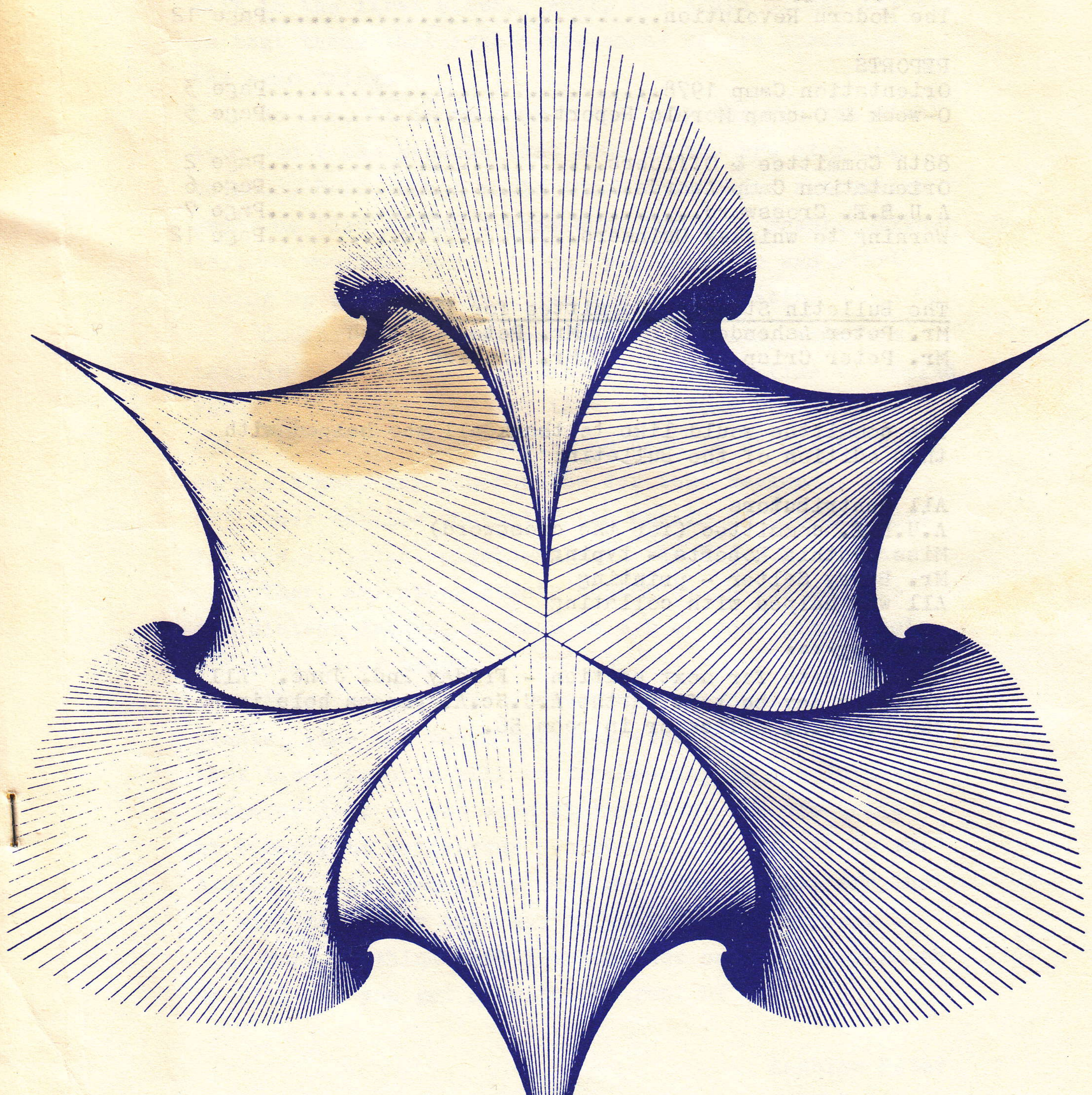
SCIENCE BULLETIN



THE BULLETIN

Contents of the first edition for 1978:

The Bulletin Standing Committee for 1978:

Mr. Peter Ashenden
Mr. Peter Crisp
Mr. Peter Liebich
Mr. Lachlan Peter

The committee would like to thank all who helped with this edition of the Bulletin:

All contributors
A.U.B.E. committee (for the crossword)
Miss Cynthia Roberts - typing
Mr. Barry Salter - printing
All who helped with collating

****NOTE****
Closing date for next edition - Friday 2nd. June. All articles may be left in the A.U.Sc.A. pigeon hole in the S.A.U.A. office or in room S6.

EDITORIAL

Well, although some of you weren't expecting it, the Science Bulletin has once again come out. After reading this publication, some of you that are new among us will wonder whether it was worth publishing this in the first place. Well, the truth of the matter is that those that aren't new among us are wondering the same thing.

So far, it is well over half way through the first term and I can presume that some of you are starting to study hard, but I would think that there are others among us that wouldn't know what the word meant. Either way, we would like you to put pen to paper and start coming up with some articles for the Bulletin.

Coming to an important matter in hand, which is that of the Reorientation camp. We would like to remind you all that the dates of this are: from Friday June 23rd. to Sunday June 25th. The camp is at Loftia Park, so don't make any other plans for that weekend. For any other details contact Robin Marlin or Rob Trengove via the A.U.Sc.A. pigeon-hole in the S.A.U.A. office.

There are other events coming up in the not too far distant future, so keep an eye on your pigeon-hole for details of these.

Also, we heven't received many reports of recent events, like the beach barbecue etc., but we are hoping that these reports will be forthcoming in the future. Remember that if you were at any event you are quite at liberty to write your own report and drop it in the A.U.Sc.A. pigeon-hole or room S6. The chances are that it will be better than any official report anyway.

Well, I think that I've carried on for long enough so I'll let you get on with the rest of it.

Lachlan Peter
EDITOR

ADELAIDE UNIVERSITY SCIENCE ASSOCIATION

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In addition, convenors are chosen to organize each activity. If you are interested in running for any position advertised in the agenda or in having your say in the running of the Association, please feel free to come to our monthly meetings.

ORIENTATION CAMP 1978.

I shall preface what is to follow by stating that this is a personal statement containing ideas and views which have developed over my 3 year involvement with the organization of these events.

It is my feeling that in several aspects the 1978 O-Camp fell short of expectations. This occurred largely as a result of 2 factors:

a) poor choice of convenors by the committee,
b) poor choice of seniors by the convenors.

In my opinion the committee as a whole and as individuals did not give adequate consideration to the selection of people to take responsibility for what is in fact A.U.Sc.A.'s major activity for the year. Greater efforts could have been made in approaching members of the Association to sound out opinions and attitudes prior to the meeting at which the appointments were made. To my knowledge few people were consulted in this matter.

Beyond this, the fact that the committee was forced to select convenors from four 1st. year students and one person (myself) who was not even a member of the Association reflects poorly upon the senior members of the committee and more widely the Association.

This factor had several significant repercussions. Both prior to, and during the camp there was a considerable lack of communication between convenors. I in no way wish to absolve myself from responsibility for this but feel that people who are likely to be working full-time during the long vacation - the period when most administrative work is to be done - or with heavy commitments elsewhere should not be chosen as convenors.

Because of the inexperience of the convenors, responsibility fell largely upon the shoulders of one person. This situation has occurred previously but not to such a great extent. One way to legitimise this situation is to appoint a single convenor with power to co-opt assistants and/or delegate responsibility as they see fit. This action would resolve the farcical situation which now exists while allowing for the training of people to assume the responsibility for organization in the future.

Now, to pass to the second point of this paper, the selection of seniors.

The performance of the majority of seniors on the 1978 Camp was one of its most disappointing features. When comments are made to the extent that some seniors were totally indistinguishable from the new students, the need for a reconsideration of selection criteria and methods becomes blatantly apparent. If "seniors" are going to disappear into the mass of first years, have a good time and "con" the new girls/guys, there seems to be little point to having "seniors" at all. The other extreme also arose to a greater extent this year than previously, that is, the problem of cliques among the seniors. Groups of seniors tended to always be highly visible: eating together, playing cards together and generally having a good time with their friends. Is this really the role of seniors on a "first year orientation camp"?

The problem was in part the fault of the convenors who tended to select friends, "nice people" without due consideration to the role of seniors and the suitability of people to fill that role. But the responsibility was not wholly the convenors. Their job was made uite difficult by the composition of the active core of A.U.Sc.A. Who apart from friends and relatively inexperienced people was there to chose from? The committee needs to seriously consider why the ssociation is unable to hold the interest of, and generate enthusiasm in its older members.

Yet even allowing for these limitations, the performance of seniors in general was disheartening. Seniors failed to participate in organized activities, others acted irresponsibly but the majority merely failed to act. Seniors should have been organizing activities, involving themselves with 1st. years, acting as liason between 1st. years and convenors and between 1st. years and visiting staff; but many preferred to sit and play cards or do nothing rather than take an active participatory role in ensuring the success of the camp. Due largely to this lack of action by seniors the camp was less successful than in past years.

Admittedly, everyone, or almost everyone, had a good time. But is this the main criteria by which success or failure of the O-Camp should be measured? How much information was passed on to the new students? What impressions of the Association, Union and University were created? Basically, how valuable was the camp as a step in preparing the 1st. years for the University environment? I would have serious reservations about giving a positive answer to this last question.

The Association need to give serious thought to the philosophy behind running an Orientation Camp. A few points which could be raised in such a discussion are:-

1) Who is the camp for?
   (Surely for the new students rather than the "heavies".)
2) How can the interests of new students best be served?
3) What exactly is the role of the "seniors" in the system adopted to meet the basic aims of the camp?

Not only does the concept of an Orientation Camp need reconsideration; the organization of such a function also needs to be rethought. A few administrative changes which should be undertaken have already been outlined. Others which bear consideration are:

1) The reduction of the number of full-time seniors. The 1978 camp had too many seniors. The camp was too large and rather than reduce the number of first year places a higher ratio of 1st. years to seniors should be introduced. This would also reduce the difficulties encountered by convenors in trying to fill the "quota" of seniors. Working with the same pool of available people the convenor would be able to make a more reasoned selection of seniors. People would miss out who might otherwise have been able to attend but stiff cheese! The camp is for 1st. years not seniors.

2) The reduction of the number of visitors, specifically student visitors. For the same reasons as above, this category should be limited to individuals who can make a positive contribution to the camp. Casual visitors intent on a day at the beach, a few free meals and a chance to check out the "talent" should be strongly discouraged from attending. Times for invited student guests should be clearly specified and limits imposed, e.g. visitors who decide they would like to stay for the whole camp should be discouraged.

3) Daytime activities should be planned. Afternoons should be filled with specific activities rather than allowing free time for people to show initiative (Most don't have much!)

4) Access to the kitchen should be limited i.e. it is a work area, not a place for gatherings, parties, gayness and frivolity at all hours of the day or night. Acess should be restricted to those working or invited by the cook.

Finally a few happy words!

Some people filled their roles adequately. Thanks to them. Others worked harder than could reasonably be expected. Special thanks to Sue Abasa for her assistance in the kitchen, and her activity as taxi and carrier to and from Adelaide, to Sandy Douglas for his efforts in general, to those people (who shall remain nameless) who helped keep me sane, and to anybody else who feels they deserve it.

DON HOUSTON.

O-Camp/O-Week Morals Report.

Rob T. - for tickling Peter S. before Norm's Group Grope was underway - 2 pink points.

Ian & Peter C. - went into the bush for a "Quicky" - 2 pink points each.

Alison - "This pear feels lovely" - 1 green point.

Peter C. - surrounded by 4 women on the night of the films - 4 black points.

Kim F., Neil G., Greg D., Jane G., Sue C., - 4 black points each for stuffing (peppers).

Richard A. & Steve N. - sitting in the back row at the films - 1 pink point each.

Andrew A. - 2 pink points for being Miss Camp.

Matthea - 2 green points for being Mr. Camp.

Simon M. - 3 green points for Camp Pie in Stomach Award.

Libby S. - 3 black points for winning the Bed Warming Award.

Wally & Lachlan - 2 green points for their mud fight.

Clare & Mike, Paul & Kathy - 3 black points each, Roman & Sandra - 3 green points for making their own heat at the BBQ on the beach during camp.

Paul M. - 1 black for saying "let's fly away together " to Alison.

Cathy L. - ½ white point for arduously studying while this was occuring.

Peter S. - 2 black points for saying to a dark lady (i.e. Cathy) "You can have whatever you like whenever you like."

Cathy - 2 black points - she sat there and took it.

Don R. & Ulrik J. - have an instinctive "feel" for each other - 3 pink points each.

Don H. - "Roman is just Roman but Peter S. is nice". - 1 pink point.

Don R., Rob T., Lachlan P., Mike W., Andrew A. - 1 pink point each for taking Ulrik J.'s bathers off.

Rob T. - 3 pink points for swimming underwater near Ulrik immediately after the afore said incident.

Don R., Don H., Chris D., Kev E., Andy E., - ½ white point each for supplying seaweed to Ulrik with which to cover himself with.

Kerry - 6 green points - for regurgitating in the other competitors bins during F.A.A.R.C.ING.

Jane R. - Alone with at least 2 males (and the lighting of Øaucasian Chalk Circle) - 5 black points.

O-Camp/O-Week Morals Report (cont.)

Jane R. & Diane D. - for "abducting" two males from the Aldinga Hotel and taking them to the beach. - 5 black points each.

Roman - had emblazoned on his T-shirt "Don't bother me I can't... - 1 white point for the fact and 2 green points for advertising it.

DonR., Don H., Chris D., Andy E.- 1 white point each for coming to my rescue and massaging my foot, calf & thigh when I had cramp in my toes.

POINT SYSTEM (for those who don't already know it)
Black points - for associating with members of the opposite sex.
Green points - for grose acts.
Pink points - for associating with members of the same sex.
White points - for good deeds.

CYNTHIA ROBERTS
MORALS OFFICER.

RESULTS OF AWARDS FROM THE O-CAMP.

Mr. Camp - Matthea.
Miss Camp - Andrew Amberg.
Camp Stomach - Simon Maddocks
Twinkle toes - Veronica Schumann.
Waist Down Award - tied between Jane Gibson and Helena.
Waist Up Award - Chris Ey.
Camp Heavy - Ian Fearnley.
Frigid Nymphomaniac Award- Diane De Pledge.
The Fallen Angel - Cynthia Roberts.
Camp Camp - Rob Trengove.
Limbo Award - Robert.
Junk-food Junkies - Mark Fabian and Peter Hine.
Richard Cranium 978 - Scott Sard.
Richard Cranium - open section - tied between Peter Leibich and Peter Crisp.
Maslins Bikini - Naomi Organ.
Camp Grubs - tied between Wally Somerville & Lachlan Peter.

FOR SALE

1 A.U.Sc.A. T-Shirt

White with turquoise printing

Size 10-12

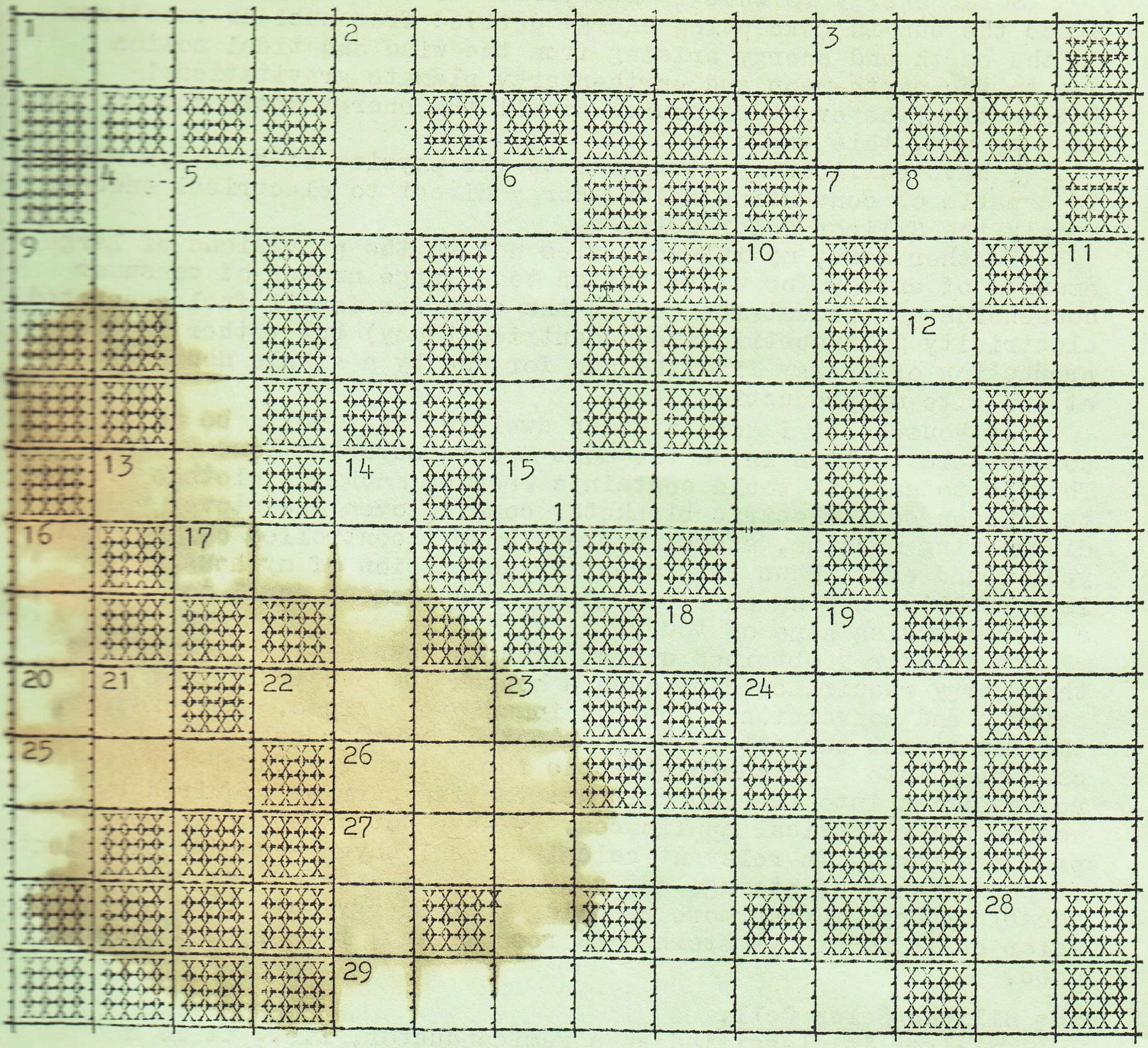
BRAND NEW

ONLY $3.00

Contact Cynthia Roberts

Dept. QN

A.U.B.E. SCIENCE CROSSWORD



CLUES

ACROSS

1. Single cell ancestor of Volvox.
4. What happens to eyebrows too close to the bunsen flame.
7. Element Sn.
9. 2240 lbs.
12. End product of many organid synthese.
13. Indefinite article.
15. Thermal energy.
17. The Egyptians worshipped this as Ra.
18. Covering device.
20. Psychological term that is useful in a game of scrabble.
22. Mendel___ successive generations of peas.
24. Common mixture of gases.
25. Fish that started a "war" between Britain & Iceland.
26. Plural of the verb "to be" (we am?)
27. Nomenclature is primarily concerned with it.
29. Greek letter.

DOWN

2. Molten rock beneath earth's crust
3. Common name for seed a e of many plants including macadami .
4. Julius Sumner Miller "Why is it ?"
5. Gold is cast into these.
6. Cessation of life processes.
8. Element no. 49.
10. Morals Officer & Secretary
11. Group II element.
14. Hypnotise.
16. The card players among us rarely miss one.
19. Archaeological site.
21. Fish eggs.
23. Martian moon.
28. Greek letter worth nine points (face value) at scrabble.

SOLAR ENERGY

Solar energy is what I interperate to be 'Energy from the Sun'. Since the sun is (excepting energy derived from nuclear reactions on the earth and energy arising from the wind and tidal motion due to the earth-moon and earth-nearby planets gravitational interaction)the eventual source of all the energy known and used by man, this topic is broad indeed.

I have confined my attention to the physics of a device which is capable of converting solar energy direct to electrical energy; namely the Silicon Solar Cell.

Further more, my interest lies not in the provisions of large amounts of energy for distribution to a large number of consumer households and industries (as in the case for fossil fuel generated electricity in industrialized countries today) but rather in the production of energy from the sun for use by a single household at the site of production.

By household, I mean a human dwelling that would be as comfortable to live in as the most modern suburban home of today. That is to say, it would contain a washing machine, clothes drier, television set, electric blankets, cooking oven and stove, dishwashing machine, stereo system, have a controlled climate all year round etc. Thus the essential definition of my household is a dwelling having an energy input requirement equal to that of a rather lavish home of today.

When energy obtained direct from the sun is to help provide the energy requirements of such a household, the problem of the storage and conversion of energy immediately rises. For example, the low direct current voltage output of a solar cell must be converted into a suitable storable form of energy for later reconversion into the 240 volt alternating current required by nearly all electrical appliances. I have not considered such problems here. In relevant calculations I have assumed coefficients of performance of storage and conversion of energy that are realizeable today, furthermore assuming that energy output from silicon solar cells is always stored and reconverted, rather than directly used.

The Silicon Solar Cell.

Silicon is classified as a semiconductor, i.e., it is a material with electrical conductivity approximately mid-way between conductors and insulators. Silicon is found in group 4 of the periodic table and exists as a crystalline solid with tetrahedral diamond-like structure, and a high melting point. The operation of the silicon solar cell depends upon some important properties of semi-conductors, and especially upon the way traces of impurities can be incorporated into the silicon crystal structure to drastically alter its electrical properties.

Semi-conductors - Considering an energy band of the electron shell of the atom, for an insulator, there is a large energy gap between the inner filled (valence) electron band and the outer (conducting) band. For metals, the inner and outer energy bands over-lap. For a semi-conductor, the gap between these bands is small. Keeping this in mind, the essential difference between the conductors on one hand, and semi-conductors on the other, is that in the latter, at absolute zero temperature, the valence band is completely full, while the former is not. Hence in a conductor, there are many slightly higher energy levels into which a valence electron can move and so become available to conduct an electric current. Electrons which are able to conduct electricity are said to be in the conduction band, so in a conductor the conduction and valence bands are found in the same (near) continuum of energy levels. In insulators and semi-conductors, there are no more energy levels in the valence band at absolute zero temperature, and the valence electrons must aquire an amount of energy greater or equal to the energy of the gap between the valence and conduction energy bands in order to move to a higher energy level and one in which they are available to conduct electricity. Quantum theory predicts that no electron can exist in this 'unallowed' energy region between electron energy bands. For an insulator the energy gap is large so that at room temperature very few valence electrons will be able to aquire sufficient energy (thermal) to move into the conduction band. Semi-conductors are characterized by a small energy band gap so that at room temperature, sufficient valence electrons are to be found in the conduction band for the conductivity to be markedly greater than that of an insulator.

Note that conduction in a semi-conductor can proceed by 2 different mechanisms. One is the normal flow of electrons in the conduction band, which is similar to that of a metal, and the other occurs because when an electron moves from the valence band to the conduction band, an unoccupied energy level is left in the valence band. Another electron can move in response to an applied electric field by moving into this level, but in so doing leaves another unoccupied level behind. This process of conduction through the valence band continues as long as there is an applied electric field and there are electrons in the conduction band. It is as if the 'hole' left by the vacating electron, moves in the direction of the applied field, and the current flow by this method is called conduction by holes.

Doped Silicon - If an element from the group five of the periodic table (usually phosphorus, arsenic ar antimony) is introduced to the silicon crystal in trace quantities, the added atoms will fit into the crystal structure as best they can. Since they have 5 electrons but use only 4 of them in bonding to 4 surrounding silicon atoms, one electron is left weakly bonded to the impurity atom. This electron requires only a small amount or energy (easily provided thermally at room temperature) in order to move to the conduction band it leaves behind a positive ion entrenched in the crystal structure. The deliberate introduction of impurities to the silicon crystal structure is known as doping. Since doping elements from group five add electrons to the silicon structure, they are known as donors. Although doping concentrations are typically of the order of one impurity atom to one million silicon atoms, this represents an addition of ten raised to the power sixteen electrons to one cubic centimetre of silicon for donor impurities. At room temperature, nearly all of these electrons are found in the conduction band. This radically increases the conductivity of the crystal, and changes the energy bands by introducing an energy level which is slightly below that of the conduction band. This new energy level is the energy of the electron which is left weakly bonded to the donor impurity atom. Electrical conductivity in the donor doped crystal is now almost entirely by electrons in the conduction band and so this type of crystal is known as N-type.

If an element from group, three of the periodic table (usually aluminium, gallium or indium) is introduced in trace quantities to the silicon crystal, the added atoms again fit into the crystal structure as best they can. Since they only have three outer shell electrons, but require four to form a stable bond with the silicon crystal structure, an unoccupied energy level or hole is introduced to the valence band. Nearby valence electrons need to acquire only a small amount of energy in order to move into the hole, so forming a negative ion fixed in the crystal and another hole.

Impurities which accept electrons from the valence band are known as acceptors. Doping concentrations are typically the same as for donors, and so something of the order of ten to the sixteenth power holes are added to the valence band. Again the conductivity is greatly increased, and the conduction is almost entirely by positive holes; hence the name P-type for acceptor doped crystals. The P-type conduction process can be realized by realizing that the acceptor atom has introduced a new energy level just slightly above that of the valence band of the silicon and only a small energy is required for the valence electrons to move up and occupy the hole introduced by the acceptor atom. In N-type crystals, electrons are known as majority carriers and holes as minority carriers, while in P-type crystals the reverse is true.

The P-N Junction - When P-type and N-type semi-conductors are joined together with no discontinuity in the crystal structure at the boundary, a diffusion current begins to flow, due to the inbalance of the concentration of holes and electrons on both sides of the junction. Holes move from the P side to the N side where they invariably recombine with electrons, while the electrons diffuse across the junction from the N side to the P side where they recombine with holes. As this current, called the injection current) proceeds, negative acceptor ions are formed near the junction on the P side as they accept electrons, while positive donor ions are formed near the junction on the N side. Thus a separation of charge occurs about the junction and this results in an electric field directed from the N side to the P side in the vicinity of the junction. This field opposes the injection current, and so an equilibrium is quickly reached where the diffusive forces tending to equalize the concentration of holes and electrons on both sides is balanced by the electric field across the junction. The extent to which the electric field extends into the crystal on each side of the junction, ceases where there are no majority carriers present. This region about the junction is known as the depletion layer.

At equilibrium, occasionally thermally generated electron hole pairs will be formed within the depletion layer. The electric field across the layer is such that it separates these pairs to form a current (called the saturation current) which flows in the opposite direction to the injection current, i.e. from the N side to the P side. When this happens, the electric field is weakened slightly, and so an injection current can flow again. At equilibrium then, the injection current is equal and opposite to the saturation current.

When electrodes are attached to the ends of a P-N junction and a load connected to them it is found that an electric current flows through the load when light is allowed to fall on the junction.

Effect of Radiation on P-N Junctions

The process is as follows. If a proton having an energy corresponding to the energy difference between the conduction band and the valence band falls on the depletion layer of a silicon P-N junction, it may be absorbed by an electron, promoting that electron to the conduction band and so forming an electron hole-pair. This electron hole-pair is acted upon by the electric field at the depletion layer, and so the electron is swept into the N region while the hole is swept in the direction of the field into the P region. Hence the P region becomes positively charged, while the N region becomes negatively charged. The operation of the silicon cell depends upon the fact that if an electric load is connected to the ends of the P-N junction, equilibrium can be regained by the electron flowing from the N region through the load(where it does work and so loses energy) and finally combining with a hole at the P side. Due to the distribution of electrons and holes in the crystal outside of the depletion region the P side has a higher energy that the N side.

The energy an electron must have in order to occupy a hole on the P side is only slightly above the greatest energy in the valence band, and so less than the energy of the electrons coming from the N side of the crystal through the load. It is this excess energy which transferred to the load that can be employed to do useful work. Of course, it may be that the equilibrium may be regained in the normal way where an injection current flows in response to the weakening of the junction field, but evidently by suitable