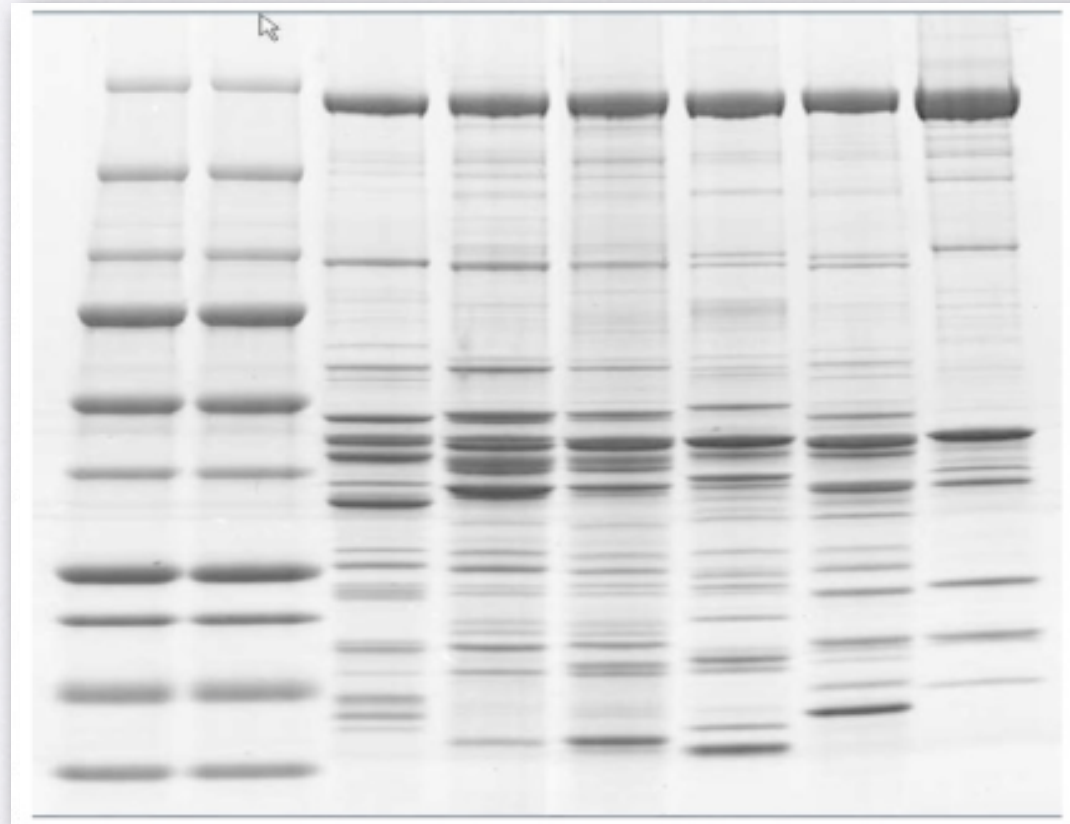


SUMMER INSTITUTE - ONLINE MODALITY CALENDAR 2022

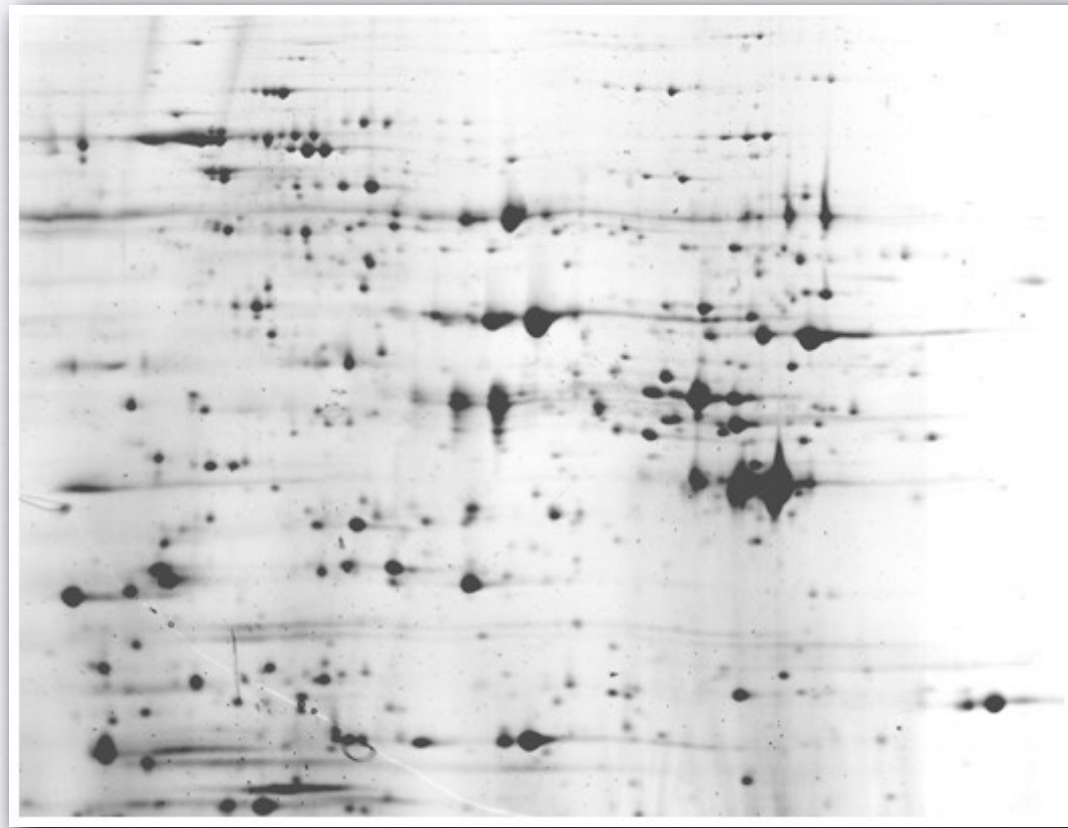
SUN	MON	TUE	WED	THU	FRI	SAT
June 26	27	28	29	30	31	July 02
	9:00-10:00am Virtual Program Orientation for Summer Institute Online Modality					
July 03	04	05	06	07	08	09
	Holiday (Independence Day)	8:30-10:00am -Welcome Reception and Buddy Meet & Greet Event	Free Day	Classes begin! 8:30-11am: BIOL4905 INTRODUCTION 8-10:20pm: Afternoon course	8:30-11am: BIOL4905 DNA PREPARATION 8-10:20pm: Afternoon course	
10	11	12	13	14	15	16
	8:30-11am:BIOL4905 PROTEOMICS I 8-10:20pm: Afternoon course	8:30-11am:BIOL4905 PROTEOMICS II 8-10:20pm: Afternoon course	8:30-11am:BIOL4905 PROTEOMICS III 8-10:20pm: Afternoon course	8:30-11am: BIOL4905 RNA PREPARATION 8-10:20pm: Afternoon course	Virtual Independence Day Activity	
17	18	19	20	21	22	23
	8:30-11am:BIOL4905 qPCR / ROBOTS 8-10:20pm: Afternoon course	8:30-11am:BIOL4905 DNA Sequence Analysis 8-10:20pm: Afternoon course	Midterm Break	8:30-11am:BIOL4905 Next Gen. Sequencing 8-10:20pm: Afternoon course	8:30-11am:BIOL4905 Automated Microscopy /AFM	
24	25	26	27	28	29	30
	8:30-11am:BIOL4905 Microarray I 8-10:20pm: Afternoon course	8:30-11am:BIOL4905 Microarray II 8-10:20pm: Afternoon course	8:30-11am:BIOL4905 Nanostring 8-10:20pm: Afternoon course	8:30-11am:BIOL4905 Flow Cytometry 8-10:20pm: Afternoon course	FINALS	
31	August 01	02	03			
	9:00-10:00am: Closing Reception		Grades available in PAWS			

Legend:
Orange: Courses Blue: Activities

Proteomics:

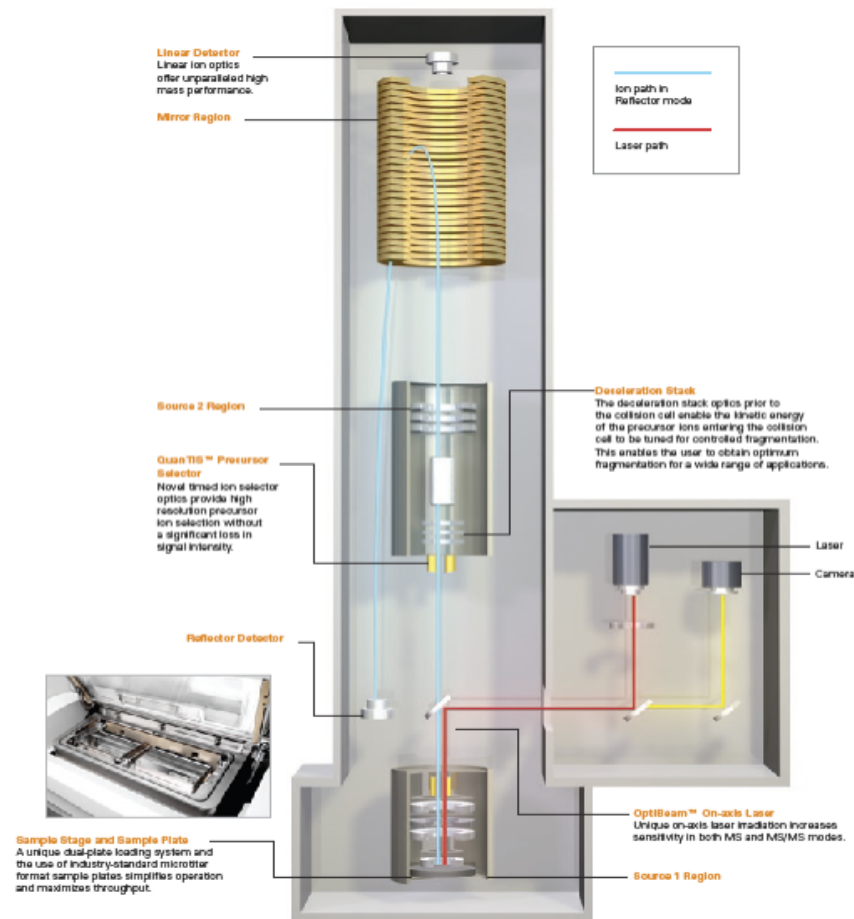
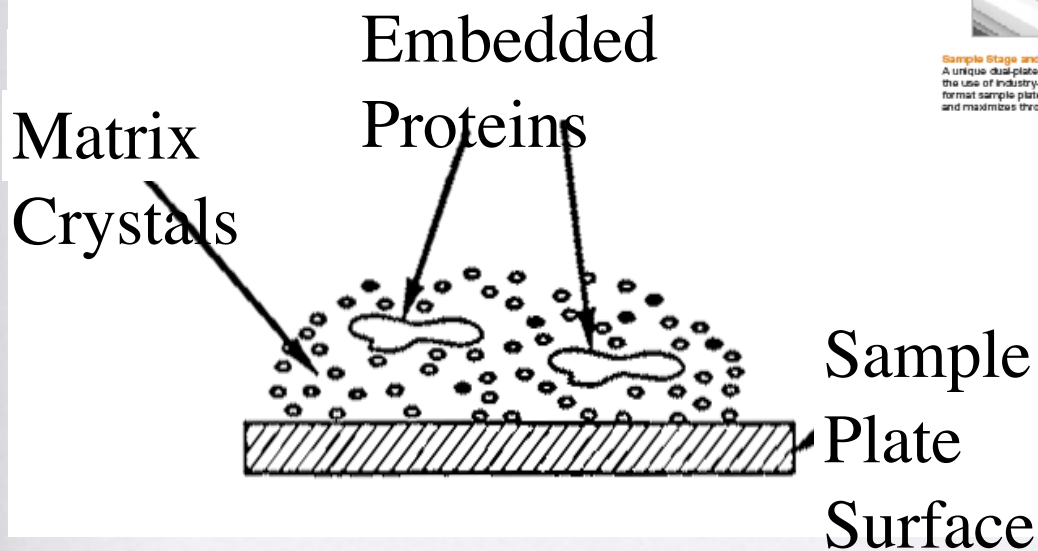


Proteomics:





Ettan II 2D gel Proteomics System complemented by a MALDI TOF/TOF(ABI) Model 4800+

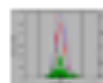


Proteomics:



Fluorescence 2-D differential in-gel electrophoresis platform

Amer sham Pharma cia Biotech UK Limited, Amer sham Place, Little Chalfont, Buckinghamshire, HP7 0NA, England



2-D differential in-gel electrophoresis (DIGE) is a powerful tool for identifying and quantifying protein spots, especially in complex mixtures. It allows for the comparison of protein expression levels between different samples.

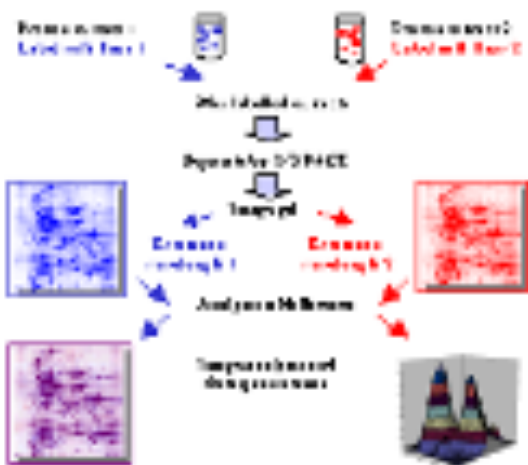


Figure 1: Overview of the 2-D DIGE technology (fluorescence dye and dye with Cy5 and Cy3 dyes) (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000).

The major benefit of this technology is its ability to identify and quantify protein spots. This is achieved through the use of a novel 2-D DIGE approach which allows for the simultaneous analysis of protein spots in different conditions. The DIGE platform is a robust and reliable tool for protein analysis and quantification.

The DIGE platform offers several key advantages:

- High resolution and sensitivity (1000x magnification)
- Multi-color labeling (up to 10 different dyes)
- Low background fluorescence (100x reduction)
- High precision (10% error)
- Low protein consumption (100 ng per spot)
- High throughput (up to 1000 spots per gel)
- Automated data analysis

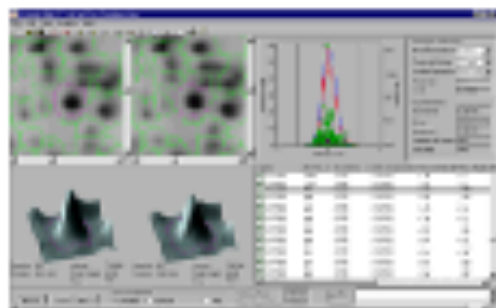


Figure 2: DIGE software interface showing spot analysis results.

The software interface provides a comprehensive overview of the DIGE analysis results. It allows for the visualization of spot intensity changes and the identification of differentially expressed proteins.

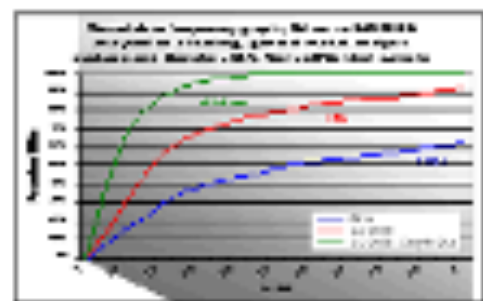


Figure 3: Graph showing the percentage of protein spots identified versus the number of spots analyzed.

To further enhance the 2-D DIGE platform, we have developed a new software tool for data analysis. This tool provides a comprehensive overview of the DIGE analysis results and allows for the identification of differentially expressed proteins.

The software tool offers several key advantages:

The DIGE platform offers several key advantages:

- High resolution and sensitivity (1000x magnification)
- Multi-color labeling (up to 10 different dyes)
- Low background fluorescence (100x reduction)
- High precision (10% error)
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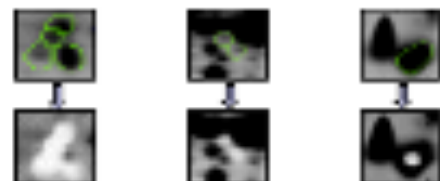


Figure 4: Protein labeling process (1000x magnification) showing the labeling of protein spots.



The DIGE platform offers several key advantages:

- High resolution and sensitivity (1000x magnification)
- Multi-color labeling (up to 10 different dyes)
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- High precision (10% error)
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- Automated data analysis

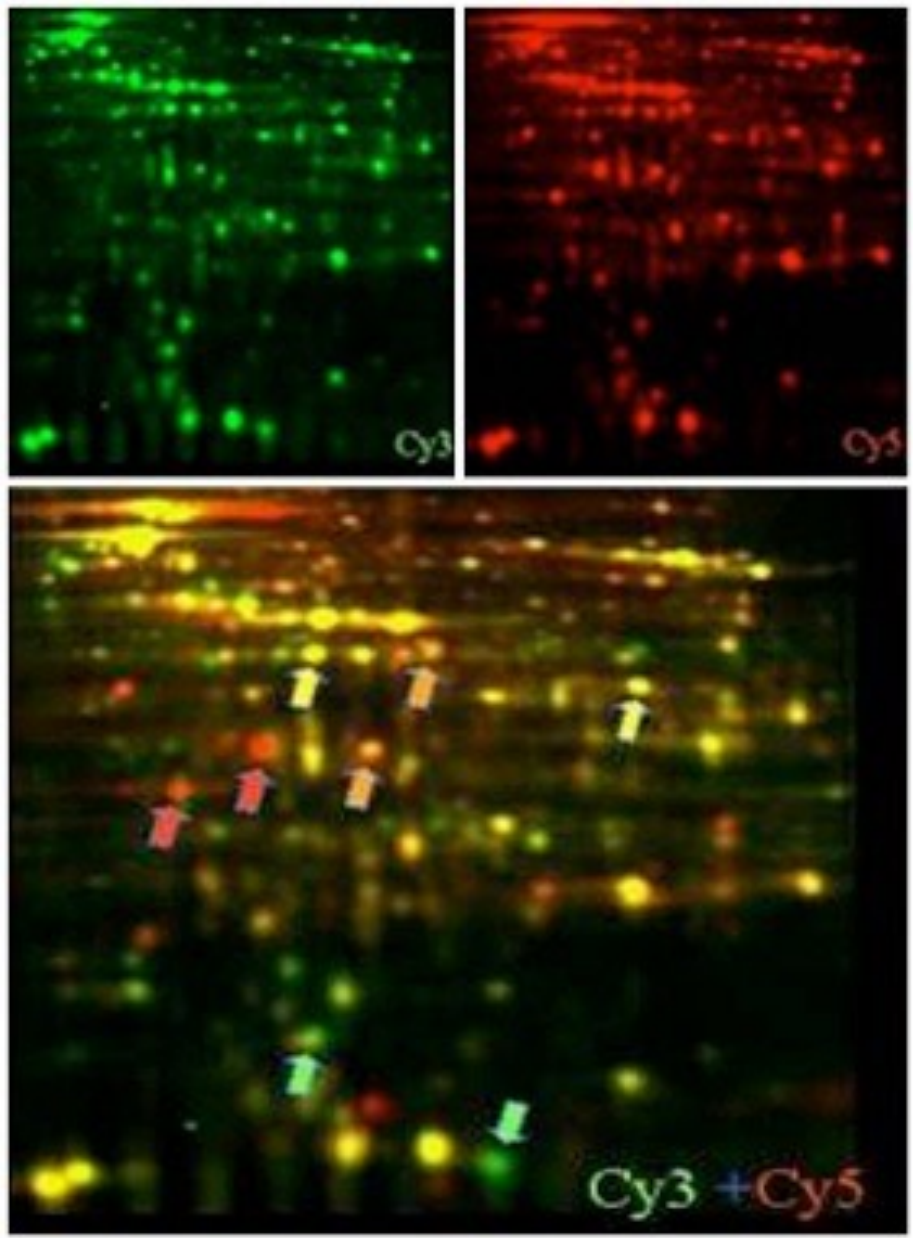
References:

1. Smith, M. D., and Kuhlmann, M. R. (2003). Proteomics: The future of biology. *Science*, 301, 1604-1609.
2. Smith, M. D., and Kuhlmann, M. R. (2003). Proteomics: The future of biology. *Science*, 301, 1604-1609.

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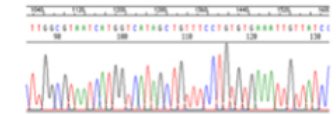
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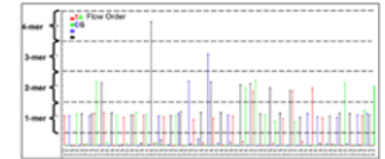


DNA Sequence Analysis: Profiling DNA

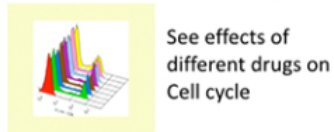
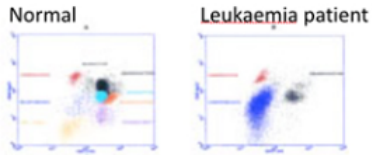


Sanger Sequencing –
>800 base pairs/run

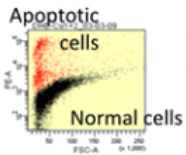
High Throughput Genomic Sequencing –
100,000 base pairs/run



Flow Cytometry Profiling Cells



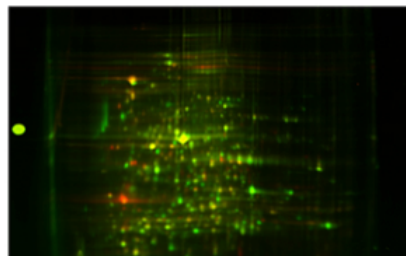
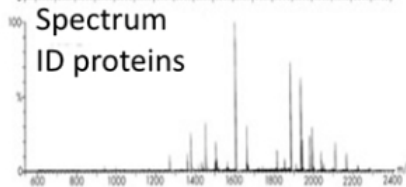
See effects of different drugs on Cell cycle



Apoptosis -programmed cell death

Cellular Functions

Mass Spectrometry

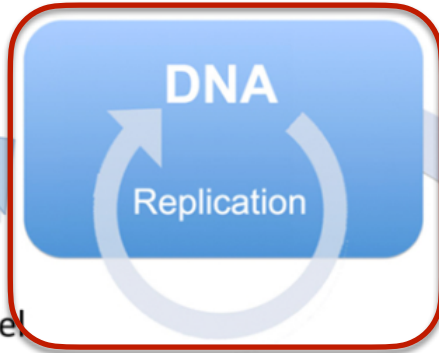
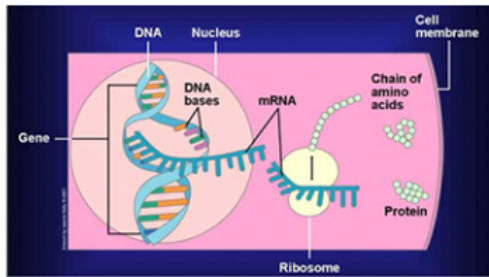
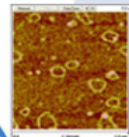


Proteomics Profiling Proteins

2D Protein gel
Protein separation using Electric charge and molecular weight

Atomic Force Microscopy Imaging at the Ångström level

Protein structure analysis



RNA Expression

Microarray: Analysis Profiling mRNA



Colour of pin-point dots demonstrates the presence / absence of gene sequences

Protein Expression



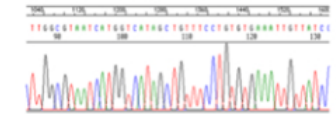
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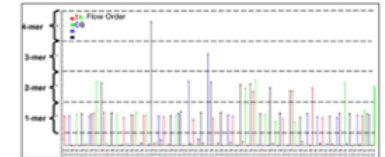


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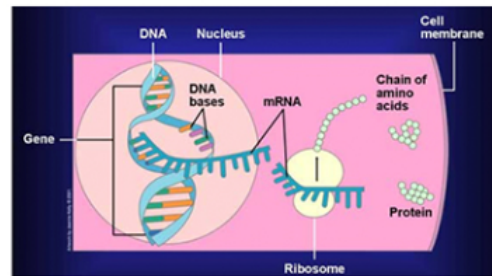


RNA Expression

Microarray: Analysis Profiling mRNA



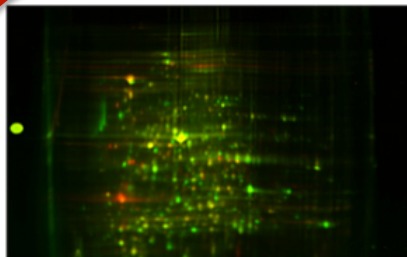
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Protein Expression

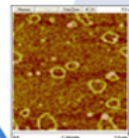
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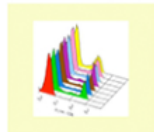
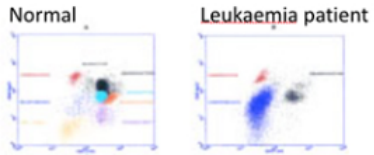


Atomic Force Microscopy Imaging at the Ångström level

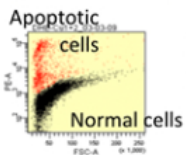
Protein structure analysis



Flow Cytometry Profiling Cells



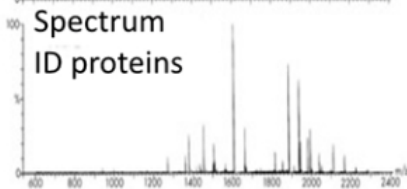
See effects of different drugs on Cell cycle



Apoptosis -programmed cell death

Cellular Functions

Mass Spectrometry





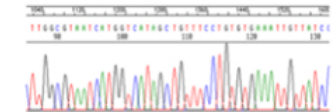
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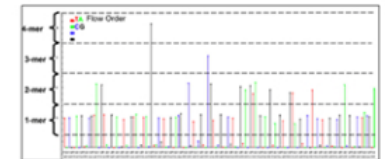


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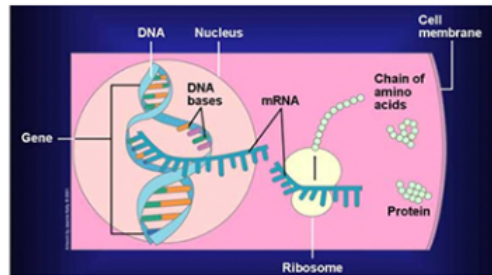
RNA Expression

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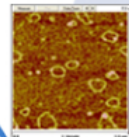


Colour of pin-point dots demonstrates the presence / absence of gene sequences

DNA Replication

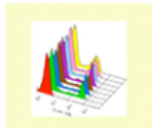
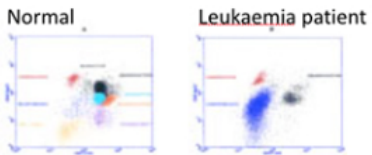


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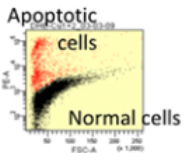


Protein structure analysis

Flow Cytometry Profiling Cells



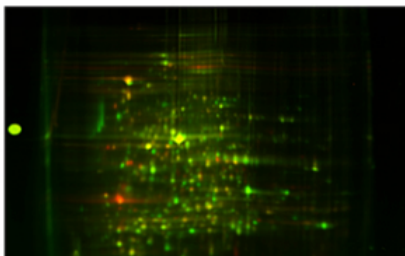
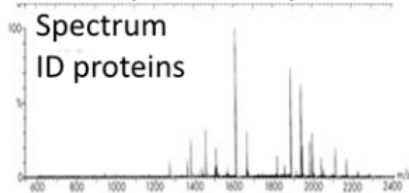
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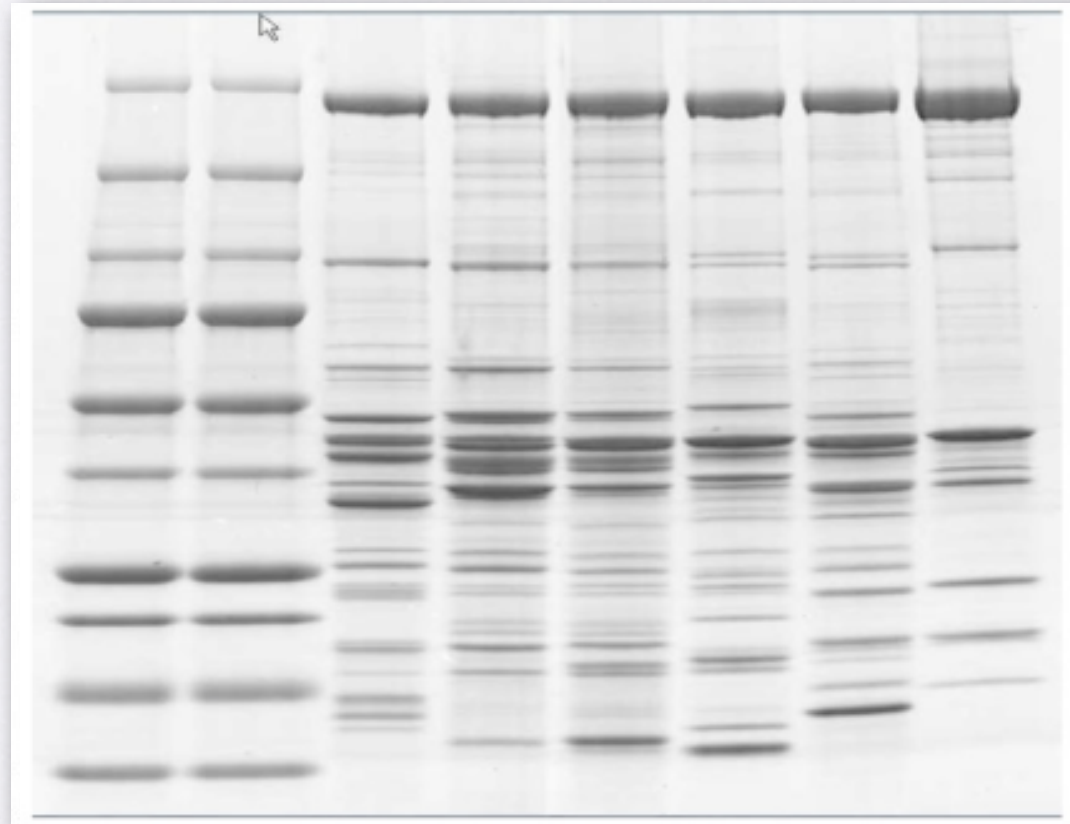


Protein Expression

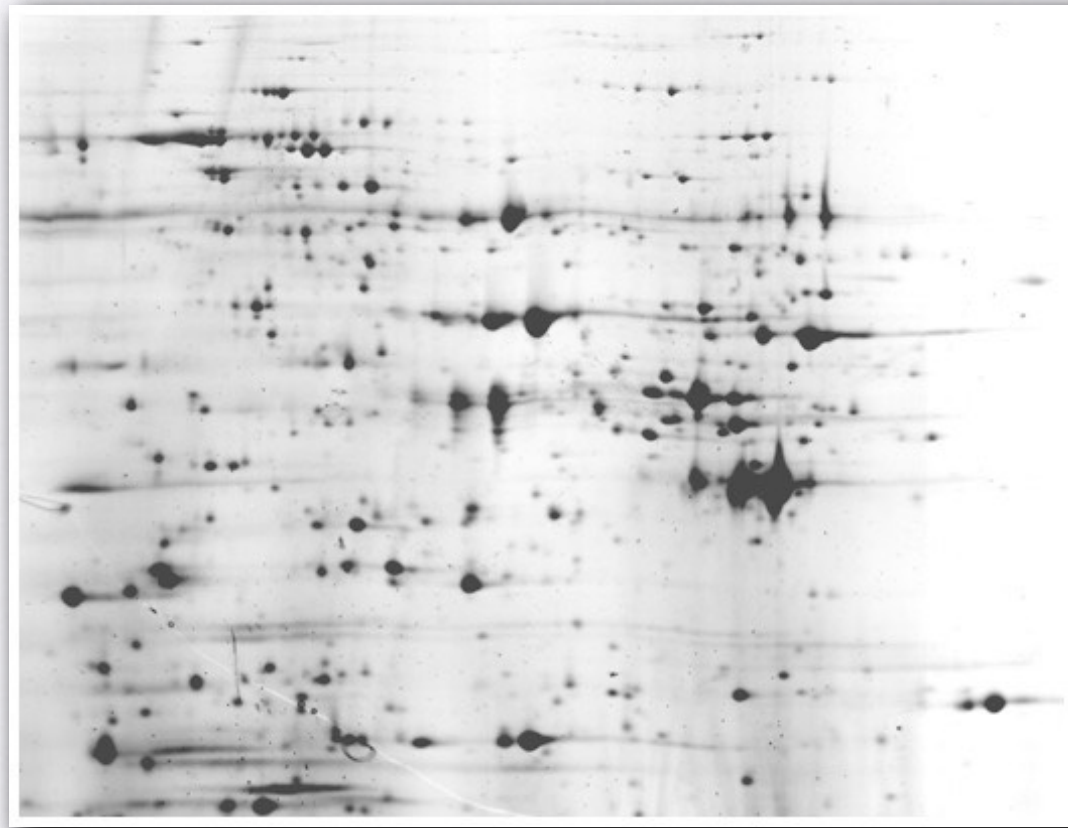
Proteomics Profiling Proteins

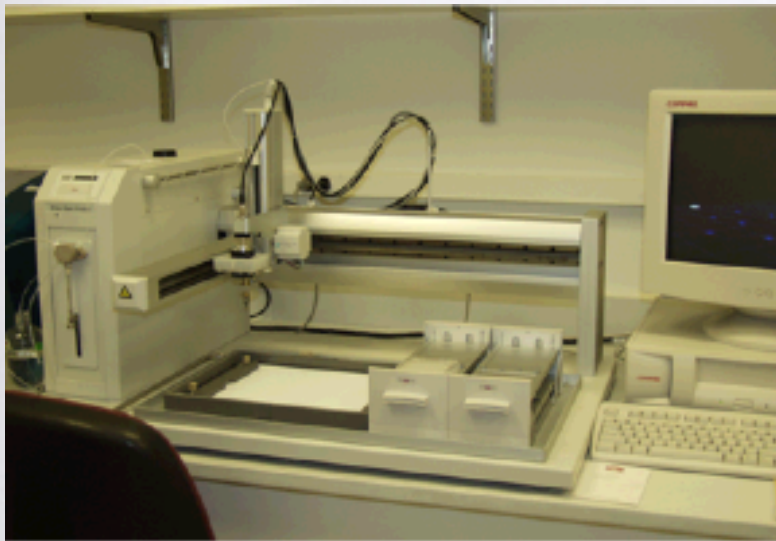
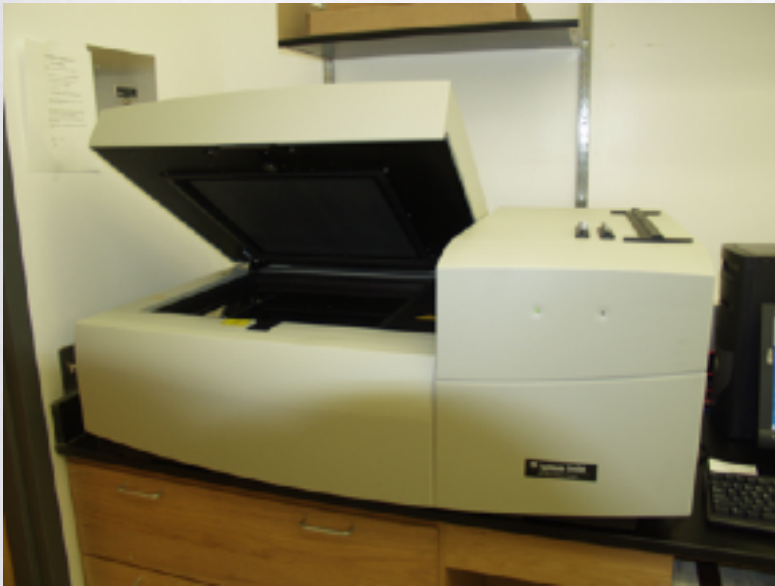
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Proteomics:

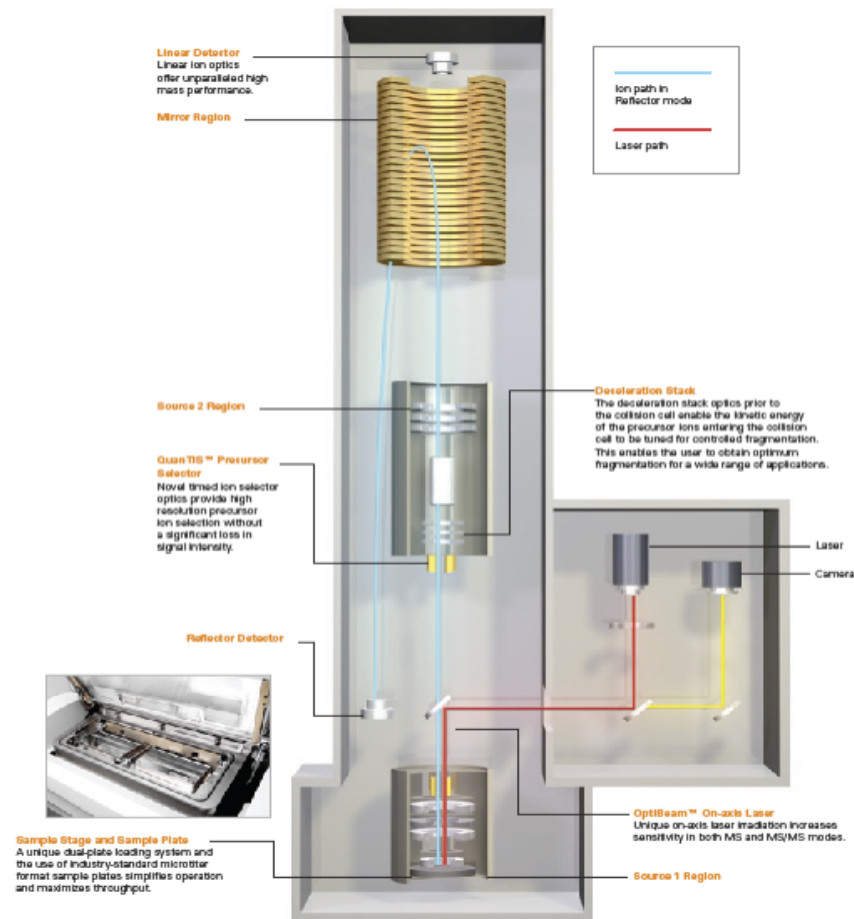
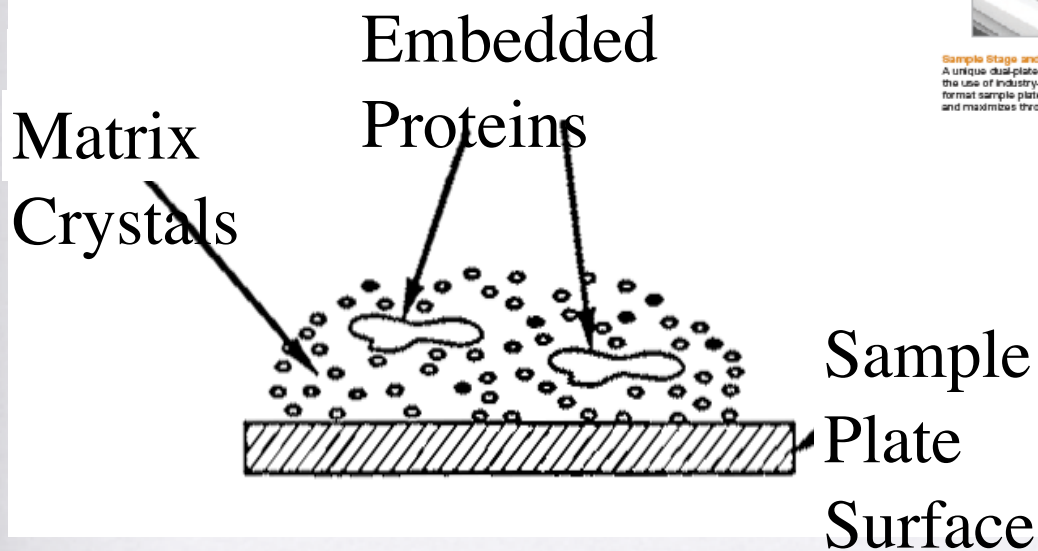


Proteomics:





Ettan II 2D gel Proteomics System complemented by a MALDI TOF/TOF(ABI) Model 4800+

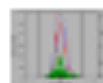


Proteomics:



Fluorescence 2-D differential in-gel electrophoresis platform

Amer sham Pharma cia Biotech UK Limited, Amer sham Place, Little Chalfont, Buckinghamshire, HP7 0NA, England



2-D differential in-gel electrophoresis (DIGE) is a powerful tool for identifying and quantifying protein spots, especially in complex samples (Figure 1).

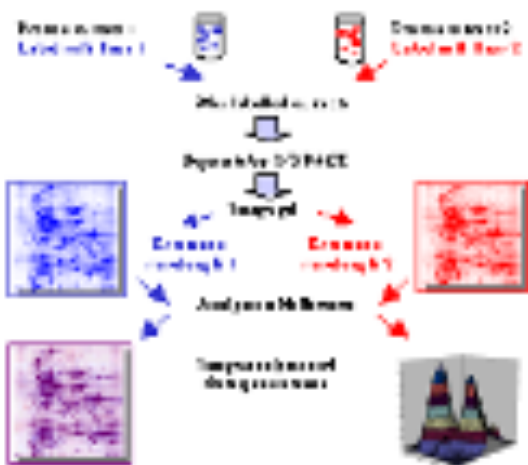


Figure 1: Overview of the 2-D DIGE technology (A schematic diagram of the workflow is shown in Figure 1).

The major limitation of the 2-D DIGE technology is the low resolution of the 2-D PAGE. However, the development of a novel 2-D DIGE approach (2-D DIGE platform) as an alternative method for protein identification and quantification, the DIGE platform. The DIGE platform is a novel method for protein identification and quantification in 2-D PAGE.

The DIGE platform (2-D DIGE platform) is a novel method for protein identification and quantification in 2-D PAGE.

- Efficiently identify and quantify protein spots.
- High resolution and sensitivity of the DIGE platform.
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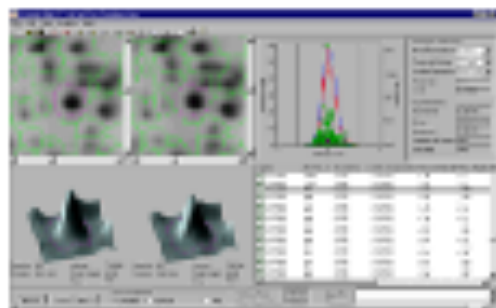


Figure 2: DIGE platform software interface (Figure 2).

The DIGE platform (2-D DIGE platform) is a novel method for protein identification and quantification in 2-D PAGE.

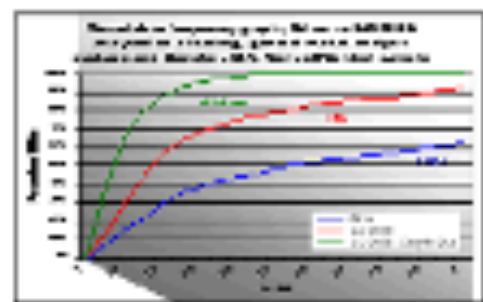


Figure 3: The DIGE platform (2-D DIGE platform) is a novel method for protein identification and quantification in 2-D PAGE.

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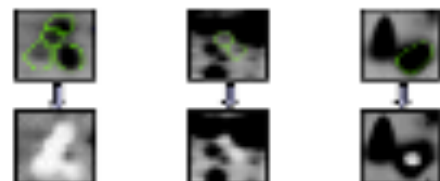


Figure 4: The DIGE platform (2-D DIGE platform) is a novel method for protein identification and quantification in 2-D PAGE.



Figure 5: The DIGE platform (2-D DIGE platform) is a novel method for protein identification and quantification in 2-D PAGE.

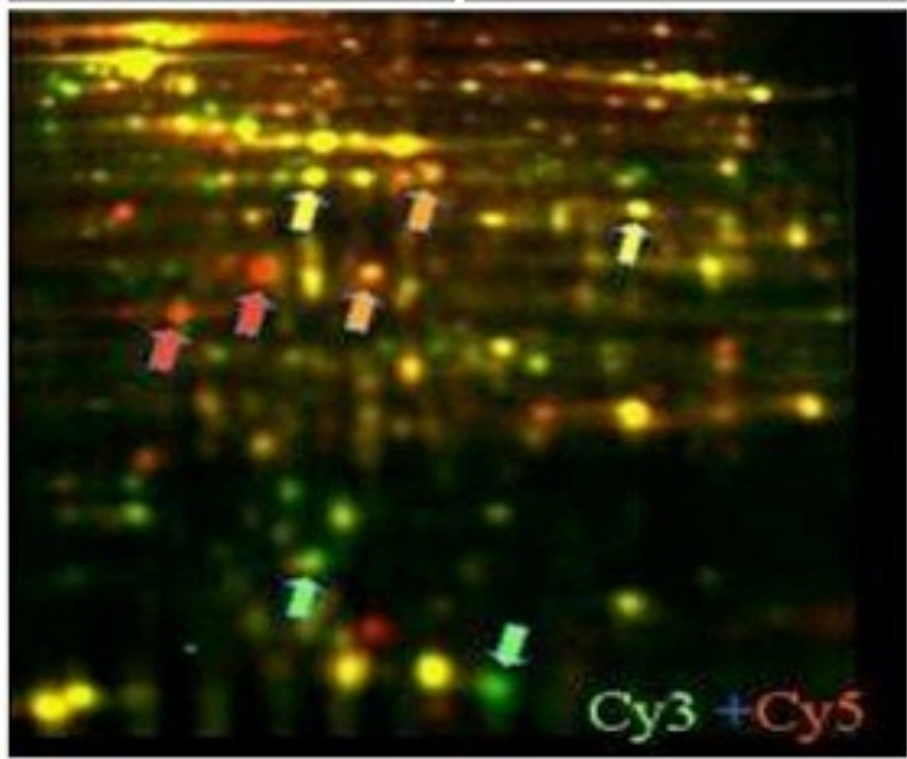
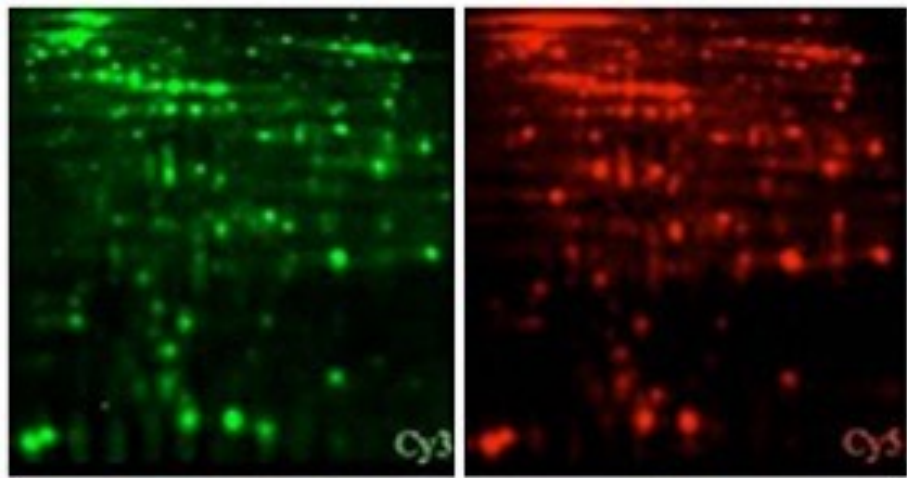
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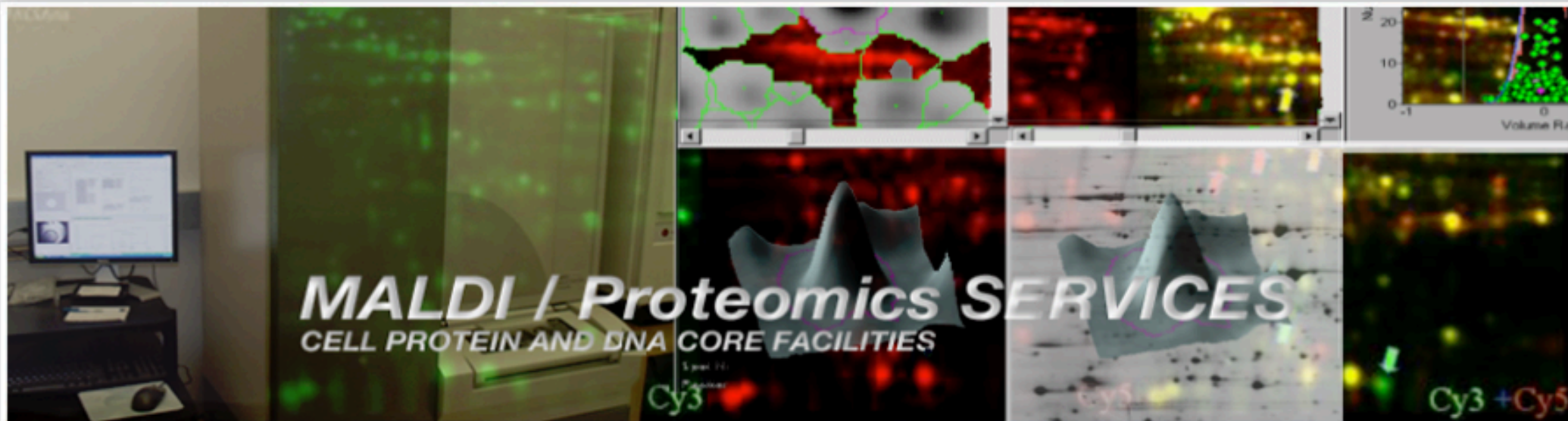
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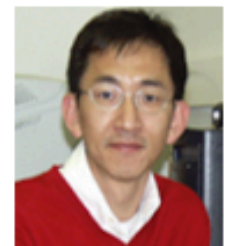
MALDI / Proteomic Services

Cell, Protein and DNA Core Facilities

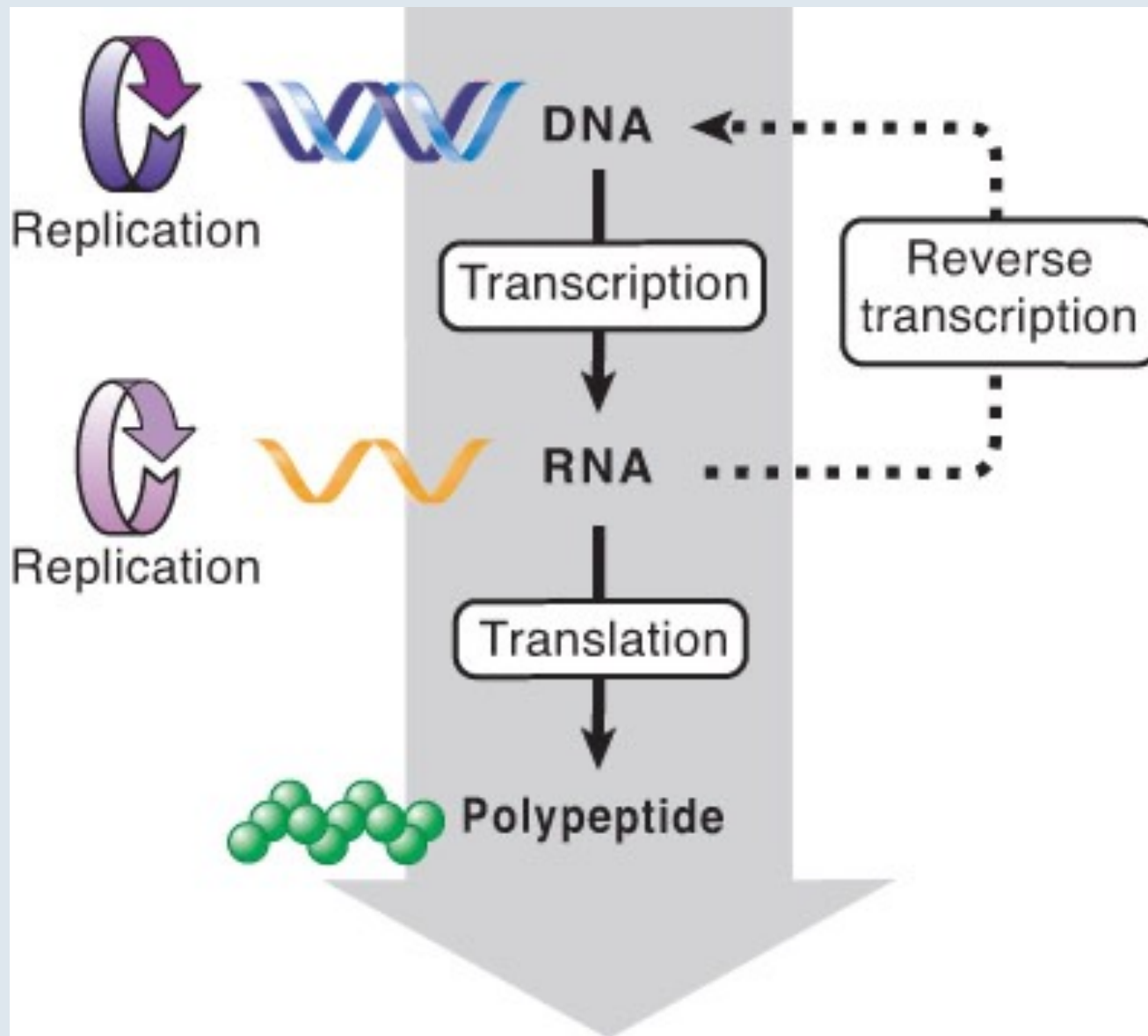
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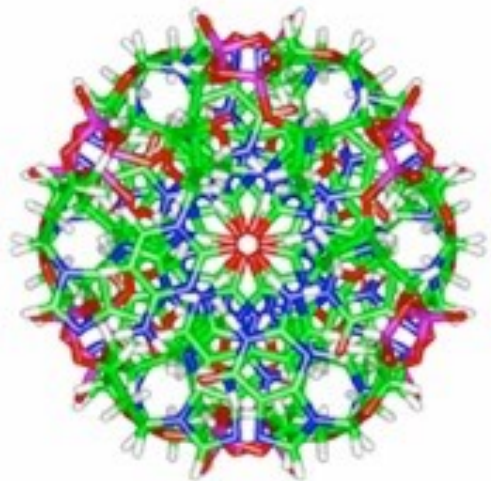
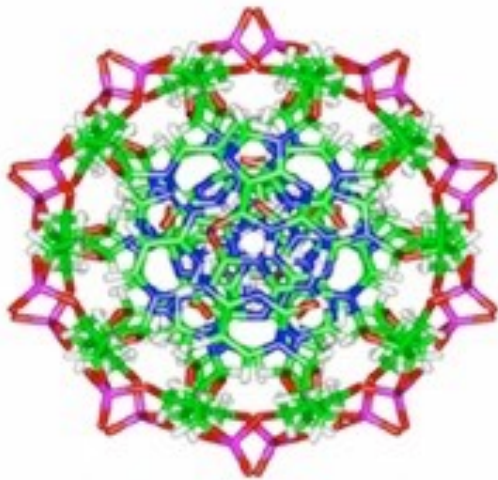
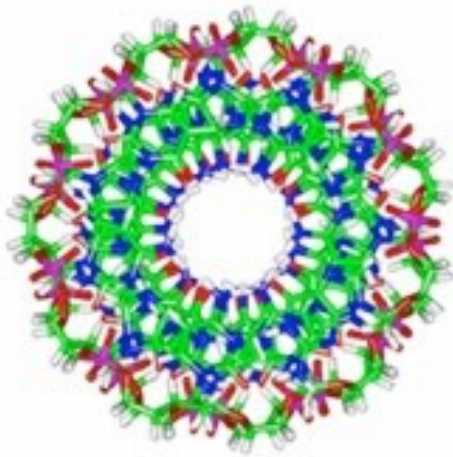
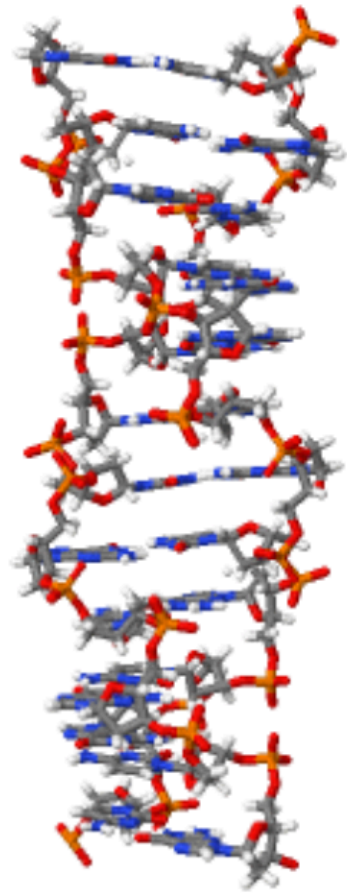
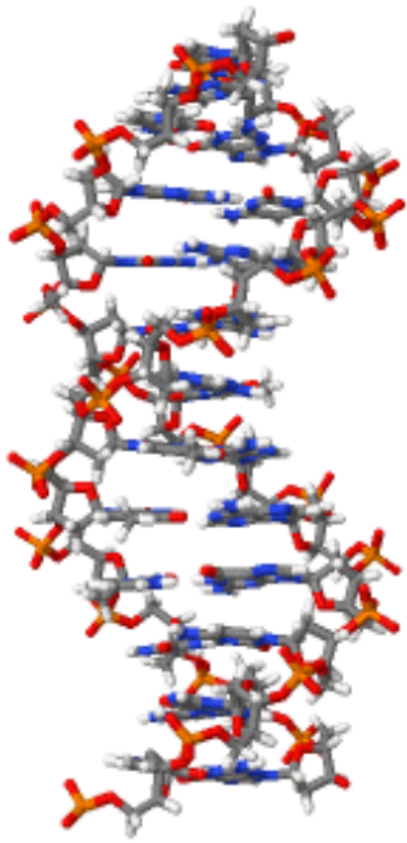
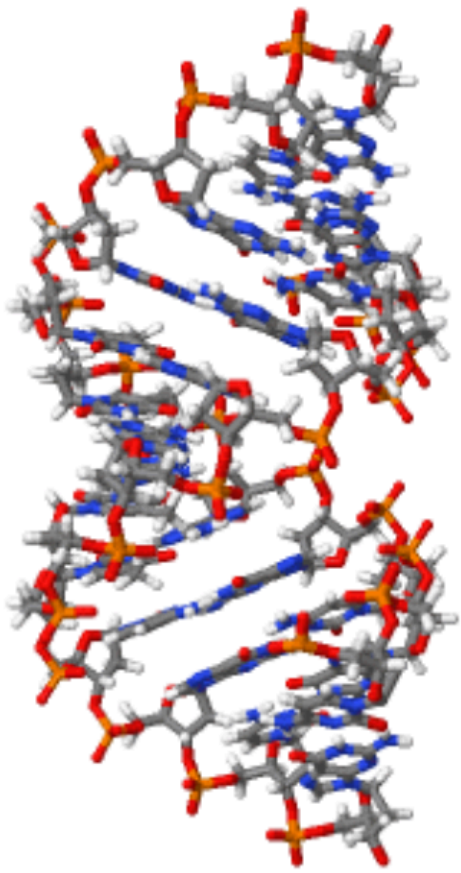
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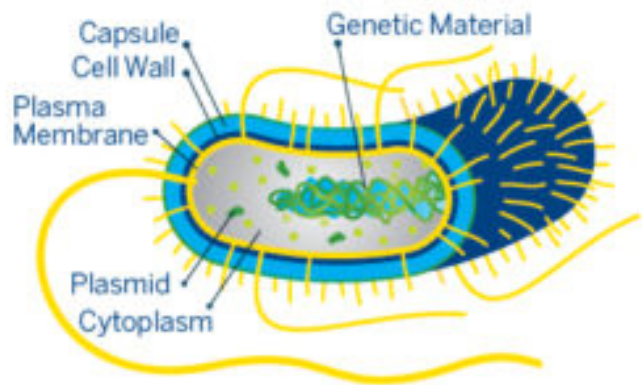
About MALDI Services



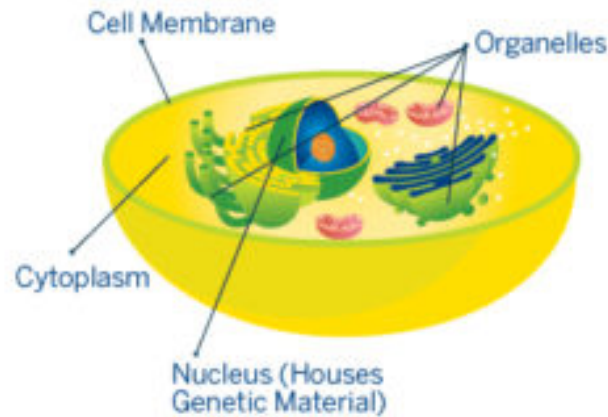
Information in nucleic acid can be perpetuated or transferred, but the transfer of information into a polypeptide is irreversible.



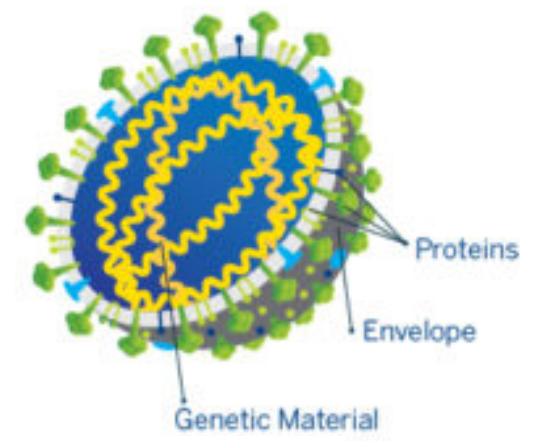
PROKARYOTE



EUKARYOTE



VIRUS



Relative size of prokaryotes and viruses

