of telephone conversations was one of many inputs we sought, but it was of considerable significance. CSIRO's input was on the underlying principles to be employed, and a CSIRO developed permanent magnet manufactured by AMT was ultimately used in our product.

A. E. Bishop and Associates, Sydney
Mr Klaus Roeske

We are a small company manufacturing high precision products which require the application of very accurate measurement. For many years now we have sought support from the CSIRO scientists at NML in a variety of areas. These are mainly where we lack the measurement facilities, but they have also assisted us in the development of measurement software. For example for a precise rack-and-pinion steering product we needed to undertake extensive product inspection involving more than a thousand inspection points, and we collaborated well with CSIRO on that task. We developed the mathematics for acquiring measurement data for analysis, CSIRO scientists developed the analytic software, and then we developed the requisite graphical/pictorial software for data presentation. We also had a more formal research arrangement with them for developing optical inspection techniques for high precision measurement.

These are examples of some larger-scale collaborations, but we more often seek shorter-term advice, for example on requisite inspection points or on surface finishing. Sometimes we develop our own systems and approaches where NML is not readily able to help. Our association with CSIRO scientists at NML goes back over 20 years and has involved a number of our people and a number of their scientists. We have had frequent visits to their laboratories in addition to our more usual telephone contacts, and they have also visited our plant. We believe we have developed a strong mutually-beneficial relationship and we will continue to draw on their expertise to maintain our competitiveness.

Standards Association of Australia (SAA), Sydney
Ms Meron Clark

Our SAA Committees are responsible for developing and updating standards for Australian products and procedures by providing recommendations to the relevant Board of SAA. We involve representatives of a number of interests and organisations with specialist expertise on our Committees. These inputs are provided on a voluntary basis by people (usually) nominated by peak national bodies representing the relevant sectors of interest in the matter being standardised e.g. consumer groups, universities, government departments and manufacturing organisations. We aim to minimise unnecessary deviations between Australian Standards and International Standards, which is increasingly important to Australian exporting companies, while also ensuring that the public interest is protected.

The SAA Committee responsible for updating standards for sunscreen agents needed a "harder" and more expert scientific input on spectrophotometric aspects of measuring sunscreen performance than existed on the Committee at the time. On the advice from a professor at the University of NSW we approached CSIRO in 1992 who nominated a scientist with the required expertise. He has since provided a scientific input to the specification for a solar simulator. This has resulted in the Committee reconsidering its specification for the simulator, and the climate for ongoing objective reconsideration of this specification is now much improved. It is very healthy for our Committees to have new ideas put forward, particularly by independent and authorative persons.

We recognise. that organisations which provide nominated persons to serve on our Committees do so because they see advantage in having their views presented on matters which affect their products and areas of interest. Our system relies on balancing the opinions of a broad cross-section of voluntary inputs, and benefits from qualified independent expertise as well as from consumer, user and commercial interests. We are aware of the pressures on CSIRO to concentrate on its research role and also secure external funding, but would be concerned if this precluded its contribution to national interest matters where it has the capability to provide a unique and valuable input.

UVS Ultra Violet, Melbourne
Mr Robert Wilson, Managing Director

UVS is a family owned business manufacturing ultra violet disinfection systems, primarily for air and water. With increasing attention to environmental quality and controls over ocean and stream discharges of secondary sewage effluent, our products are aimed at this rapidly growing market in both Australia and overseas. UVS has been successful in winning six of the last seven tenders all by the NSW PWD.

As a manufacturer of low pressure mercury vapour lamps, we are able to develop a complete secondary sewage treatment plant comprising of lamps, sleeves, power supplies, computerised alarm systems, stainless steel lamp modules, and control cabinets. The ability to develop the complete sewage treatment system is very important, because the value of the UV lamps in a $500,000 sewage project is only around 10%. To justify continuation of R&D it must be into improvement of the complete system. Currently the largest secondary sewage UV treatment plant that has been installed is capable of disinfection at a flow rate of 120 L/sec., with a 521 L/sec. plant coming on line in June 1995. With development of new high power lamps and systems of this volume throughput, we are able to look at supplying to the world market.

Our association with the National Measurement Laboratory in CSIRO started some 15 years ago and progressively developed over the years. The advice and support we have received has been invaluable in our success to date through enabling us to maintain and enhance our technology-based competitive edge. The quick and informal access to NML people who understand well our measurement requirements for developing and testing our new designs has been central to our technology development program. It is the only way a small company like ours can tap into world class science and be kept aware of international developments which impact on our business.

The contacts we have range from informal telephone advice on the importance of various measurement parameters and techniques to visits to our plant, usually at our expense, by Sydney-based scientists to discuss broader aspects of our technology development program. In such a recent visit CSIRO people were able to introduce us to a top level scientist in our field from a leading German multinational company. That company had recently vacated its interests in this field and he was able to alert us to significant relevant developments in Europe. CSIRO's ability to tap into and introduce us to such experts is vitally important to us as small companies do not have the resources to establish such contacts on their own.

The value of the CSIRO/NML's reputation in our region is also critical to our marketing success abroad. We had, for example, been trying for a number of years to supply systems to Hong Kong authorities, but they wouldn't even look at our products. We had CSIRO/NML undertake an independent test of our lamp's power output. The Hong Kong agencies were happy to accept these test results as being authoritative and we subsequently won an important contract from them. Prospects in that market now look sound and we have entered into an important local distribution agreement in Hong Kong, and similarly in the Middle-East. The benefit to our company from the acceptance of the impartiality and accuracy of CSIRO's testing far exceeds the charges involved for undertaking such tests. UVS in its own right is a NATA registered laboratory, but we required independent test results from an internationally accepted test laboratory.

We are now moving towards placing a major contract with CSIRO for development of new lamps for our next generation of products after many years of sound advice on a less formal basis. The expertise at NML is unique in Australia and invaluable in providing guidance for our development of new products. Without the input from CSIRO we wouldn't have won recently contracts in NSW worth more than $2 million. They helped us to compete successfully in both domestic and international markets.

In our business we have to look at supplying niche markets and compete through our technological edge. We will continue to look to CSIRO to provide world standard scientific input into our development of new products.

Australian Defence Industries (ADI), Melbourne
Mr Len Dobbin

We have quite a deal of contact with CSIRO in general, including in particular with scientists from the Cooperative Research Centre (CRC) for Mining Technology and Equipment in Brisbane and also with geomechanic scientists based in Perth. We are constantly looking for new market opportunities which match our specialist engineering and manufacturing capabilities and in this context mining equipment is of particular interest.

Our informal contacts with the CSIRO scientists from the CRC for Mining Technology and Equipment are quite frequent. They are usually telephone inquiries which we originate either to seek information relating to a technical problem or to discuss longer-term prospects. There have also been a number of site visits by both of us.

We already do a considerable amount of "build-to-print" work for the mining industry and other users of heavy engineering products, concentrating on the fabrication and machining of big assembly parts. Examples are bore mills, sag mills and tunnel boring machines, the last being fabricated for the Melbourne Metropolitan Board of Works for sewerage tunnels. We often seek technical opinion from the CSIRO Brisbane group on potential market advantages we discern from these engineering and manufacturing activities.

ADI is becoming more export oriented so any advice or information is of particular importance to us. Examples of ADI's export activities include our use of precise fabrication capabilities to manufacture enclosures, covers, ducts and shafts for gas turbine machinery for General Electric in the United States.

ADI and CSIRO have an umbrella agreement (MOU) which facilitates contact between our organisations, and we are also involved in the CRC for Materials Welding and Joining headed by CSIRO in Adelaide.

Overall we regard our CSIRO informal contacts as very useful. We tend to be sceptical of advice, but have found that the advice we receive from CSIRO scientists holds up well to critical scrutiny and we now judge their advice as excellent. This have given us the confidence to approach them both on competitive technologies and on specific technical problems. They have contributed indirectly through informal advice to a number of our projects, including some ventures which we may well not have pursued without their objective and expert advice.

BHP Research, Port Kembla
Mr Bruce Morrison

We have several ongoing contacts with CSIRO scientists in both the Divisions of Applied Physics and Manufacturing Technology. In the past we were also very interested in instrumentation developed by the then Division of Textile Physics, for example their optical instrument for precise distance measurement which was capable of 2-3 micrometer resolution that we considered applying to measurement of coating thickness uniformity, and also a wedge device for measuring colour.

With the Division of Applied Physics we have valuable contacts with both their temperature measurement and magnetics scientists. In the latter field we keep a watching brief on their work through informal contacts and also occasionally get them to do magnetic tests for us on a fee-for-service basis. They also visit us for NATA certification purposes. In the temperature measurement area we had a very successful and valuable collaborative project with their scientists on temperature measurement for our metal coating processes. This has led us to maintaining contact and exchanging information more generally on pyrometry and other temperature measurement techniques. For example a suggestion they made for use of "prod-thermocouples" was very valuable to us.

Our contacts with the Division of Manufacturing Technology have followed a similar pattern and have been similarly fruitful. We had a very successful formal collaboration with them on surface inspection systems, and since have had numerous informal discussions with them on a number of related matters.

Most of our informal contact is by telephone, but I have also visited both these CSIRO Divisions on a number of occasions and they have also visited us. Being able to tap into their scientific expertise is very valuable for us, and we also pass information to them of similar value. This type of access to knowledge through information exchange and informal networking benefits both parties.

Malcolm Nearn and Associates, Sydney
Mr Malcolm Nearn

I operate a consultancy business providing advice in the field of cosmetics and over-the-counter pharmaceutical products. Colgate Palmolive sponsor my business to provide expert input on its behalf to the Standards Association of Australia (SAA) Committee responsible for developing and updating standards for sunscreens.

My initial contact with the scientists from the CSIRO Division of Applied Physics stemmed from our joint involvement in this SAA Committee, and the CSIRO expert advice on that Committee for the development of a simulator for synthetic sunlight has been invaluable to us. I now have a number of on-going informal contacts with that CSIRO scientist which I consider important to my business. CSIRO's expertise and independence enable it to make a unique contribution in this field.

BHP Petroleum, Melbourne
Mr Anthony Polomka

My contacts with the CSIRO Division of Chemicals and Polymers are relatively recent. I first became involved with them in relation to problems encountered with failures of hydraulic control lines in our Timor Sea operations associated with the high temperatures in some locations. The CSIRO scientist played the key role in identifying the failure mechanisms and in determining that the polymeric degradation was only occurring in the hot sections of these lines. This led to us only having to undertake a partial line replacement with substantial savings for us; the cost of replacing the whole undersea line would have been of a different order of magnitude. We have now also introduced a long-term monitoring program.

Following this successful collaboration I have approached them formally and informally for advice on a range of other matters, for example in the field of elastomers and polymers into a problem with loss of tensile strength of our slings for umbilical supports, and also into the performance of teflon seals. I have found in all these instances that their advice is sound and has been provided in a reasonable time frame which meets our needs. The advice given has led to us having a far better appreciation of failure mechanisms and expected life of these products in different environments.

It is very useful for us to know where capable expertise is readily available, and they are certainly my first "port-of- call' for advice in these areas. The approaches are not all one-way, but rather often involve exchange of information. I believe they derive considerable spin-off benefit from our alerting them to what happens in the field, as well as our benefiting from access to their scientific expertise.

Central Highlands Water, Ballarat
Mr Bob Ford

Our contacts with the CSIRO Division of Chemicals and Polymers go back over more than 10 years. The initial contact related to a new sewage treatment process they had developed. They contacted us and this led to them installing a pilot plant at our facility on which we undertook the monitoring. Following the successful demonstration of the process capability we then designed the full-scale plant. This contract was extremely beneficial from our point of view as it has resulted in significant reductions in our costs.

We have continued informal contacts with these scientists since that time, particularly in relation to improvements and upgrading of that plant. These contacts are usually by telephone, but we also meet with them at conferences on water and sewage treatment. They involve 2-way exchanges of information which are of benefit to both of us. They respond positively to our requests for technical advice on matters which can be dealt with quickly. For more major matters we may well enter into further formal contracts given our past positive experience and the good professional relationships we have maintained over the years.

CEM International, Melbourne
Mr Arthur Chipman

Our contact with the CSIRO Division of Manufacturing Technology welding technology group originated some 2 to 3 years ago. We had a contract to fabricate very high pressure gas storage cylinders and we are experienced in fabricating and welding special steels, in this instance quenched and tempered steels. We encountered some technical problems relating to the welding of these cylinders and the Gas and Fuel Corporation suggested we contact the CSIRO group in Adelaide for assistance. At a subsequent joint meeting we held here in Melbourne involving all parties the CSIRO scientist was able to offer very valuable advice as to how difficulties in our proposed approach might be overcome and on alternative approaches we might pursue. We decided to keep to our existing procedures, with some modification, rather than adopt the alternatives suggested, but nevertheless found the discussions very illuminating and helpful to us in improving our procedures. At the same time I believe the CSIRO scientist found valuable the information we were able to provide based on our practical experience. It was a good exchange of information of value to all of us.

As a consequence of this meeting we invited the CSIRO scientist to visit our plant during which we discussed other production techniques and ways to improve them. He was again able to make suggestions which proved to be extremely valuable to us. We were looking for an alternative to our grinding techniques for back-gouging and plasma techniques were suggested along with a reputable supplier of the machinery. We subsequently obtained that machine on trial, confirmed its capabilities and suitability, and then purchased it. It has been a big success for us. The technique is very good, well-suited to our needs, and has substantially reduced the time and costs of this stage of our production process.

These experiences were so positive for us that we are now very keen on maintaining and extending our informal contacts with CSIRO. Most recently they advised us on techniques for investigating cracks that were appearing in some of our welds. We adopted the technique they suggested and quickly found that the source of our problem was a poor batch of welding wire from a supplier. The analysis of the weld metal spectra enabled us to find the problem source far more quickly than we would otherwise have done, and the speed of problem identification and rectification was extremely valuable to us.

Overall the advice we have received from CSIRO has been very constructive and helpful to us, and we have found that they are also good listeners and receptive to our ideas and practical experience. They are prepared to discuss things through and give reasons for their advice which builds confidence. In the near future we will be involved in sophisticated machine tooling and would be intending to seek initial advice from the relevant scientists in CSIRO to help us introduce this new technology.